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Unleashing Innovation: Barriers, Government Support Programs, and What Works Best

Obstacles to innovation for businesses can range from financial constraints and skills gaps to market uncertainty and regulatory barriers. Revisiting data around the time of the 2008 financial crisis, the author examines how Canadian firms attempt to overcome these barriers and how government programs can best support them in such a period of turmoil.

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Unleashing Innovation: Barriers, Government Support Programs, and What Works Best

by Catherine Beaudry

- **With business innovation a key to improving productivity and prosperity, Canada's underperformance in this area is a cause for concern. This *Commentary* explores how businesses respond to obstacles to innovation and how public policy can best support their efforts in a period of turmoil.**
- **This research makes two primary contributions. First, it provides novel empirical evidence on how firms actively respond to and mitigate innovation obstacles through various strategies while facing financial constraints. Second, it offers the first systematic assessment of government support programs' effectiveness in addressing specific innovation barriers within the context of firm-level mitigation efforts.**
- **Firms that actively address innovation barriers – especially financial ones such as lack of capital – through government support programs or internal strategies show higher innovation rates, though financial constraints remain a persistent, partially unresolvable obstacle.**
- **Government support programs are most effective when combined with firms' own efforts and show strong results for financial and market-related barriers, but less so for skill and regulatory challenges, highlighting the need for more targeted and diversified policy tools.**

Introduction

Canada continues to underperform in business innovation despite long-standing government efforts and considerable funding support. This persistent weakness threatens productivity and competitiveness, particularly in an era of global uncertainty marked by trade tensions and financial instability. The current economic environment – characterized by recovery from recent crises and limited fiscal flexibility – requires a strategic assessment of the effectiveness of current innovation levels. This *Commentary* evaluates the impact government programs have in helping firms navigate innovation barriers, including when compounded by financial constraints. Using data from Statistics Canada, it explores how businesses respond to obstacles and how public policy can support their innovation efforts.

The analysis draws on Statistics Canada's 2009 and 2012 Surveys of Innovation and Business Strategy (SIBS), which drill down into the specifics on innovation barriers, allowing us to capture firm behaviour

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during and after the 2008 financial crisis – a period of similar turmoil for firms as the current one. The findings show that innovation propensity improves when firms take action – whether successful or not – to overcome barriers. Government support programs are generally associated with higher innovation rates, although they fall short of fully neutralizing the impact of financial constraints. This suggests that while policy efforts are directionally effective, they must be more precisely tailored to address specific and interacting obstacles firms face.

In addition to financial aid, firms also often rely on non-governmental strategies to overcome innovation barriers, such as partnerships and skill development. These barriers tend to be interrelated – financial, regulatory, market, and knowledge-related challenges often co-occur – necessitating multi-pronged as well as tailored policy responses.

There is also a lack of detailed understanding about which types of support work best for different kinds of firms. As a result, future innovation policy must move beyond one-size-fits-all approaches and focus on more targeted, evidence-based interventions that maximize the return on public investment and better support firms of varying sizes and sectors.

Innovation Barriers and Mitigating Measures

Policymakers, corporate leaders, and academic scholars broadly agree that innovation plays a crucial role in ensuring the productivity and growth of companies, supporting community wellbeing, and fostering the prosperity of localities, territories, and nations alike.

Over the past two decades, the relationship between innovation barriers and firm performance has received considerable research attention, producing important insights into the challenges that impede business innovation.[1] Studies have consistently identified financial constraints, skilled labour shortages, and market uncertainty as significant barriers.[2]

However, a critical gap remains in understanding how businesses successfully navigate these challenges. Previous analyses have focused primarily on identifying and measuring obstacles, particularly financial constraints, but our analysis takes a different approach by examining the tools and strategies firms employ to overcome these barriers – including government support programs.

