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UNIVERSITY OF
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PICKING WINNERS:
HOW GROWTH AND NATIONAL CONTEXT
SHAPE SCALE-UP ENTREPRENEURS'
ASSESSMENTS OF INNOVATION POLICY MIXES

Steven Denney, Travis Southin, and David A. Wolfe

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Abstract

Cross-national research shows that large firms, especially those in digitally intensive sectors, exhibit significantly greater market power, higher levels of productivity, and greater innovation capacity. But the challenge of supporting the current generation of scale-ups, the group from which the next generation of large firms is likely to emerge, is not the same for all countries. Companies operating in small and open trading economies face structural barriers that those in larger countries do not, specifically with respect to access to capital, markets, and uneven competition. These challenges are particularly acute for digitally intensive industries, such as information and communication technologies. Canada provides a particularly apt case for investigation, as it is a small, export-oriented, and slower growing economy. It has a comparatively strong start-up ecosystem and a federal government committed to supporting high-growth firms and the creation of more large firms, especially those in knowledge-economy sectors. Despite favorable start-up conditions, relatively few Canadian firms reach scale-up or high-growth status. The failure suggests there has been a substantial disconnect between the innovation policy support provided by successive Canadian governments and the domestic technology industry, but begs the question of what is missing?

Drawing on interviews with entrepreneurs from Canadian technology scale-ups, complemented by interviews with technology start-ups and key industry actors, we find that scale-up entrepreneurs' distinct policy preferences are rooted in their experiences encountering barriers to growth specific to Canada's political economy. These barriers include lack of access to patient capital, a small internal market, a 'branch plant' industrial structure, an overly neutral innovation policy mix, and fierce competition with much larger foreign technology firms. Contrary to conventional wisdom, scale-up entrepreneurs prefer a more active role for federal policy support in the form of demand-side, direct, and targeted innovation instruments. The findings presented in this paper provide a more nuanced understanding of the innovation policy landscape and the preferences of technology scale-up firms. As such, the findings contribute key and unique findings to the literature on entrepreneurship, innovation policy, and policy mixes.

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1.1 Introduction

Large firms dominate the economic landscape. Cross-national research shows that large firms, especially those in digitally intensive sectors, exhibit significantly greater market power, higher levels of productivity, and greater innovation capacity (McMahon et al. 2021; Manyika et al. 2018). This global trend raises the spectre of superstar firm market consolidation and a decline in labor's share of GDP (Autor et al. 2017). Given the difficulties in determining, *ex ante*, which firms will grow (Storey 1994; Hölzl, 2009) and the strong association between entrepreneurial quality at the time of firm foundation and growth trajectories (Guzman and Stern 2017; Catalini, Guzman & Stern 2019), innovation policymakers face a dilemma of devising policy strategies and the accompanying instruments to support strong business dynamics in firms with the potential to scale.

But the challenge of supporting the growth of the next generation of large firms and, specifically, the cohort of established, higher-growth firms from which future large firms are likely to emerge is not the same for all countries. Companies operating in small and open trading economies face structural barriers that those in larger countries do not, specifically with respect to access to capital, markets, and uneven competition (Baldwin and Lin, 2002; Mohnen & Rosa, 2002; & Tourigny and Le, 2004). These challenges are particularly acute for digitally intensive industries, such as information and communication technologies (Freeman & Lundvall 1988, Autio & Yli-Renko 1998; Harris 2015).

Canada provides a particularly apt case for investigation, as it is a small, export-oriented, and slower growing economy (Edquist & Hommen, 2009). It has a comparatively strong start-up

ecosystem (Gregson and Saunders 2002; Denney, Southin, and Wolfe 2021) and a federal government committed to supporting high-growth firms and the creation of more large firms, especially those in knowledge-economy sectors (Economic Strategy Tables 2018; Innovation Science and Economic Development Canada 2019). Despite these favorable conditions, Canada's innovation policy to date has produced lackluster results in terms of narrowing the gap between Canadian and competitor countries' innovation performance, including business expenditures on research and development (BERD), firm-level productivity, investments in digital technology, exports, and patenting (Nicholson 2018; Wolfe 2019a; Gallini and Hollis 2019; Munro and Lamb 2021). Canada's market-oriented approach to innovation policy has failed to break its private sector out of a 'low innovation equilibrium' where profitability has not required investments in innovation because of a structural reliance on foreign innovation, especially in the United States (Nicholson 2018; Council of Canadian Academies 2018). Despite favorable start-up conditions, relatively few Canadian firms reach scale-up or high-growth status (Parsley and Djukic 2010; Deloitte 2011; Deloitte 2012). The failure suggests there has been a substantial disconnect between the innovation policy support provided by successive Canadian governments and the domestic technology industry, but begs the question of what is missing?

Drawing primarily on interviews with entrepreneurs from Canadian technology scale-ups, complemented by supporting interviews with technology start-ups and key industry actors, we find that scale-up entrepreneurs' distinct policy preferences are rooted in their experiences encountering barriers to growth specific to Canada's political economy. Our research contributes to the literature on entrepreneurship, innovation policy, and policy mixes in several distinct ways.

First, we propose an updated analytical framework that marries entrepreneurship (experiences and perspectives) to literature on political economy and, more recently, policy mixes. First, by centering the analysis on the entrepreneur and firm, we bring the actor back into the policy mix discourse. Second, we situate entrepreneurs' opinions, experiences, and preferences within both the political-economic context of the Canadian economy and the innovation policy landscape. The result is a more refined insight for understanding firms' policy perspectives, and what they think should be done to improve the policy mix for high-growth or scale-up firms.

This paper addresses a gap in the literature on innovation policy mixes by using firm-level perspectives to illustrate what firms want and why firms justify their policy preferences with reference to their stage of growth (type of firm) and their national economic context (political economy of small, trading economies). The paper is organized as follows: first, we review the policy mix literature as it applies to policy objectives and instruments, focusing on the importance of scale-ups, or high-growth firms, in addition to the need to take account of national context (country size and industrial structure) and firm actors (specifically, the entrepreneur) in understanding why firms hold the policy preferences that they do. Next, we review the empirical basis for analyzing interviews with scale-ups entrepreneurs and other relevant actors. Then we present and analyze the analytical findings, followed by a brief discussion and conclusion.

2.1 Policy Mixes: Firm Type, National Context & Actors

Policy mixes, defined as the combinations of policy instruments and the arrangements of goals and means, have seen renewed interest and focus in the literature on innovation policy (Flanagan et al., 2011; Borrás and Edquist, 2013; Magro and Wilson, 2013; Lanahan and Feldman, 2015; Flanagan and Uyarra, 2016; Martin, 2016). Existing research on innovation policy mixes, however, is criticized for neglecting the role of actors and context in favour of studies that focus primarily on analyzing policy instruments and mixes (Flanagan et al. 2011; Cunningham et al. 2016; Rogge & Reichardt 2016; Kern, Rogge & Howlett 2019; Lindberg, Markard and Andersen 2019). Recent work has shifted the focus from being place agnostic to considering place-based policies, especially governance structures (Magro and Wilson 2019). Attention has also been paid to firm types (such as start-ups; see Audretsch et al. 2021) and the importance of aligning policy instruments with firm-specific goals. Building on these advances in the policy mix and innovation policy literature and calls to involve both place and actors, we focus specific attention to national context, especially size of the economy, industry structure, and the entrepreneurs involved. This informs the theoretical and analytical approach employed in this paper. First, we discuss the importance of scale-ups and why they are, or should be, a central concern regarding innovation policy mixes and the support for firm growth.

2.2 Firm Type: Scale-ups

Following the seminal work by Birch (1979) on the importance of small, high-growth firms in creating the bulk of new employment opportunities, the literature in entrepreneurship studies has renewed its focus on high-growth small and medium enterprises (Coad et al. 2014). Sometimes

referred to as high-growth firms (cf. OECD 2007; Kaufmann 2016), scale-ups are defined by sustained employment and revenue growth over time.¹ They are associated with a disproportionate economic impact, especially regarding net job creation (Birch 1979; OECD 2010; Haltiwanger et al.; Rivard 2017). For example, six percent of Sweden’s high-growth firms accounted for 42 percent of new jobs between 2005-2008 (Daunfeldt et al. 2013). A similarly disproportionate impact is observed in the UK (Storey 1994; Nesta 2009), the United States (Clayton et al. 2013) and Canada (Vu and Huynh 2019). They also contribute more to productivity gains (Du and Temouri 2015; Haltiwanger, Jarmin and Kulick 2016; Du & Vanino 2021), innovation (Coad and Roal 2008; Hölzl and Klaus 2010), research and development, and exporting (Huang 2019). Research points to positive externalities, as well, with benefits of scale-up activities extending beyond the firms themselves (OECD 2013; de Nicola, Muraközy, and Tan 2019).

Scale-ups are distinct from start-ups and early growth firms, with whom they are often confused. Both types typically register net growth, but a crucial difference is that start-ups also have high destruction rates (Vorkin and Gascon 2017), whereas scale-ups do not (OECD 2018), leading some scholars to question the enormous emphasis placed on new firms (Shane 2009). A significantly reduced likelihood of failure is the idea behind the concept of a ‘threshold’ firm, a concept pioneered by Steed (1982) for the Science Council of Canada.

¹ Definitions typically focus on growth in employee and revenue, in addition to firm age and size. Useful additions have been made to the original OECD definition (2007) by the Kauffman Foundation (Morelix, Reedy, and Russell 2016). For the revenue-based definition, used here, scale-ups are identified as those with 20 percent annualized revenue growth over a three-year period and with a minimum revenue threshold of \$2 million at the end of the growth period.

In Canada, the federal government has made repeated attempts in recent years to craft more effective policies to support scaling firms, although these efforts have been partial at best (Wolfe 2019a). Despite highly favorable conditions for start-up firms,² few Canadian firms reach scale-up or high-growth status (Deloitte 2011; Deloitte 2012). The Ontario Chamber of Commerce (2016) finds that “While Canadians may have greater opportunities to start a business, the next generation of large and globally competitive Canadian firms has not materialized.” Song and Bérubé (2021) find significant bottlenecks to growth at the 20+ and 50+ employee points, indicating that Canadian firms with growth potential, many of whom are likely scale-ups, face significant barriers to breaking through into the larger firm-size categories.

These barriers to growth provide a clear justification for strategies to support high-growth firms (cf. OECD 2010). Reading surveys of UK scale-ups, Lee (2014) finds “recruitment, skill shortages, obtaining finance, cash flow, management skills and finding suitable premises” as key hurdles among UK firms. Coutu (2014: 30-33), using another survey of UK scale-ups identifies similar barriers, chief among them talent suitable for established firms; exporting and selling to the public sector (i.e., government procurement); lack of later-stage growth capital; and support for research and development.

Of the potential impediments to reaching scale-up status in Canada, reports find that improper incentive structure, inadequate government support, and misalignment of support to scaling-up objectives hinders firms’ performance (Ontario Chamber of Commerce 2016;

² According to the 2019 Global Entrepreneurship Monitor (GEM), Canada’s total early-stage entrepreneurial activity (TEA) ranks considerably higher than both the global and regional averages. As established in Denney, Southin, and Wolfe (2020) for the Greater Toronto Area, there is evidence of robust start-up ecosystems in Canada, especially for firms in digitally intensive industries (e.g., technology).

Advisory Council on Economic Growth 2017). Surveys of finance and growth for Canadian firms find that scale-up firms are more likely than the rest of the firm population to cite financing as a growth barrier and report greater difficulties in seeking the government as a client (Vu and Denney 2021). Other studies reach similar conclusions regarding the lack of scale-up talent, especially in senior-level sales and marketing (Herman and Marion 2015) and the lack of access to non-dilutive capital (BDC 2015: 9-10). The report from Canada's Economic Strategy Tables (2018) called explicitly for supporting the growth of medium-sized firms to become large firms. Barriers faced by firms in larger countries, such as the US, differ from those in many smaller, trade-oriented economies. There are distinct structural barriers faced by growing and more established firms in smaller countries, such as Canada.

2.3 Innovation Policy Mixes: National Context

Structural characteristics and organizational determinants are perceived by firms as obstacles to innovation in small, developing countries (de-Oliveira & Rodil-Marzábal, 2019), as well as in smaller, trade-oriented economies such as Canada (Baldwin and Lin, 2002; Mohnen & Rosa, 2002; & Tourigny and Le, 2004). Small, open economies face barriers related to scale in securing niches in increasingly winner-take-all technology markets such as information communication technologies (Freeman & Lundvall 1988, Autio & Yli-Renko 1998, Harris 2015).

Harris (2015) argues that there is a bias in small, open trading economies against Schumpeterian or technology-based industries. He argued that the microelectronics revolution would trigger a race for technological advantage, and considering the resources required to

succeed in this race, governments and multinationals would be the leaders, thus the entry barriers associated with technological innovation affect smaller firms to a greater extent than large ones. And to the degree that smaller economies are characterized by a larger number of smaller, indigenous firms, this places the entire economy at a disadvantage with respect to technological competition. Firms operating in smaller economies do so within a suboptimal industrial structure with respect to competing in technology industries. Consequently “the social incentive to subsidize Schumpeterian industries is greater in a small open economy than in a large, closed economy” (2015, 105).

Scholars of national innovation systems have, for some time, examined the role of innovation policy mixes in addressing the common innovation challenges shared by small, open countries (Freeman & Lundvall, 1988; Edquist & Hommen, 2009; Wolfe 2019b). Small countries have limited domestic market demand, which hinders opportunities for firms to innovate via close learning linkages with users of their technologies. Also, the increasing technological complexity of most market segments places firms, especially small and medium enterprises (SMEs), at a particular disadvantage. The greater demands placed on any given firm requires greater human and financial resources – precisely what smaller countries tend to lack. The digitization of advanced industrial economies has raised minimum R&D investment thresholds for innovation, which, absent adequate and appropriate R&D support, puts SMEs at a major disadvantage (Walsh 1998). Recent evidence indicates that large firms, and especially those in digitally intensive sectors, exhibit significantly greater market power and productivity, thus making better and more efficient use of firm inputs (OECD 2021).

The Canadian economy is comprised largely of SMEs. Its lack of Canadian technology anchor firms, particularly since the decline of Research in Motion (McNish and Silcoff 2015)

and collapse of Nortel (Calof et al. 2014), stands in contrast to many of its small ‘slow growth’ country peers, such as the Netherlands and Sweden, who have a considerable number of large multinationals (Edquist & Hommen 2008: 454).³ Historically, Canada has long pursued industrial policies that relied on the import of foreign technology and foreign direct investment. The structural dependence on technology imports from foreign multinational enterprises has been described as a barrier to innovation, making the country a buyer of technology and not a creator or even competitor (Williams 1994; Smardon 2014). Industrially, Canada largely remains oriented towards natural resource extraction and continues to prefer technology transfers over ownership (Dalpe 1988: 259; Nicholson 2018), although there is stated desire to transition towards the promotion of business innovation and clean technologies (Treasury Board Secretariat 2017; Industry, Science, and Economic Development Canada, 2019).

The literature on innovation policy mixes suggests that formulating innovation policy involves choosing between at least three different types of instruments: 1) neutral versus targeted; (2 supply side versus demand-side; and (3 direct versus indirect (Edler & Hommen 2009; Edler, et al. 2016). Regarding neutral versus targeted approaches, innovation policy scholars have emphasized the ability of policymakers to proactively select different pathways to economic development (Breznitz 2007; Ornston 2012; Weiss 2014). There are many examples of countries strategically targeting support to secure competitive advantage in high-technology segments of global production networks, such as China in digital technologies (Segal 2003) or Taiwan with semiconductor manufacturing (Breznitz 2007). This type of strategic targeting of

³ Edquist & Hommen’s (2008) edited volume *Small Country Innovation Systems* contrasts the shared innovation challenges and policy mix dynamics of the small, high-income but ‘slow growth countries’ of Sweden, Norway, Finland, Denmark, and the Netherlands to those of the small, ‘fast growth countries’ of Taiwan, Singapore, Korea, Ireland, and Hong Kong.

policy support also underpins the innovation success of larger, supposedly ‘liberal market economies’, such as the United States, whose direct military research grants were instrumental in fueling the information technology revolution (Mazzucato, 2013; Weiss, 2014; Taylor, 2016).

The general pattern across OECD countries observed in the review of the direct program support for R&D and innovation undertaken by researchers at Manchester University noted that “recent decades have seen a revival of programs targeted at strategic technologies that cut across several industrial sectors” (Cunningham, Gök, and Laredo 2013: 12), highlighting the crucial role of the state in enabling technological development. Table 1 outlines the taxonomy of firm-level innovation policy instruments and policy decisions (i.e., *how* does it support firms -- indirectly, directly, etc.), including examples of instruments that the federal government of Canada makes available to firms operating in the country.

Table 1: Taxonomy of Firm-level Innovation Policy Instruments in Canada

Firm-level Innovation Policy Instruments	Policy Decisions			Canadian Federal Policy Instruments
	<i>Supply-side or Demand-side</i>	<i>Direct or Indirect</i>	<i>Neutral or Targeted</i>	
<i>Tax incentives for R&D</i>	Supply	Indirect	Neutral	-SR&ED Tax Credits
<i>Direct support – grants for firm R&D and innovation</i>	Supply	Direct	Both	-IRAP grants (neutral) -SDTC grants (sector targeted) -Strategic Innovation Fund (firm targeted, sector neutral) -Innovation Superclusters Initiative (technology/sector targeted) -CanExport grant (neutral)
<i>Technical services and advice</i>	Supply	Direct	Both	-NRC research labs (technology targeted) -Trade Commissioners Service (neutral) -IRAP consultations (neutral) -Accelerated Growth Service (firm targeted)
<i>Policies to support collaboration, clusters, and networks</i>	Supply	Both	Both	-IRAP (neutral) -CAIP (neutral) -NCE (technology targeted) -Innovation Superclusters Initiative (technology/sector targeted) -Pan-Canadian Artificial Intelligence Strategy (technology targeted)
<i>Public procurement policies</i>	Demand	Direct	Both	-BCIP (neutral) -Innovative Solutions Canada (challenge targeted)

Adapted from Edler, Abdullah, Cunningham, & Shapira (2016). Acronyms: SR&ED (Scientific Research & Experimental Development Tax Incentive); IRAP (Industrial Research Assistance Program); SDTC (Sustainable Development Technology Canada); SADI (Strategic Aerospace and Defence Initiative); AIF (Automotive Innovation Fund); ASIP (Automotive Supplier Innovation Program); NRC (National Research Council); CAIP (Canada Accelerator and Incubator Program); BCIP (Build in Canada Innovation Program); NCE (Network of Centres of Excellence)

The literature suggests that overcoming innovation barriers specific to small countries requires a targeted innovation policy (cf. Edquist & Hommen, 2009) – where the state actively targets innovation investments towards specific niches of technological comparative advantage (Freeman & Lundvall, 1988). Small states who employ targeted investments in specific technology niches can overcome size disadvantages and secure competitive niche positions in global production networks (Katzenstein 1985; Freeman & Lundvall 1988; Dalum, Fagerberg & Jorgenson 1988; Breznitz 2007; Edquist & Hommen 2008; & Ornston 2012). Small, slow growth countries with advanced economies often prioritize macroeconomic ‘framework’ policies due to interest group pressure from traditional industries (and large multinational enterprises), a lack of policy coordination, and ideological resistance amongst policymakers. In these economies “there appears to be an ideological commitment to so-called neutral policies that has in effect ruled out the adoption of pursuing more selective policies in a conscious way” (2008: 469). This differs significantly from smaller, rapid innovation-based economies like Taiwan, South Korea, and Ireland where “fewer mature industries that would stand to benefit from so-called neutral policies favouring the existing structure of production and already established technological trajectories.” The outcome in smaller, slow growing countries is an innovation policy mix defined by “fragmentation, debate and a lack of consensus” (Edquist & Hommen 2008: 460; Breznitz 2007).

The failure to provide adequate support for Canadian firms to reach global scale suggests a disconnect in the innovation ecosystem between the policy supports provided by successive governments and the high-technology community.

2.4 Innovation Policy Mixes: Actors

Innovation policy mix research has recognized the need to focus on the perspectives of firms, both as recipients of policies as well as drivers of policy change (Uyarra et al. 2011; Rogge & Reichardt 2016; Kern, Rogge and Howlett 2019). Recent work has emphasized the need for more analytical focus on: 1) Understanding policy instruments as products of policymakers' subjective worldviews that are sometimes at odds with those of policy recipients; and 2) incorporating the subjective perspectives and preferences of actors (particularly entrepreneurs) within policy mix analysis (Flanagan et al. 2011; Rogge & Reichardt 2016; Kern, Rogge & Howlett 2019; Lindberg, Markard & Andersen 2019; Coburn et al. 2021).

The new policy mix framework calls for analysis of the policy process responsible for producing the policy mix, as well as how firms in this process view the policy mix's consistency and coherence (Uyarra et al. 2016). These elements are crucial ingredients in actors' assessments of a policy mixes' overall 'credibility', or "the extent to which the policy mix is believable and reliable" (Reichardt and Rogge, 2016, 1627; see also: Costantini et al., 2017; Rogge and Dütschke, 2018). Furthermore, innovation policy scholars recognize the extent to which policy support for globally competitive firms must be designed from both a firm-based and a systems perspective (Metcalf 1995; Flanagan et al. 2011; and Wolfe 2019b).

Scholars of Canadian political economy have long recognized that business interests play an influential role in shaping Canada's innovation and industrial policy, but that there are significant differences between firms in more traditional resource and manufacturing sectors and those in technology sectors (Williams 1994; Atkinson and Coleman 1989; Smardon 2014). These studies find that firms in technologically dependent, branch plant sectors, such as manufacturing,

prefer a limited, ‘market-oriented’ role for the state in supporting innovation through supply-side, indirect, and neutral instruments (Smardon, 2014). New industry associations, which represent the interests of technology scale-up companies, forward significantly different views of Canada’s preferred approach to business support (Bergen 2017).

Do Canadian scale-up firms in digitally intensive sectors like ICT differ in their opinion regarding the availability of policy supports and the policy mix more generally, as the literature would suggest? Little is known about the policy preferences of these firms and the rationales employed for their policy preferences (and how they differ from other firms, such as start-ups). The paper addresses this knowledge gap by mapping the innovation policy preferences of a current generation of Canadian technology scale-up firms.

3.1 Data and Methodology

Collecting data on actors’ policy preferences vis-à-vis the policy mix is key to our analytical framework. Our study adds nuance to the treatment of actors in innovation policy studies by differentiating between the perspectives of scale-up technology firms from technology start-ups or early growth SMEs. In addition to providing the perspective of an important subset of firms, the focus overcomes “the tendency of some innovation policy studies to downplay variety within actor categories (e.g., individual researchers, SMEs, universities)” (Uyarra et al. 2011: 706).