Research on innovation barriers has evolved considerably over the past three decades, revealing complex relationships between the obstacles firms face and their innovation outcomes. Early studies focused primarily on identifying and categorizing barriers[3] and highlighting their complementarity.[4] Four main categories of obstacles emerge: financial constraints, knowledge barriers, market challenges, and regulatory impediments (see Box 1 for more).

Each category affects different types of firms in distinct ways, with impacts varying by firm size, sector, and innovation stage. This complexity demands nuanced policy responses rather than one-size-fits-all solutions.

These barriers do not operate in isolation – rather, they form an interconnected web of challenges that firms must navigate. Understanding these relationships is important for effective policy design, as removing single barriers often proves

1 See: Baldwin and Lin (2002); Mohnen and Rosa (2002); González and Pazó (2005); Lööf and Heshmati (2006); Mohnen et al. (2008); Savignac (2008); D'Este et al. (2012); and Blanchard et al. (2013).

2 See: Canepa and Stoneman (2003); Segarra-Blasco, Garcia-Quevedo and Teruel-Carrizosa (2008); Tiwari et al. (2008); Amara et al. (2016); García-Quevedo, Pellegrino and Savona (2016); and García-Quevedo, Segarra-Blasco and Teruel (2018).

3 See: Segarra-Blasco, Garcia-Quevedo and Teruel-Carrizosa (2008); D'Este et al. (2012); and Pellegrino and Savona (2017).

4 See: Mohnen and Rosa (2002); Baldwin and Z. Lin (2002); Galia and Legros (2004); Mohnen and Röller (2005).

insufficient to stimulate innovation. Instead, policy interventions must, therefore, simultaneously address multiple, complementary obstacles.

Firms employ diverse strategies to overcome innovation barriers. Some choose to abandon innovation efforts when faced with significant obstacles – what researchers term the "deterring effect" (D'Este et al. 2012). Others actively work to overcome barriers through various means, including seeking external funding, developing internal capabilities, forming strategic partnerships, or accessing government support programs (Tourigny and Le 2004).

Such programs represent a valuable tool for helping firms overcome innovation barriers, but their effectiveness varies considerably. While most research has examined direct subsidies and R&D tax credits,[5] evidence suggests that programs supporting human capital development (i.e., the skills and expertise of a firm's workforce) and knowledge transfer may be equally important (Amara et al. 2016 and Szczygielski 2017).

However, there remains a significant gap in our understanding of how different types of government support interact with specific innovation barriers and firm characteristics. This gap is particularly relevant for policy design, as it affects our ability to target support programs effectively and determine which combination of support mechanisms is most effective for different types of firms facing various innovation challenges at different stages of the innovation process (Mohnen and Röller 2005). This understanding becomes particularly important in the context of limited public resources and the need to maximize the impact of government support programs.

Overcoming Barriers

Understanding how firms attempt to overcome barriers to innovation provides valuable insights for policy design. Some firms abandon innovation efforts when faced with significant obstacles – known as the "deterring effect." Others actively work to overcome barriers through various means, including seeking external funding, developing internal capabilities, forming strategic partnerships, or accessing government support programs.

Such support programs represent an important tool for helping firms overcome innovation barriers,[6] but evidence on their effectiveness remains scarce. While most research has examined direct subsidies and R&D tax credits, which are easily measurable (Bérubé and Mohnen 2009; Czarnitzki and Bento 2012; Lokshin and Mohnen 2012), programs supporting human capital development and knowledge transfer may be equally important, albeit less tractable. The obstacles categories review mentioned in the previous section is indicative of the needs in this regard.

Firms actively pursuing innovation frequently employ government support programs to address innovation barriers. Firms using financial support mechanisms (including R&D tax credits, grants, and venture capital support) report higher rates of innovation obstacles compared to those accessing non-financial support services (Tourigny and Le 2004). This finding suggests a potential selection effect wherein firms facing more significant barriers actively seek government assistance.