This paper draws on more than 100 interviews with Canadian technology firms conducted from July 2018 to February 2020, in addition to dozens of consultations with ecosystem actors and relevant stakeholders. The empirical analysis focuses on the 71 interviews with the CEOs of Canadian scale-up firms. The questions ask about a variety of opinions

regarding their experiences as scale-ups, such as their access to markets and capital, as well as their preferred federal support for business growth and expansion.⁴ Additionally, we contrast the views of the scale-up CEOs with those of 30 interviews with technology start-ups from the Greater Toronto Area, to consider differences in policy preferences by a different firm type [analysis in Appendix B of the Supplementary Information (SI)].

For scale-ups, given that all but a few of the firms were privately owned at the time of the interview, we relied on self-reported metrics and publicly available information to determine their economic profiles.⁵ We only included firms who met the Kauffman Foundation's definition of a revenue scale-up at the time of the interview: at least 20 percent annualized revenue growth over the last three years, with an employment threshold of no fewer than 10 employees at the start of the observation period and revenue threshold of at least \$2M (Morelix Reedy, and Russell 2016).⁶ More details on the interview process, including recruitment strategy, and the questionnaire are provided in Appendix D of the SI.

⁴ We also explored opinions regarding access to talent and an understanding of intellectual property. There was little policy-relevant insight to talent questions and IP.

⁵ Of the 71 firms in our sample, the median revenues and employee counts were \$19.5M CAD and 110 employees. The median year of founding was 2008. Approximately 50 percent (36) of all interviewed firms are in the Greater Toronto Area (inclusive of Waterloo). Jurisdictions from British Columbia, Alberta, Manitoba, and Québec are also represented in the sample.

⁶ Given the nature of the data collection (self-reported financial information), we counted the year of the interview in 2018 as one of the three years of observation for ease of recall. We found interviewees were better able to provide information this way. For the interviews in 2019, we asked about the same period (2016-2018). We recognize that interviewees may be inclined to inflate numbers or may otherwise provide inaccurate estimates. To the extent possible, we fact checked the information provided with publicly available information. No firms who would be counted as a scale-up based on self-reported financials alone were determined to not be scale-ups. A few interviewees from firms who were not scale-ups indicated as such. We are confident that we have, in fact, identified Canadian revenue-based technology scale-ups for our analysis.

The transcripts of semi-structured interviews were analyzed using the qualitative data analysis (QDA) software program Nvivo (Deterding and Waters 2018, Jackson and Bazeley 2019) for content and discourse analyses. Interview questionnaires were semi-structured to enable open ended answers to general questions probing the role of government in supporting innovation policy instruments.⁷ Opinions were coded as ‘preferences’ (i.e., what firms want) wherever an interviewee expressed a positive sentiment (desire/approval). Similarly, the same policy categories were used to code ‘criticisms’ (i.e., neither working nor desired) whenever an interviewee expressed negative sentiment (flaw/frustration/disapproval).

The focus on firm preferences in the policy process builds from Rogge and Reichardt (2016: 1630), who develop an “extended policy mix concept as an analytical framework for investigating the link between real-world policy mixes and technological change.” Figure 2 shows how opinions expressed by the entrepreneur interviewees were coded by preferences (positive sentiment), criticisms (negative sentiment), or overlapping opinions (areas for policy improvement) among the types of policy instruments offered (see, for reference, Table 1).

4.1 Mapping the Policy Preferences of Canadian Scale-ups

A closer view and better understanding of policy mix *actors*, specifically the entrepreneurs themselves (i.e., scale-up entrepreneurs), could yield a better insight into the barriers to providing a supportive environment for scale-up firms. Canada fits the ‘low growth, small country archetype, with innovation policy mixes favouring more neutral instruments available to

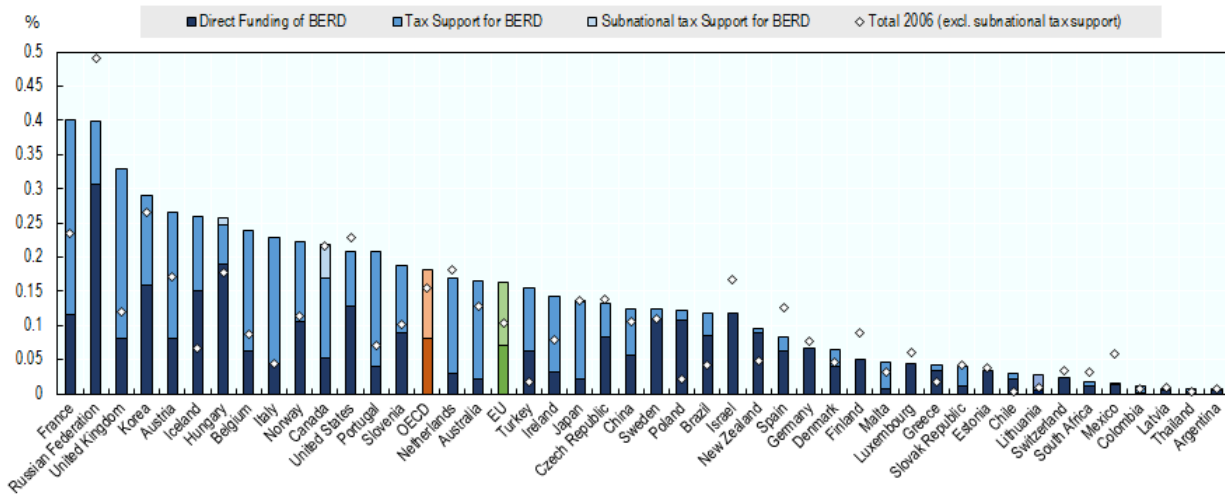
⁷ That is, supply-side (grants, loans, tax credits) versus demand-side (procurement), indirect (tax credits) versus direct (grants, loans), and neutral versus targeted, as per Edler, Abdullah, Cunningham, and Shapira (2016).

all sectors and firms, rather than employing targeted supports to specific sectors, technologies, or firms (Edquist & Hommen 2008; Nicholson 2018). The relatively few direct and targeted grant programs have historically been directed at traditional manufacturing sectors like automotive and aerospace, largely ignoring the digitally intensive knowledge economy-based services industries (ISED, 2019). Canada is also similar to other small, ‘slow growth’ countries in its prioritization of ‘supply-side’ investments in inputs to the innovation process over demand-side interventions (Edler, 2019), as similarly observed in the Netherlands, Denmark, Sweden, and Norway.

Selecting the right policy instruments to support scale-ups and fast-growth companies has proven problematic for Canadian governments over the past four decades. Firm-level innovation supports are skewed towards indirect policy instruments, such as tax credits, as opposed to direct-to-firm grants. R&D tax incentives, namely the Federal government's Scientific Research & Experimental Development (SR&ED) tax credit, has constituted between 74 and 90 percent of total Federal government spending on support for business R&D each year since 2000 (OECD 2019).⁸ Cross-national data from the OECD (2020b) on business enterprise expenditure on R&D (BERD) shows that Canada spends far less, as a proportion of GDP, on direct funding of BERD and significantly more on (indirect) tax support (Figure 1). Many countries employ policy mixes of direct and indirect, as well as demand and supply-side policies in a targeted manner, employing many instruments in efforts to support the development of specific sectors and technologies.

⁸ The SR&ED tax credit is employed in a neutral fashion and is available to any firm that qualifies, regardless of sector and firm-type. More can be read about SR&ED tax credit here: <https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program.html>.

Figure 1: Direct government funding and tax support for business R&D, 2018 (percentage of GDP)



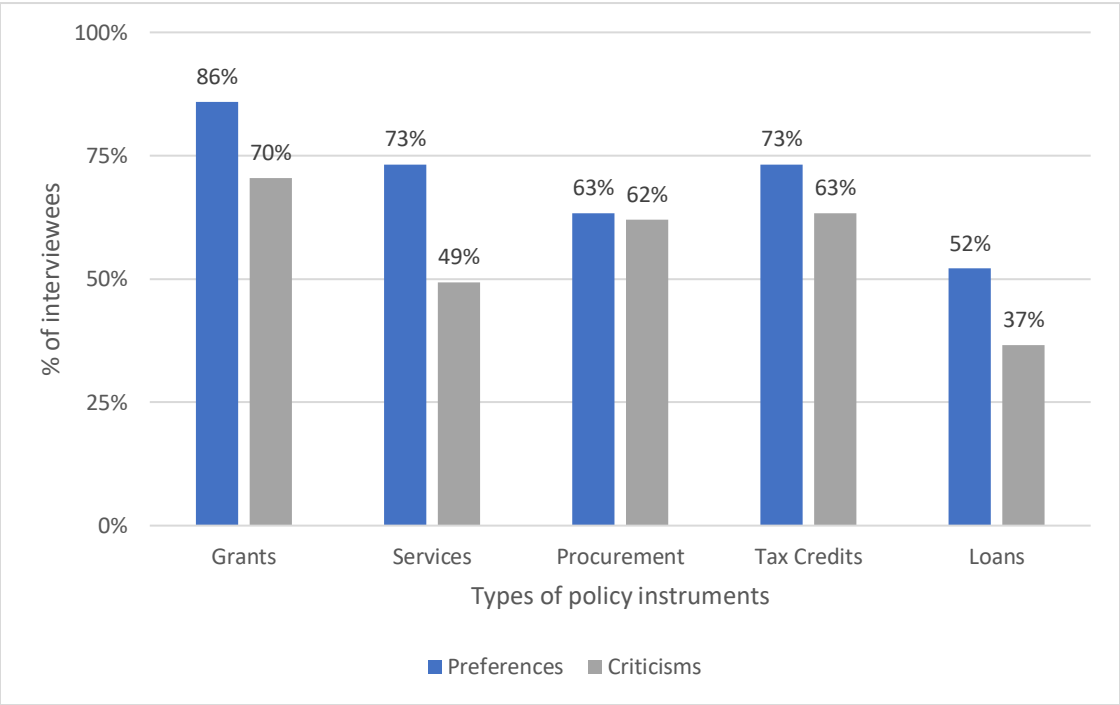
Source: OECD Measuring Tax Support for R&D and Innovation

With respect to the attitudes of scale-up entrepreneurs toward innovation policy instruments, we find scale-up entrepreneurs' articulate policy preferences for a more *targeted* innovation policy mix employing *direct* grants and *demand-side* procurement. These views are conditioned by their experiences growing a firm to scale in Canada, which underscores the importance of national context and firm type in how firms assess their policy mix environment. Scale-up firms identify Canada's small internal market, lack of patient (re: non-dilutive) capital, branch plant/resource-dependent economic heritage, and comparatively laissez-faire innovation policy mix as barriers to further growth and expansion.

Figure 3 presents the overall findings, displaying the percentage of interviewees who expressed policy preferences and criticisms of each instrument. Preferences are concentrated in favour of demand-side policies like procurement and direct spending instruments like grants and services. Criticisms are concentrated in largely the same policy areas as preferences. At first

glance, this may appear confusing, but this constitutes areas where interviewees express interest in policy improvements. For example, procurement is an instrument with qual preferences and criticisms. As we unpack more below, this is because scale-up firm desire greater procurement opportunities (i.e., preference) but also find the procurement process in Canada extremely frustrating. However, to better understand where preferences and criticisms overlap and where they do not, we need to look more closely at where interviewees had overlapping sentiments.