The Canadian context exemplifies the extensive range of available support mechanisms, including both financial and non-financial assistance. These

5 See: Szczygielski et al. (2017); Guan and Yam (2015); Guo, Guo and Jiang (2016); Yang, Huang and Hou (2012); and Cappelen, Raknerud and Rybalka (2012).

6 Some key literature reviews are found in Jaumotte and Pain (2005), Becker (2015), Petrin (2018), Bloom (2019) and Jugend (2020).

Box 1: Four Types of Innovation Barriers Companies Face

1. Financial Constraints

Financial constraints consistently emerge as the most significant barrier to innovation across numerous studies spanning multiple jurisdictions.[a] These constraints manifest principally as a lack of internal funds and limited access to external financing to deal with high innovation costs, but some authors also consider excessive economic risks among financial constraints. The impact of financial barriers proves particularly acute for small- and medium-sized enterprises and firms in knowledge-intensive sectors (Canepa and Stoneman 2008).

While about 25-30 percent of firms across all technology levels report financing constraints, their severity varies significantly (Tourigny and Le 2004). High-technology firms report these constraints as particularly binding, suggesting they may require specialized financing solutions. This finding aligns with broader evidence about the challenges of financing knowledge-intensive businesses where assets are primarily intangible.

The impact of financial constraints is substantial and multifaceted, and leads firms to prematurely terminate innovation projects, significantly delay development work, or abandon innovative initiatives entirely (Canepa and Stoneman 2003, 2008; and Mohnen et al. 2008). Others find that the lack of internal funds may be less important than difficulties in maintaining dedicated innovation staff (Tourigny and Le 2004).

Financial constraints interact in complex ways with other innovation barriers such as market uncertainty and regulatory requirements (Tiwari et al. 2008). When firms face multiple barriers simultaneously, financial constraints often emerge as the dominant concern, though their impact may be moderated by other factors (Mohnen et al. 2008). This suggests that while addressing financial constraints should remain a policy priority, effective innovation support may require coordinated interventions simultaneously addressing multiple barriers.

A significant insight for policy design lies in the timing of financial constraints: they are most likely to derail innovation projects during their conception phase rather than during execution (Mohnen et al. 2008). This suggests that early-stage financing support – provided early in the innovation process – may be particularly important for fostering innovation, especially for firms contemplating their first innovation investments.

The relationship between financial constraints and innovation is not straightforward. Some suggest that it follows a U-shaped pattern (D'Este 2012). Firms with no innovation activity report significant financial barriers, often citing them as reasons for not innovating. These constraints appear less severe for firms engaged in modest innovation efforts (one or two activities). However, financial constraints re-emerge as a major concern for the most innovative firms – those pursuing multiple innovation activities simultaneously. This apparent paradox reflects the learning process of innovation – as firms engage more deeply in innovative activities, they become more aware of financial challenges and better able to articulate specific funding needs. Such a differentiated pattern suggests that financial support programs may need different designs to address barriers at different stages of the innovation journey.

2. Knowledge Barriers

Knowledge barriers represent the second major category of obstacles that significantly impact firms' ability to innovate and warrant specific policy attention. They encompass human capital limitations (particularly skills shortages), information gaps regarding technologies and markets, and difficulties in finding qualified personnel or establishing effective collaboration networks (D'Este 2012).

a See: Hall (2002); Canepa and Stoneman (2008); Savignac (2008); Tiwari et al. (2008); Hottenrott and Peters (2011); and Mancusi and Vezzulli (2014).

Box 1: Continued

Knowledge barriers can fundamentally impair innovation performance through various mechanisms. When firms face significant knowledge-related constraints, they often delay innovation projects (Canepa and Stoneman 2003; Segarra-Blasco, Garcia-Quevedo and Teruel-Carrizosa 2008; Amara et al. 2016), reduce their innovation ambitions or abandon initiatives entirely, particularly during the critical conception phase (García-Quevedo, Segarra-Blasco and Teruel 2018). This pattern suggests that early intervention through targeted support programs, aimed at training or recruiting specialized personnel, may be especially valuable in preventing project abandonment.