Figure 3: Policy Preferences of Scale-up Entrepreneurs



Notes: Proportion are out of total interviewees (n=71)

Table 2 presents the percentage of interviewees who expressed simultaneous statements of preference and criticism by policy instrument. There are two ways to read these findings. First, the overlapping of preferences and criticisms for any given instrument type. Here we see where interviewees expressed a desire for the instrument but also found problems with it as currently constituted. We see calls for improvements of grants, where 62 percent of interviewees

expressed both preferences and criticisms. With procurement (61%), these two instruments constitute most of the overlap. Improvements to other direct instruments, such as loans and services, are also identified. By contrast, only 35% of all criticisms about indirect tax credits were statements overlap with preferences, meaning many interviewees expressed *purely negative sentiment* towards this instrument.

The second way to read the findings here is where there are overlaps between the two sentiments. For example, where a criticism overlaps with a preference; this indicates a desire for one type of instrument *instead of* the other. For example, in 39 percent of all interviews tax credit criticisms overlapped with a preference for grants. Many of the calls to improve the tax credit instrument, as we will show, involve disrupting its overly neutral application as a support for all firms. It was less common for interviewees to explicitly call for, say, grants over tax credits. The explanation for this is rather simple: most interviewees like both and, as the overlapping criticisms and preferences indicate, simply want more/better direct support.

Table 2: Overlapping Policy Preferences and Criticisms of Scale-up Entrepreneurs

		Criticisms					
		Procurement	Grants	Loans	Services	Tax Credits	Neutral
Preferences	Procurement	61%	15%	3%	7%	14%	17%
	Grants	15%	62%	8%	20%	39%	30%
	Loans	1%	10%	31%	6%	7%	8%
	Services	10%	23%	7%	44%	14%	15%
	Tax Credits	7%	23%	3%	4%	35%	8%
	Neutral	0%	6%	0%	0%	1%	0%

Notes: Proportion are out of total interviewees (n=71)

Finally, Table 3 illustrates the number of interviewees who employed specific policy rationales when expressing preferences or criticisms about the various policy instruments. It was not common for the entrepreneur interviewed to employ both policy rationales *and* attitudes towards policy preference. We read such answers as more sophisticated perspectives that not all interviewees provided (i.e., for many it was sufficient in their view to either like or dislike a particular policy). The most common rationale used to justify criticisms and preferences across all policy instruments was a call for more system-level coordination. Twenty-eight interviewees expressed a desire for a whole of government approach to innovation policy characterized by the targeted deployment of direct grants and demand-side procurement as part of a holistic strategy to support domestic scale-up firms.

Preferences for procurement were often rationalized with calls to correct for power imbalances with large foreign firms (27% of interviewees) and to copy other countries' policies

(23%). Grants were often justified to correct for Canada's overly neutral innovation policy mix (30%). Regarding criticisms, 27 percent of interviewees complained that procurement ignores power imbalances by favouring large foreign firms, while less but not an insignificant number said the same about grants (e.g., foreign direct investment attraction; 21%). 23 percent of interviewees complained that tax credits are too neutral.

Table 3: Policy Rationales of Scale-up Entrepreneurs

	Rationale: <i>Neutral</i>	<i>Foreign-</i> <i>targeted</i>	<i>Copy</i> <i>other</i> <i>country's</i> <i>policies</i>	<i>Solving</i> <i>Social</i> <i>Problems</i>	<i>System-level</i> <i>Coordination</i>
Preference: <i>Procurement</i>	17%	27%	23%	21%	39%
<i>Grants</i>	30%	18%	10%	13%	39%
Preference: <i>Loans</i>	8%	0%	3%	1%	11%
Preference: <i>Services</i>	15%	7%	10%	4%	24%
Preference: <i>Tax Credits</i>	8%	6%	4%	1%	11%

	Rationale: <i>Neutral</i>	<i>Foreign-</i> <i>targeted</i>	<i>Copy</i> <i>other</i> <i>country's</i> <i>policies</i>	<i>Solving</i> <i>Social</i> <i>Problems</i>	<i>System-level</i> <i>Coordination</i>
Criticism: <i>Procurement</i>	14%	27%	21%	20%	38%
<i>Grants</i>	20%	21%	10%	8%	35%
<i>Loans</i>	4%	0%	1%	0%	7%
<i>Services</i>	7%	10%	3%	1%	18%
<i>Tax Credits</i>	23%	7%	8%	6%	21%

Notes: Proportion are out of total interviewees (n=71)

The following subsections provide more qualitative detail about the preferences of scale-up entrepreneurs, illustrating how interviewees justified their three main policy preferences (targeted approaches, direct grants, and procurement) via the main policy rationales (correcting Canada's overly neutral policy mix, correcting power imbalances with foreign firms, copying other countries' policies, and coordinating the policy mix). Importantly, this additional detail and analysis reveals how the articulation of these preferences and rationales is informed by interviewees' experience with barriers to scaling posed by aspects of Canada's political economy.

4.2 Preference for Targeted Approaches

Entrepreneurs expressed a general desire for policymakers to adopt a more strategically focused industrial policy that mobilizes multiple policy instruments in a holistic fashion towards supporting the scale of promising Canadian technology firms. Of the entrepreneurs who maintained that Canada's current policy mix was too neutral, most criticized the R&D tax credits, followed by concerns that grants and procurement were not focused sufficiently on supporting scale-up firms. Several expressed a need to emulate other countries' more targeted approaches to supporting scale-ups or high-growth firms. The following quote is representative of the general preference for strategically targeted, whole-of-government approaches:

We're at the beginning of a new technology war in the digital space. And we better catch up, because [other countries] are all [investing] through selected procurement, through big funding of the digital space, and the Canadians are nowhere to be seen... A lot of private sector money [in other countries] is coming from the public sector in the form of tax credits, through direct technology funding, through

specialty grants, all kinds of mechanisms. Through selected procurement, preferred procurement, all kinds of policies to support the technology industry at a large scale. [...] We should be doing this; we should be doing the same.

The preference for more targeted approaches is evident in the number of firms who complained about the excessive reliance on tax credits in the overall policy mix. This sentiment was often developed through interviewees' experiences competing in global markets with large competitors whose home governments mobilize many types of innovation policies in a race to dominate fiercely competitive, winner-take-all market segments. One entrepreneur challenged Canada's reliance on the largely neutral instrument of SR&ED tax credits, lamenting: "They've been wanting to fund a million little, tiny start-ups [...], which is basically a way of sprinkling around a whole bunch of money for as many constituents as they can, but it doesn't necessarily create the next Blackberry, Bombardier, or Nortel."

Interviewees note that Canada's neutral approach of spreading support across all sectors and firm-types ignores structural barriers to scaling up, such as the power imbalance with foreign multinationals in oligopolistic technology markets. While many appreciated the non-dilutive nature of Scientific Research & Experimental Development (SR&ED) tax credits, they expressed concerns that it was not the most optimal use of funds on a national level, particularly given Canada's relatively small size.

Grants were viewed as a more strategic alternative. The following quote reflects many firms' preferences for targeted grants to support scale-up firms via instruments like the Strategic Innovation Fund (SIF)⁹ over the more neutral SR&ED program:

Stop this 'spray and pray' tactic and focus on the targeted support... What is required, and what other jurisdictions are winning with, is direct support in the form of long-term vision incentives [...] we need more SIF. We need less SR&ED and more SIF. [...] The one thing that is going to support me the best at this stage of my company's scale is SIF, because it's going to be direct investment and is going to leverage other investors to come in.

Many entrepreneurs felt that Canada's neutrality in spreading tax credits and grants across the entire economy, rather than doubling down on domestic scale-ups, functions to skew the overall policy landscape in favour of foreign multinationals.

Another entrepreneur noted that Canada's small market does not equip Canadian firms with sufficient revenue or investment for global competition with much larger players: "Canada is immediately and tragically stunted at a native market of around 35 million that is, in many, many cases, a taker of technologies, processes, and innovations that happen outside that

⁹ Stream 1-3 of the Strategic Innovation Fund (SIF) is designed to support firms "looking to undertake projects that encourage research and development (R&D) activities to accelerate technology transfer and commercialization, facilitate the growth and expansion of Canadian firms and/or attract and retain large-scale investments to Canada." More can be read about SIF here: https://www.ic.gc.ca/eic/site/125.nsf/eng/h_00004.html. The program is intended to support firms in strategic industrial sectors and is the policy instrument that probably most closely aligns with scale-up preferences (in addition to the Industrial Research Assistance Program, which also directly funds projects). Funding is available for both multinational and domestic firms and has been allocated for both. According to publicly available information as of February 2021, 27 out of 72 firms selected for support were domestic SMEs.

jurisdiction.” They elaborated on how these ‘structural glass ceilings’ limit export growth, saying:

The dynamics, the scale, the pre-existing relationships, the cultural, financial, and regulatory burdens are just—they are material to international success. [...] Canadian companies, if they have international competitors or cross-border competitors, simply lose all wars of attrition [...] as they align with the gorillas in the space for economic and road map validation, they inevitably, slowly but surely, lose their ability to be independent and to be successful.

This entrepreneur argued that Canada needs to be “quite selective as to the areas where they want to try and position Canadian champions,” because “We don’t have the ability to take our limited capital and spread it across a large war front.”

Beyond targeting industries, several entrepreneurs noted that the barriers to growth as a scale-up in Canada’s political economy necessitates a firm-level, targeted approach. In response to the question about the relative merits of non-targeted approaches, one entrepreneur said:

I dare someone to actually point to something that's been tremendously successful, that has scaled-up using the process [of indirect support]. Rather, look at the successful countries in the world like Israel, Sweden, Australia [...] they'll pick an industry [...] but then they try to pick winners there. You actually have to have the ability to engage with industry to determine which are the likely winners and the likely losers, you do have to make bets like that. That's why Israel, a country of what, 2, 3, 4 million people is eating our lunch in digital technology development: because they pick winners. The government backs proven winners.¹⁰

¹⁰ Israel has a population of approximately 8.8 million people, as of 2018, and Sweden has a population of just over 10 million (in 2019).

This same entrepreneur expressed another popular criticism that Canada lacks the state capacity, or willingness, to identify and support promising firms: “It's not that hard to pick winners [...] each one of those successful countries’ governments are informed by a Technology Advisory Board or a technology court.” They contrasted this with Canada, stating “we don't have a technology court or advisors. There is no established systematic way to actually engage with business, and especially technology businesses, to actually get their opinion on what's working and what isn't working and picking the winners out of that.”

The opinions expressed above reflect a widespread desire for innovation policymakers to extend the targeted approach of the Accelerated Growth Service, a federal program that targets high growth firms for government support (currently through advising),¹¹ even further by selecting the most promising firms into a ‘vetted’ category where policymakers proactively identify pre-qualified firms and tailor a wide range of innovation policy instruments for these firms in order to maximize their chances of competing at a global level. This perspective is similar to that expressed in the report on the consultations with the federal government’s Economic Strategy Tables. “Canadian entrepreneurs are good at launching companies,” the 2018 report states, “but struggle to scale, citing insufficient access to financing, advice, global talent, markets and growth opportunities as barriers” (Economic Strategy Tables 2018: 7).

The next two sections focus on two of the most preferred policy instruments: direct contributions (e.g., grants and loans) and demand-side instruments, such as strategic procurement and standards.