Firms that have successfully introduced innovations or engage in multiple innovation activities – ranging from intramural R&D (i.e., research and development conducted within the firm) to market introduction of new or significantly improved goods and services – consistently report higher levels of knowledge-related constraints than less potentially innovative firms. This pattern reveals an important dynamic: knowledge barriers tend to act less as initial deterrents to innovation and more as revealing or learning obstacles that emerge as firms deepen their innovation efforts (D'Este 2012).

Knowledge barriers affect less innovative and more innovative firms in distinct ways. For firms that perform only a few innovative activities, the impact often relates to basic capability gaps, while for firms that engage in more innovation activities, the challenges more commonly involve specialized skills and complex knowledge networks. This suggests the need for innovation-level-appropriate support mechanisms that evolve as firms progress in the number of their innovation activities.

Furthermore, traditional approaches that focus primarily on removing initial barriers to R&D, such as tax credits, may be insufficient. Instead, policy interventions may need to evolve alongside firms' innovation journeys, providing increasingly sophisticated support as firms encounter more complex knowledge-related challenges, including commercialization support, for instance. Firms actively engaged in innovation require different types of knowledge support than those contemplating their first innovation investments.

The interconnection between knowledge barriers and other innovation constraints, particularly financial limitations, adds another layer of complexity to policy design. Firms with higher concentrations of qualified personnel or substantial training investments often report more severe financial constraints, possibly reflecting their better understanding of innovation costs and risks (Hottenrott and Peters 2011). This suggests that building innovation capabilities may actually increase firms' awareness of, and sensitivity to, other innovation barriers, particularly financing needs.

The multifaceted nature of knowledge barriers presents both challenges and opportunities for policy intervention. While skills shortages and information gaps may appear as distinct issues, they often interact with organizational rigidities and financial constraints in ways that require coordinated policy responses (Mohnen et al. 2008). This implies that effective innovation-support programs must address both immediate skill needs and longer-term capability building.

3. Market or Demand Challenges

Several interconnected market-related obstacles constrain innovation. These include innovation hurdles such as demand uncertainty for new products and services, limited customer responsiveness to innovation, market concentration and dominance by established firms, as well as competitive intensity in target markets. These barriers show distinct patterns across different types of innovations and markets.

These factors demonstrably reduce firms' propensity to innovate and their willingness to invest in R&D activities (Tiwari et al. 2008, García-Quevedo, Pellegrino and Savona 2016). The empirical evidence points to important amplification effects between market and financial barriers. Market obstacles have particularly severe

Box 1: Continued

impacts on financially constrained firms, leading to higher rates of innovation project abandonment, increased likelihood of project delays, and reduced probability of initiating new innovative activities (Mohnen et al. 2008).

Market barriers have both deterring and revealing effects – they can prevent firms from initiating innovation activities, but also become more apparent to firms as they engage more deeply in innovation (Iammarino, Sanna-Randaccio and Savona 2009; García-Quevedo, Segarra-Blasco and Teruel 2018). This dual nature requires carefully calibrated policy responses that address both market entry barriers and ongoing competitive challenges.

4. Regulatory Impediments

Regulatory barriers significantly impact specific sectors or types of innovation. These barriers include compliance costs, regulatory uncertainty, and standards-related challenges. They particularly affect firms operating in heavily regulated sectors.

Empirical evidence demonstrates that regulatory compliance concerns significantly influence innovation project trajectories. Perceived regulatory uncertainty leads to systematic project delays, cancellations, and reduced initiation of new innovative activities (Canepa and Stoneman 2003). Further, there is a negative correlation between perceived regulatory compliance burdens and innovation probability (Pellegrino and Savona 2017).

Analysis of firm-level response patterns reveals important heterogeneity in regulatory barrier effects. Highly innovative firms demonstrate increased sensitivity to regulatory inflexibility, suggesting that regulatory frameworks may disproportionately affect advanced innovation activities (Iammarino, Sanna-Randaccio and Savona 2009). Regulatory barriers, hence, exhibit significant revealing effects, serving as indicators of firms' innovation intensity rather than purely deterrent factors.