¹¹ More can be read about the Accelerated Growth Service program here: <https://www.ic.gc.ca/eic/site/117.nsf/eng/home>.

4.3 Preference for Direct Grants and Loans

Of the entrepreneurs interviewed, 39 percent expressed a preference for grants over tax credits, making this the most popular simultaneous expression of preference for one instrument over another (see Table 2). Interviewees regularly cited the need for non-dilutive, direct-to-firm instruments like grants and loans.¹² They explained their policy preferences for non-dilutive direct grants in relation to the ‘impatient’ nature of Canada’s financial ecosystem.¹³ Interviewees noted that government grants help the firm grow while staving off pressure to dilute equity ownership. One entrepreneur notes that, in order to maintain control and stave off an earlier exit, “the things that you want to finance your firm with are real customers, then grant money, then external capital, in that order.”

In general, entrepreneurs described patient capital as either lenders or equity investors with long-term time horizons and a risk-tolerance expectation geared towards large-scale growth. Self-financed firms described their autonomy vis-à-vis their non-dilutive capital structure as a key element in enabling their *continuous* growth.¹⁴ Interviewees emphasize the trade-off between

¹² While the majority of those interviewed preferred direct grants, there were also many entrepreneurs who expressed appreciation for the role played by SR&ED tax credits as a form of non-dilutive capital. One particularly strong preference summarized it as follows: “[We] self financed, really bootstrapped our way through [growth]. [...] A key piece for us was the SR&ED program. We just would not exist without it.”

¹³ Nearly one third (23) described their firms as primarily self-financed compared to VC-financed (22), angel investors/high net-worth individuals (10), publicly traded (7), Private Equity (5), and acquired (3). Self-financed firms often financed their growth through a mix of initial personal/family funds, followed by revenues and debt financing. Self-financed firms were on average older (2001) and larger in revenues (\$125.5 million) and employees (613) than firms backed by VC (2010, \$30.5m, 149), Private equity (2006, \$68.3m, 366), and Angel-financed firms (2011, \$8.6, 46).

¹⁴ Research shows that firms with ‘growth potential’ usually grow *with or without* venture backing (Catalini, Guzman & Stern 2019), but firms that take on dilutive capital, and thus surrender equity/control in the

control and funding, with many stressing the importance of maintaining control of the firm and avoiding equity investors by prioritizing non-dilutive sources of capital. One self-financed scale-up firm noted that “entrepreneurs that want to keep control of their business will not want to use venture capital. If you work with the venture capital guys, you aren’t thinking long term, I don’t care what they tell you, they want to be out in 3-5 years, so they will find someone to sell it to.”

Entrepreneurs attribute the dearth of patient capital to Canada’s legacy as a resource-extraction economy, with financiers being more attuned to the realities of the country’s natural resource or traditional manufacturing industries and thus overly risk-averse in lending to technology scale-ups. One entrepreneur’s indictment of Canadian banks and the financial ecosystem generally, which is largely representative of the interviewees generally, said the following:

On the debt side of things, Canadian charter banks, they really don’t understand technology businesses. They understand oil and gas, they understand mining, they understand forestry businesses, they understand how to price inventory and timber that is sitting in a yard. They [the banks] look at our inventory and they say they have no idea how to price that. They don’t understand it: ‘You tell me there is IP behind it, you tell me there is 70% margin, I don’t get it because lumber is 4% margin.’ They just don’t understand it.

Many of the entrepreneurs interviewed believe that Canada’s lack of non-dilutive options is compounded by an absence of large Canadian acquirers and secondary investors, which leaves foreign acquisition as the primary solution to provide a return for the initial investors. “The one

firm, tend to exit earlier than firms that do not. Wasserman (2017) finds an inverse relationship between value and control. Founders who take on venture capital funding exit at significantly higher values than those who do not but earlier in the firm’s life cycle than would otherwise be the case. In fact, for each level of control that the founder(s) gives up, the value (at exit) increases by about 20 percent.

area that we still lack is growth stage and buyout stage PE [private equity],” noted one entrepreneur. Another noted that, “unfortunately, and this is where the rest of the market lets down these entrepreneurs, the only exit is south of the border [...] where the venture fund we would like to sell it to is a Canadian security, there just is no Canadian security to buy it.” They continued, this is because “the sale of companies that have not allowed a Canadian consolidator to stick around and provide that Canadian exit for those venture funds.”¹⁵

Table 4 shows the number of acquisitions of technology firms by the acquirer’s country of control for select countries between 2010 and 2019. As indicated in the interviews, American capital plays an oversized role in Canadian technology sector. One interviewee noted that large American firms see “good bargains up in Canada, like the Value Village” for technology. The data here reflect the opinions of scale-ups entrepreneurs who see American capital as playing an oversized role in Canadian technology ecosystems; a view consistent with the ‘low innovation equilibrium’ thesis (Nicholson 2018).

¹⁵ Institutional investors were cited as a possible solution by one interviewee: “Bay Street has a trillion under management [but] it just thinks of tech as risk, as opposed to looking at the business and understanding the market and understanding the actual risk.” One solution envisioned was for “CPP to put 1% of its asset towards large scale PE buyouts of private tech companies [...] I think that would send a signal in the market that it is time to do something about that. That is one part of the capital stock that is still broken.”

Table 4: Technology Firm Acquisitions by Country of Control from 2010-2019 (top 5)

<u>Canada</u>			<u>Israel</u>			<u>Sweden</u>			<u>Australia</u>			<u>South Korea</u>		
	n	%												
USA	604	51%	USA	144	53%	SWE	166	39%	AUS	198	39%	KOR	41	63%
CAN	392	33%	ISR	51	19%	USA	88	21%	USA	169	33%	USA	9	14%
GBR	51	4%	GBR	19	7%	NOR	40	9%	GBR	45	9%	JPN	5	8%
FRA	32	3%	CHN	10	4%	GBR	30	7%	N.A.	14	3%	DEU	2	3%
DEU	9	1%	FRA	10	4%	DNK	19	4%	CAN	13	3%	N.A.	2	3%

Source: Crunchbase, Authors' calculations. Technology firm defined as those companies categorized as one of the following: software, information technology, data and analytics, internet services, hardware, consumer electronics, gaming, financial services, biotechnology, artificial intelligence, financial services, or apps. "N.A." = unclassified.

Finally, preferences for direct grants were often justified by reference to Canada's small size and lack of non-dilutive capital sources in comparison with competitors whose home countries actively utilize direct grants. "Directly funding job creation and innovation and export sales is a virtuous circle with a feedback loop [particularly] in a small country like Canada," notes one entrepreneur. They add, "There's no question that [other small countries] get that and they will continue to fund those feedback loops."

4.4 Preference for demand-side instruments

One of the most common stated preferences for new or improved policy instruments was for the Canadian government to assume a more active role in employing demand-side instruments, such as procurement, in a targeted fashion to act as a 'market-maker' in support of scale-up firms in strategic technology sectors. Entrepreneurs justified their preference for demand-side procurement in terms of the need to correct for the small size of the Canadian market, combined

with the power imbalance with foreign multinational firms. Procurement was frequently cited as a missed opportunity to enable Canadian firms to overcome pressures for early exit by using the government as a reference customer, bolstering their credibility in export markets and their ability to retain equity in future financing rounds. Many entrepreneurs stressed the under-utilized market-making potential of combining standards, innovation grants, and procurement. One interviewee summarized the potential as follows:

Imagine there is a standard regulation that says all [levels of government] must adhere to that standard, and there is a federal funding program which helps match that standard. If [our firm] was involved in defining the standard and owning the IP around it, you just made a market for me. The government doesn't necessarily need to pick winners in this case, but it does need to grow markets where winners exist.

A common rationalization for a targeted deployment of demand-side policies was based on the neutrality of existing Canadian approaches that failed to account for structural power imbalances vis-à-vis global competitors, and as such, favour foreign firms over domestic companies.

Another entrepreneur echoed this sentiment, noting: "It's the procurement processes, the way that they think. They're going to look at providers being IBM or Siemens. It's not going to be us. So, policy needs to change. And it has to change at the top." After noting how US states favour local firms while maintaining a more competitive and value-based application process, one firm noted that "the federal government is completely inaccessible to us to the level that it's a difficulty even arranging meetings. The bureaucracy is unbelievable."

Another common rationale used to support preferences for demand-side innovation policies of procurement was using a mission-oriented, whole of government approach. One entrepreneur describes strategic procurement via mission-oriented, national projects, as such:

[Regarding procurement,] I think what is important is to have society projects. And I think in Canada, we're afraid to give money to businesses, because we don't know how to do it. [...] In the US, NASA is giving billion-dollar contracts. When you give a billion-dollar contract to any companies in the world, you build industry around that. We don't have that. Our military is not spending like that, our space agencies are not spending like that. So, we need to build proper mechanisms to get a billion [dollars] going in the direction we want to go. And this can be done through strategic procurement, visionary procurement, [but] we don't have structural projects like that.

Similar to perspectives on the lack of collaborative capacity to identify strategic R&D investments, many firms criticize the absence of mechanisms to identify and mobilize large-scale procurement resources around solving social problems. Innovative Solutions Canada, for instance, was identified as “a good step in the right direction,” but strongly criticized as too small-scale, not fast enough, and not coordinated enough with significant industry players. Furthermore, firms complained that existing procurement innovation programs ignore innovative solutions from scale-up firms that are already in the market but are overlooked due to inertia and risk-aversion within existing non-innovation procurement processes.

5.1 Robustness Checks: Start-up Companies & Survey of Finance and Growth

There are several challenges inherent to making inferences with interview data that we have endeavored to address. First is the nature of the research design, which focuses on a non-random selection of scale-up entrepreneurs. This approach invites criticism about the external validity of our findings. Furthermore, we do not compare responses here to those of non-scale-up entrepreneurs in the main body of the paper, which would provide an important baseline or point of comparison. The non-scale-up community and the broader assumptions of the innovation policy community (especially federal policymakers) constitute a normative sample of opinion against which we compare the opinions provided by our interviewees, but this will certainly remain unsatisfactory for many.

To address both concerns, we provide two important robustness checks on our findings in the SI Appendices. The first explores the policy preferences of technology *start-ups* in the Greater Toronto Area, finding that, compared to scale-ups, start-up firm entrepreneurs hold significantly different policy preferences than their scale-up compatriots (Appendix B). Contrary to scale-ups firms, start-ups are less concerned with government intervention and direct-to-firm supports, among other differences. The comparative findings are consistent with our expectations and the arguments presented here, namely: by virtue of crossing the ‘threshold’ and surviving the start-up and early growth stage, scale-ups reach a new level of development and their CEOs (the scale-up entrepreneurs) take on new views as relatively more strategic thinkers and planners. Start-ups, because of their primary concern with survival and profitability, do not assess policy mixes in the same way. There is, in fact, much less interest in available policy instruments.

The second check uses survey responses from a random selection of Canadian entrepreneurs in Statistics Canada's Survey of Finance and Growth of Small and Medium Enterprises and compares the difference between scale-up firms and non-scale-up firms on innovation metrics as well as their opinions about barriers to growth and procurement (Appendix C). We find that scale-ups are more innovative and that scale-up entrepreneurs do indeed have unique dispositions, especially given their experiences in trying to sell to the federal government. The survey-based findings add further evidence that scale-up firms are structurally different and, therefore, scale-up entrepreneurs hold distinct views vis-a-vis non-scale-up entrepreneurs.

6.1 Conclusion

In this paper, we show that scale-up entrepreneurs' distinct policy preferences are conditioned by their experiences with barriers to growth that are specific to Canada's political economy. These barriers include lack of access to patient capital, a small internal market, a 'branch plant' industrial structure, an overly neutral innovation policy mix, and fierce competition with much larger foreign technology firms. Contrary to conventional wisdom, scale-up entrepreneurs prefer a more active role for federal policy support in the form of demand-side, direct, and targeted innovation instruments. The findings provide a more nuanced understanding of the innovation policy landscape and preferences of technology scale-up firms.

This paper fills a gap in the literature on innovation policy mixes by using scale-up entrepreneurs' perspectives to illustrate how firms justify their policy preferences with reference to their stage of growth and their national economic context. To date, the policy mix literature has not taken sufficient account of industry actors' opinions and experiences, especially those of

entrepreneurs. A new, actor-focused turn in the literature will encourage policymakers, researchers, and program evaluators to adopt an industry actors-centered approach. The research and findings presented in this paper sought to be precisely this.

Regarding policy mix consistency, scale-up entrepreneurs see a misalignment between the federal government's stated goal of scaling Canadian technology firms and the current innovation policy mix that takes a laissez-faire approach, characterized by a reliance on supply-side investments via indirect tax credits employed in a non-targeted fashion.

The articulation of these policy perspectives is informed by their experience encountering the barriers to scaling technology firms in the small, open Canadian economy (i.e., the policy mix context): market entry barriers to small firms in winner-take-all market segments and a financial sector that favours equity dilution and early exit. Alleviating these contextual factors provide the rationale for their policy preferences for a more active innovation policy mix characterized by the targeted use of direct grants and demand-side procurement. In short, our study illustrates how firm-type and political economy context interact to shape how actors assess the consistency and coherence of policy mixes.

Future research should continue to explore how firm type (growth stage) and national context animate entrepreneur's assessments of innovation policy mixes. A comparative research agenda on firm-level perspectives on innovation policy mixes would be a useful extension of the theoretical framework developed in this paper. Finally, it would be useful to examine the relative influence exerted by various actor groups with differing policy preferences on the evolution of innovation policy mixes. Analyzing actor influence alongside other institutional and ideological drivers of policy change/stability would shed more light on the governance of innovation policy

mixes, effectively bridging the hitherto isolated literatures of comparative political economy of growth regimes (Hassell & Pallier, 2021), theories of the policy process (Wieble & Sabatier, 2018), and innovation policy mixes (Edler, et al. 2016).

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Appendix A – Innovation Policy Instruments & New Trudeau Initiatives

Table SI.1 reproduces Table 1 from the manuscript but differentiates between policy instruments added by new initiatives under Justin Trudeau administration (as of writing, the current administration) and the older policy mix. This table is referenced in the manuscript’s Conclusion.

Table SI.1: Taxonomy of Firm-level Innovation Policy Instruments in Canada - New Initiatives Focus

Firm-level Innovation Policy Instruments	Policy Decisions			Canada	
	<i>Supply-side or Demand-side</i>	<i>Direct or Indirect</i>	<i>Neutral or Targeted</i>	<i>Pre-Trudeau (pre-2015)</i>	<i>Trudeau Initiatives (2015-present)</i>
<i>Tax incentives for R&D</i>	Supply	Indirect	Neutral	-SR&ED Tax Credits	
<i>Direct support – grants for firm R&D and innovation</i>	Supply	Direct	Both	-IRAP grants; -SDTC grants; -SADI/AIF/ASIP grants	-Increased IRAP & SDTC funding -Strategic Innovation Fund -Innovation Superclusters Initiative -CanExport grant
<i>Technical services and advice</i>	Supply	Direct	Both	-NRC research labs -Trade Commissioners Service -IRAP consultations	-Increased IRAP funding -Accelerated Growth Service
<i>Policies to support collaboration, clusters, and networks</i>	Supply	Both	Targeted	-IRAP -CAIP -NCE	-Innovation Superclusters Initiative -Pan-Canadian Artificial Intelligence Strategy
<i>Public procurement policies</i>	Demand	Direct	Targeted	-BCIP	-Innovative Solutions Canada
<i>Innovation Inducement Prizes</i>	Demand	Direct	Targeted		-Smart Cities Challenge

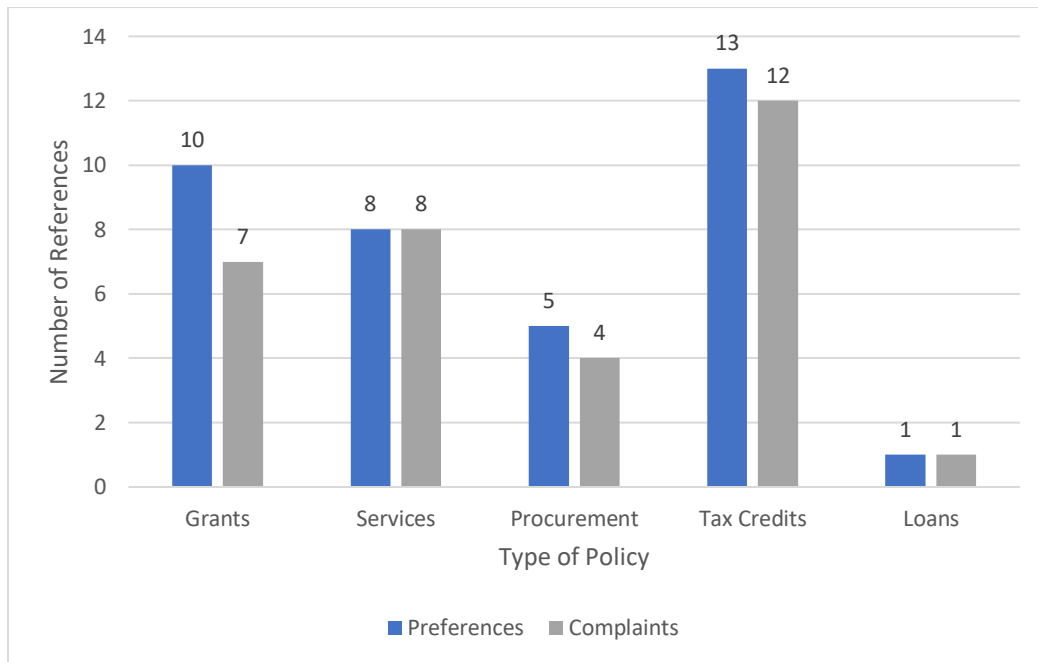
Adapted from: (Edler, Abdullah, Cunningham, & Shapira, 2016). Acronyms: SR&ED (Scientific Research & Experimental Development Tax Incentive); IRAP (Industrial Research Assistance Program); SDTC (Sustainable Development Technology Canada); SADI (Strategic Aerospace and Defence Initiative); AIF (Automotive Innovation Fund); ASIP (Automotive Supplier Innovation Program); NRC (National Research Council); CAIP (Canada Accelerator and Incubator Program); BCIP (Build in Canada Innovation Program); NCE (Network of Centres of Excellence)

Appendix B – Robustness Check 1: Start-up Preferences

In the manuscript, we claim that scale-ups, by nature of the firm organization and structure, hold policy preferences and dispositions significantly different from other types of firms, such as start-ups and early growth firms. Since our interview programme did not include start-ups, our claim is not empirically validated in the manuscript. However, using a small number (n=30) of technology startup interviews (firms <5 years old) – all Canadian owned firms based in the Greater Toronto Area – from a previous project (Denney et al. 2020)¹, we coded their policy preferences using the same coding scheme applied in this research and based on similar policy prompts and questions. Figure SI.1 shows the overall findings according to policy preferences and complaints. Overall, we find a firm perspective more befitting of non-scale-ups. Grants (direct funding instrument) is less salient than a neutral policy instrument (i.e., ‘tax credits’). Further, there is little strategic discussion about the value or lack thereof of a neutral policy mix or the influence of multinationals and foreign capital.

¹ All firms involved (and coded for reporting here) were in the early stages of their product and service development (<= 5 years old) and were assigned a 4-digit NAICS code that would classify them as a technology firm.

Figure SI.1: Policy Preferences of Start-up Entrepreneurs



The rationales employed by start-up CEOs, tellingly, leans more towards ambivalence towards government programs. Most focus on customer/demand and less on more strategic thinking (i.e., what’s best for the technology ecosystems), and shy away from considerations of IP strategies, patenting, or influencing policymaking. An illustrative quote, regarding whether the firm was actively seeking IRAP (Industrial Research Assistance Program) funding, a source of direct government funding, reads as follows:

We [are] not. The BDC [Business Development Bank of Canada] introduced us to them, saying that they tend to share partnerships and invest in the same companies. And IRAP said, ‘come back to us when you are mid-tier company. We’d prefer not to invest in start-ups.’ So, I haven’t gone back, again because it is so time consuming, I would much rather get consumer revenue.

The start-up firms, even after expressing some reservations about the effectiveness of the Scientific Research and Experimental Development (SR&ED) Program, would typically emphasize its importance. In defending the value of SR&ED to start-up firms, as a form of employment subsidy and support equally accessible to all, and arguing against the idea that SR&ED funding authority would be given to a VC-like fund (to select only the best performing firms), one respondent had the following to say:

[SR&ED is Canada's] number one program, and it's one of the programs that recently they've been looking at and proposing some alternative models, and I've actually written to the government, saying that I really hope they don't make some of the changes they've been speculating on. The SR&ED program is a very powerful program because it does not presuppose the sale of the business as the end outcome of success. The SR&ED program says that if you're doing valuable work advancing technologies through research and scientific development, that the government will support you in terms of making that happen. So, it doesn't not matter whether you want to sell the business or whether you want to keep it for a long time. If you would be really happy to create a business that employed 100 Canadians for the next 30 or 40 years, it doesn't matter.

Appendix C – Robustness Check 2: Insights from Survey of Finance and Growth of Small and Medium Enterprises²

Due to the non-random selection of participants into the survey interviews, it is not possible to distinguish a representative view of scale-up entrepreneurs towards innovation policy supports. An externally valid measure of scale-up entrepreneurs' preferences would require a probability sample of all entrepreneurs. Such a survey is, in fact, conducted by Statistics Canada, in their Survey of Finance and Growth of Medium Size Enterprises (SFGSME). A survey of firms with at least \$30,000 in revenue and employment levels between 1-499, the survey asks questions about a firm's overall business experience, especially those related to finance and growth, in addition to recording information on firm ownership structure.³

Using survey responses from the 2017 survey linked with firm-level financial information from the General Index of Financial Information (GIFI), we explore whether scale-up firms answer differently than non-scale-up firms on some relevant questions for which data were obtained.⁴ Identifying revenue scale-ups, by the same definition used in the manuscript, we examine whether there are significant differences in performance and experience. Questions

² The data used here was the principal data source for the following report: Viet Vu and Steven Denney, "Scale the Gap: Exploring gender ownership and growth experiences for Canadian firms" (Brookfield Institute for Innovation and Entrepreneurship, March 2021). The analysis is the joint IP of the authors.

³ The target population is stratified by age (of business), enterprise size, industry, and geography and excludes joint ventures, non-profits and enterprises in industries 'not of interest'. Industries out of scope, by the North American Industry Classification System (NAICS), include: utilities (22), finance and insurance (52), management of companies and enterprises (55), educational services (61), public administration (91), automotive equipment rental and leasing (5321), commercial and industrial machinery and equipment rental and leasing (5324), out-patient care centres (6214), medical and diagnostic laboratories (6215), other ambulatory health care services (6219), general medical and surgical hospitals (6221), psychiatric and substance abuse hospitals (6222), specialty (except psychiatric and substance abuse) hospitals (6223), community food and housing, and emergency and other relief services (6242) and private households (814110). For more, see the survey documentation at: https://www.ic.gc.ca/eic/site/061_nsf/eng/h_02774.html.

⁴ To identify revenue scale-ups, we use financial information two years prior to the year of survey and two years after, specifically real total revenue at year end from the corporation income tax return (T2 form linkage).

related to innovation and growth are explored. First, we look at whether a firm is innovative or holds intellectual property (IP) (two variables which belong, broadly speaking, to the same category bin of ‘innovation’).

Second, we examine questions related to growth barriers and barriers to procurement. The purpose of these robustness checks on our findings (presented in the manuscript) is to determine whether scale-ups do, in fact, hold significantly different views than non-scale-ups. We forward an explanation based on firm organization and structure which holds that scale-ups, due to the nature of the scale-up firm itself, will perform differently and hold opinions significantly and substantively different from non-scale-ups.

We use single dichotomous outcome variables for innovation and IP. Respondents were shown a list of firm-level innovations and types of IP and asked to indicate simply ‘yes’ or ‘no’ for whether the business engaged in that innovation or held that IP (see Table SI.1 for an overview). Questions related to growth and procurement are explored individually, where the sample size permitted, and are listed in Table SI.2 below.

Due to small sample sizes, we could not measure technology firms only or specifically. We report overall results. Despite the industry difference, determining whether scale-ups hold a significantly unique opinion vis-à-vis non-scale-up enterprises is useful for the research presented here.

Figures SI.2-5 report the findings. First, we find that (revenue) scale-ups are significantly more innovative than non-scale-ups (Figure SI.2). 45% of scale-ups firms say they innovate, whereas only 34% of non-scale-ups do. A slightly larger percentage of scale-ups, compared to non-scale-ups, have IP holdings (46-35%). As indicated in the research on scale-ups reviewed in

the manuscript, scale-ups are indeed more innovative overall, as measured by self-reported firm-level innovations or IP holdings.

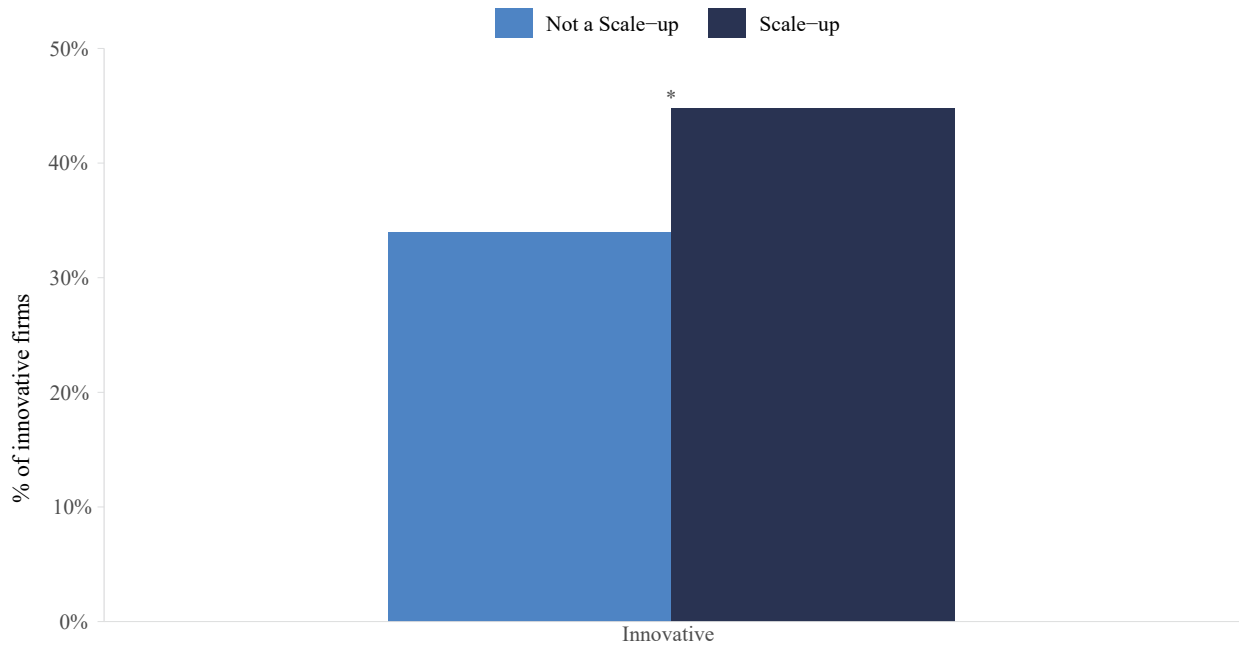
Second, in Figure SI.4-5, we see that there are also differences in opinion by (at least one) growth experience and procurement experiences. For growth barriers (Figure SI.4), we see some notable differences in opinion, with a greater proportion of scale-ups saying labour shortages (47% for scale-ups vs. 42% for non-scale-ups) and financing (20-17%) are growth barriers. For financing, we show how that matters, especially for technology scale-ups, in the interview analysis. These findings are not, however, statistically significant. The consumer demand item for which the differences are, but in the opposite direction (i.e., non-scale-ups are more likely to cite this as a growth barrier than scale-ups). The difference for consumer demand underscores our claim that scale-ups are market-validated threshold firms, which would be less concerned with consumer demand (as established firms with a product/service that has market fit).

In Figure SI.5, the survey findings present a noteworthy narrative. We see that a significantly smaller proportion of scale-ups do not identify the federal government as a potential client (76% for scale-ups; 85% for non-scale-ups). We also see that, among those who do seek the federal government as a client, scale-ups are more likely to say they were unsuccessful (14% to 6%) or that the application process was due cumbersome (9% to 5%). It is important to note that 'non-scale-up' should not be equated with small firm, start-up, or early growth firm. Many non-scale-ups will include larger, but not necessarily high-growth, firms.

What the data on procurement suggest is twofold. First, a greater proportion of scale-ups actively seek the federal government as a client. Second, a greater proportion of scale-ups, compared to non-scale-ups, cite unsuccessful applications or a cumbersome application process

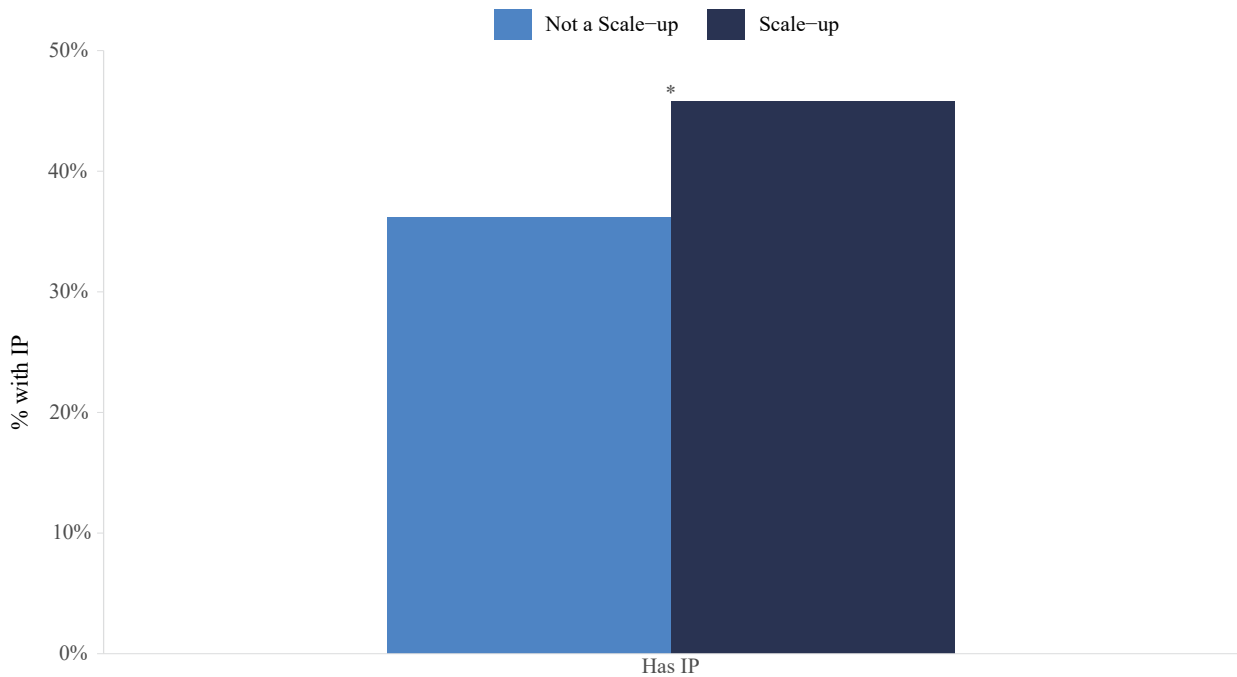
as the reason why, despite targeting the federal government as a client, they fail to sell to them. We find strong corroborating evidence of findings presented from the technology scale-up specific interviews regarding procurement as a preferred but underutilized demand-side policy instrument. These findings are contextualized for technology scale-up firms in the interview findings, specifically the difficulties faced for those attempting to leverage federal procurement programs.

Figure SI.2
Was the Firm Innovative between 2015–2017?



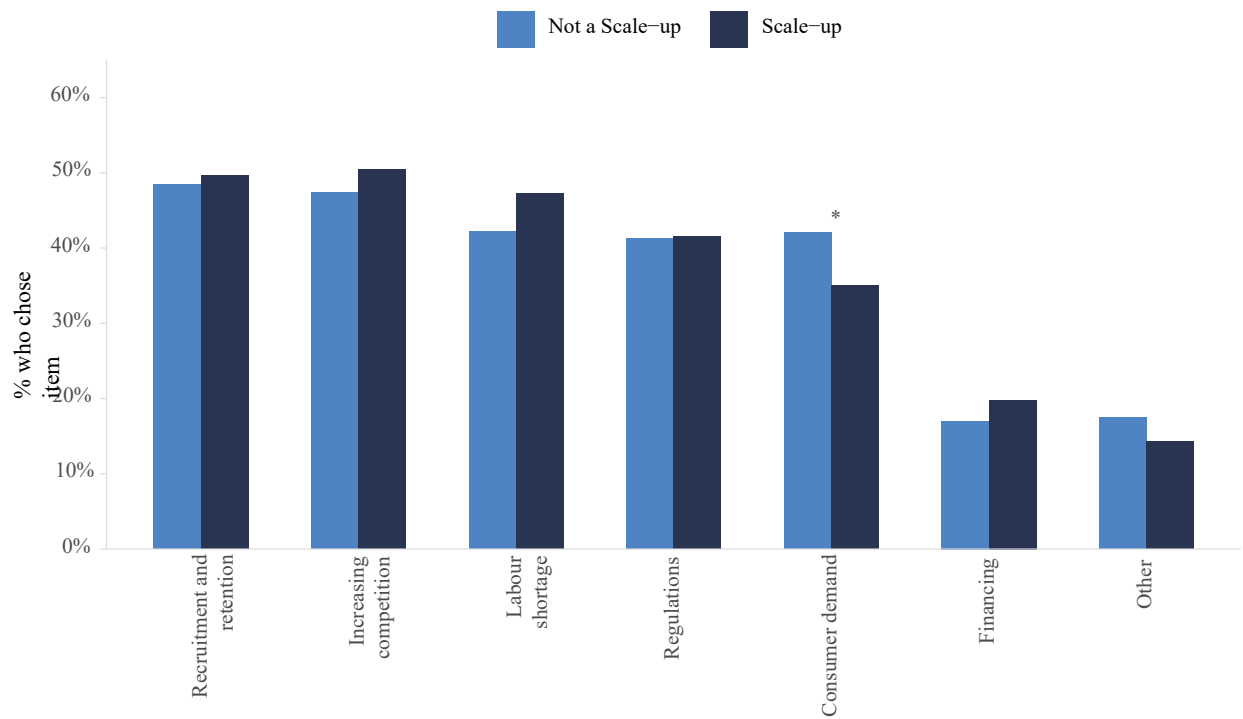
Scale-up status is defined by revenue growth according to OECD definition. Asterisk (*) indicates difference in proportions is statistically significant at 95% confidence (two-way test of proportions). Source: 2017 Survey on Financing and Growth of Small and Medium Enterprises

Figure SI.3
Did the Firm Have Intellectual Property in 2017?



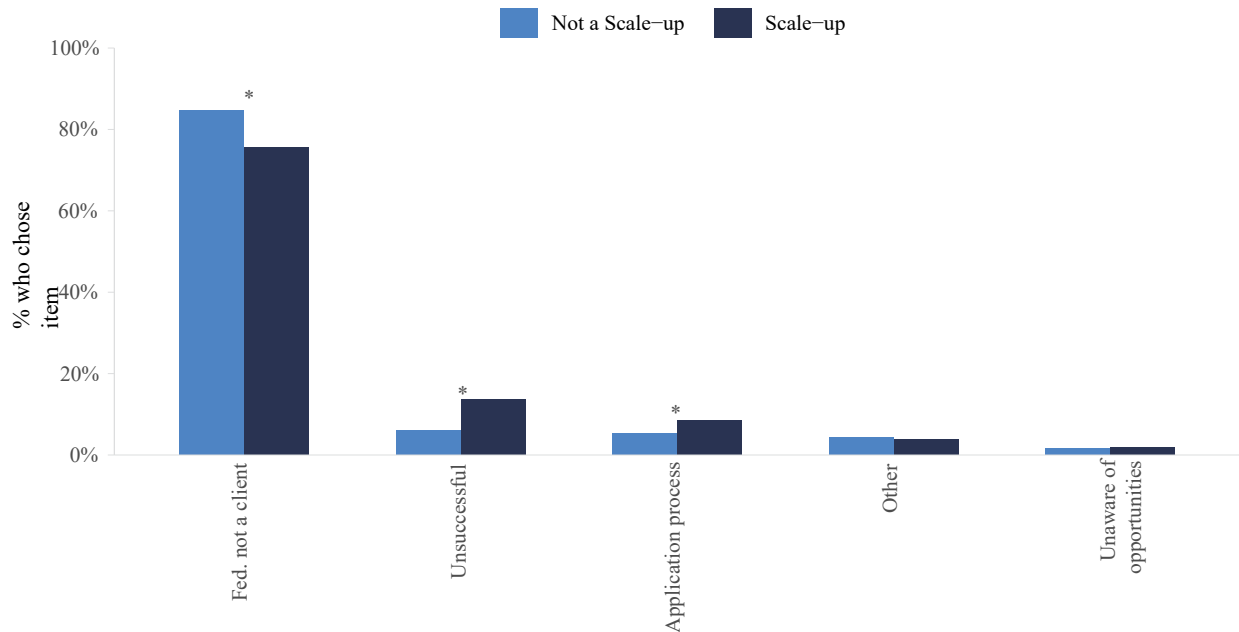
Scale-up status is defined by revenue growth according to OECD definition. Asterisk (*) indicates difference in proportions is statistically significant at 95% confidence (two-way test of proportions). Source: 2017 Survey on Financing and Growth of Small and Medium Enterprises

Figure SI.4
Growth Barriers for SMEs in Canada By Firm Type, 2017



Scale-up status is defined by revenue growth according to OECD definition. Asterisk (*) indicates difference in proportions is statistically significant at 95% confidence (two-way test of proportions). Source: 2017 Survey on Financing and Growth of Small and Medium Enterprises

Figure SI.5
Procurement Barriers for SMEs in Canada, 2017



Scale-up status is defined by revenue growth according to OECD definition. Asterisk (*) indicates difference in proportions is statistically significant at 95% confidence (two-way test of proportions). Source: 2017 Survey on Financing and Growth of Small and Medium Enterprises

Table SI.1 – Questions about Growth and Procurement Obstacles in SFGSME (2017)

<i>Which of the following are obstacles to the growth of your business?⁵ [dichotomous outcomes; respondents marks 'yes' or 'no']</i>	<i>Which of the following were reasons your business did not sell to the federal government in the last 3 years? [2015, 2016, 2017; dichotomous outcomes; respondents marks 'yes' or 'no']</i>
1. Shortage of labour	1. The federal government is not a potential client for your products or services
2. Recruiting and retaining skilled employees	2. Application process is too complicated or time consuming (e.g., insufficient understanding of contracting process, volume of paperwork, clarity of solicitation document)
3. Fluctuations in consumer demand	3. Unaware of contracting opportunities
4. Obtaining financing	4. Applied for a contract but was unsuccessful
5. Government regulations	5. Other
6. Increasing competition	6. The federal government is not a potential client for your products or services
7. Other	7. Application process is too complicated or time consuming (e.g., insufficient understanding of contracting process, volume of paperwork, clarity of solicitation document)

⁵ Omitted due to small sample size: Rising cost of inputs; Maintaining sufficient cash flow or managing debt; and Corporate tax rate.

Table SI.2: Questions about Innovation and Intellectual Property from SFGSME (2017)

<i>In the last three years has your business developed or introduced any of the following innovations?</i>	<i>As of December 2017, did your business hold any of the following types of Intellectual Property?</i>
1. A new or significantly improved good or service	1. Registered trade-marks
2. A new or significantly improved production process or method	2. Patents
3. A new organizational method in your business practices, workplace organization or external relations.	3. Registered industrial designs
4. A new way of selling your goods or services	4. Trade secrets
	5. Non-disclosure agreements
	6. Other type of intellectual property protection

Appendix C – Scale-up Interview Guide

Below we reproduce the semi-structured interview guide in full. Answers that were coded or where quotes were derived come from the final section, “Government Support.”

The Scale-up Experience

Munk School of Global Affairs and Public Policy

The objective of this study is to gain a more nuanced understanding of how Canadian technology scale-ups fit into the larger discussion of Canada’s long-term economic prospects. Successfully scaled firms are the focus of this study. We ultimately want to know what challenges have scale-up firms encountered while growing? How do they view the role of government in supporting (or not) scale-ups? Accordingly, we have crafted a questionnaire in accordance with the Council of Canadian Innovation’s three priorities for scale-up firms. That is, access to talent, markets, and capital.

By systematically collecting qualitative experiences from Canadian scale-ups and augmenting them with empirical research of the impact and relative importance of scale-ups on Canada’s economy, we aim to generate a nuanced picture of three things: 1) What is a scale-up, and what is it like to scale a technology firm in Canada? 2) What government programs are effective in supporting firm growth and where are the policy gaps or mismatches? 3) What is the long-term impact of scale-ups on Canada’s economic prosperity -- now and in the future? We will use interview findings to inform government policy on innovation policies and support programs for scale-up firms.

A. Markets

- 1) What is the overall proportion of your sales or source of revenue from the home market versus markets abroad?
 - a) What proportion of your sales are to private sector clients versus public sector clients?
- 2) What is the rate of growth in your sales over the last five years: from abroad versus at home?
- 3) What have been the main barriers to the growth of your firm? How have you been able to surmount or overcome them?
- 4) What is your market access strategy? Do you utilize resellers?
- 5) Is the public sector a target market? If so, have you been successful?
 - a) Are there any barriers to your company obtaining access to government procurement?
 - b) Have you leveraged existing government procurement programs in Canada to grow your company? Were they helpful?
- 6) Have you pursued markets outside of North America?
 - a) Have you used gov't resources to facilitate international expansion?

- 7) Have you undertaken strategic co-development with key customers? Who are your reference customers?

B. Talent

- 1) What is the open headcount at your company?
 - a) How many are technical versus non-technical jobs?
 - b) How many hires do you plan on making in the next 1-2 years?
- 2) Where do you recruit?
 - a) Have you used recruiters?
- 3) How long, on average, does it take you to fill vacancies?
- 4) Do you feel the postsecondary educational institutions are meeting the skill needs of your company?
 - a) Do you have access to the best talent graduating from Canadian universities?
 - b) Are there any specific mismatches between skills brought by new graduates and those needed by businesses?
- 5) Do Canada's personal taxation rates or other tax policies help or hinder your company in hiring?
- 6) Have you been able to recruit talent from outside the country, including the US?
 - a) Have you hired people back from the US?
- 7) Do you use any government programs to help you recruit?
 - a) Are you aware of the federal government's Global Skills Strategy program?
 - i) Have you used it? Which category (A and/or B)?
 - b) Are there specific subcategories of technical or managerial HR requirements that you need to successfully scale your firm? Can you find the talent that you need?
- 8) Do you have talent retention challenges?
 - a) Are you losing more talent than you are bringing in?
 - b) In specific categories: management, technical, marketing, sales, design.

C. Capital

- 1) How are you financed? (self-financed, VC, PE, etc.)
 - a) Do you offer employee stock options?
 - b) Do you have an employee equity plan?
- 2) Can you access the working capital that you need to grow your company?
 - a) What is the source of the working capital?
 - b) What assets do you need to provide or demonstrate to access capital?
- 3) What are the factors that determine where you raise capital?
- 4) What's your horizon on a liquidity event?
- 5) Are you trying to grow your company through acquisitions?
 - a) If so, how are you financing those acquisitions?
- 6) How are your intangible assets valued?

- a) Will a bank finance your company if you mostly have intangible assets?
- b) What proportion of your assets are intangible?
- 7) Which type of policy approach is more effective in supporting Canadian scale-ups: tax-based policy supports such as SR&ED or more direct supports such as IRAP, Mitacs, and other programs?

D. IP Strategy

- 1) Does your company have an IP strategy?
- 2) How many patents does your company hold?
- 3) Did you collaborate with local research institutions, such as universities or community colleges?
 - a) If so, how effective was this collaboration?
- 4) What other strategies does your company employ to increase your freedom to operate?
- 5) Do you have technology or products that can be certified by international standards setting bodies?
 - a) Have you worked with the standards Council of Canada?

E. Government Support

- 1) Is the government supporting your investments in innovation?
 - a) If so, how?
 - b) If not, what should be done about that?
- 2) What policy measures have been most helpful in supporting your firm's growth and innovation strategy?
 - a) Do you see a different role for tax-based policy supports such as SR&ED versus direct supports such as IRAP, Mitacs, and other programs?
- 3) What role do companies play in influencing policy?
 - a) [If appropriate] Does the government actively seek your input? If so, do you think your input affects policymaking?
- 4) Which stakeholders do you think have significant influence driving innovation policy?