These findings carry important implications for regulatory policy design, suggesting the need for frameworks that maintain necessary oversight while minimizing uncertainty and implementation friction for innovative enterprises. Particular attention should be paid to the effects on firms pursuing multiple concurrent innovation activities.

programs span training, incentives to recruit recent graduates, grants, tax credits, public procurement, access to government research laboratories, export incentives, and market information and technical advisory services. However, despite this breadth, empirical evidence on the effectiveness of these programs remains limited, and direct evidence of their success in mitigating specific innovation barriers is scarce.

The available evidence does suggest positive effects of government support in helping firms overcome innovation barriers. For instance, cost-constrained firms receiving government support undertake larger innovation projects than would otherwise be possible (Falk 2007). Segarra-Blasco et al. (2008) identified relationships between specific support programs and cost-based innovation barriers, though their analysis stops short of establishing causal effects on barrier mitigation.

Nevertheless, there remains a significant gap regarding the mechanisms through which firms utilize support programs and their effectiveness in overcoming specific innovation barriers. As Hall et al. (2016) highlighted, "There is relatively little knowledge about what makes an organization innovate, which conditions favour the rise of such organizations and whether certain socio-economic environments and policies can support their development in both

manufacturing and service industries" (p. 193). Critical areas requiring investigation include program utilization patterns across firm types, success metrics for different support mechanisms, impact analysis of barrier mitigation programs, and comparative effectiveness across policy instruments.

Understanding the relationship between government innovation support mechanisms and firms' capacity to overcome innovation barriers is essential to assessing program effectiveness and identifying future policy design. It is crucial to determine which combination of support mechanisms proves most effective for different types of firms facing various innovation challenges. Both the direct and indirect effects of government support programs need to be assessed. While programs may directly address specific barriers, they may also help firms develop capabilities that make them better able to overcome other obstacles. This multiplicative effect suggests potential benefits from coordinated policy approaches that address multiple barriers simultaneously while supporting firms' overall innovation capabilities. This understanding becomes particularly important in the context of limited public resources and the need to maximize the impact of government support programs. This *Commentary* highlights the need for a comprehensive and systematic evaluation of government support program effectiveness in addressing innovation barriers.

Data and Methodology

Data Sources

To provide recommendations for the current post-pandemic, post-inflationary, post-high interest and geopolitically-uncertain period, we investigated a relatively recent period of turmoil with sufficient granularity. Indeed, the period immediately after the 2008 financial crisis provides appropriate insights to draw lessons from firms' strategic responses during that critical economic transition.[7]

Our research integrated data from three Statistics Canada databases to examine post-financial crisis innovation dynamics: the SIBS[8] (2009 and 2012, which cover the 2007-2009 and 2010-2012 periods, respectively), matched with the General Index of Financial Information[9] (GIFI) and the Research and Development in Canadian Industry[10] (RDCI) database for the same periods.

To our knowledge, the SIBS is the only survey that addresses both the obstacles to innovation and the actions that firms took to mitigate them. Furthermore, both government programs and other mitigation measures are assessed.

7 We acknowledge that by looking at this period, we are missing some of the more recent government programs, e.g., the Ontario Scale-Up Platform and the Canada Accelerator Incubator Program, and their impacts.

8 More details on SIBS 2009 and 2012 data and methodology can be found at: Statistics Canada. 2010. "Survey of Innovation and Business Strategy: Detailed Information for January 2007 to December 2009." Ottawa: Statistics Canada. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=60670; Statistics Canada. 2014. "Survey of Innovation and Business Strategy: Detailed Information for 2012." Ottawa: Statistics Canada. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=137295.

9 More information on GIFI can be found at: Canada Revenue Agency. 2023. "General Index of Financial Information (GIFI), RC4088(E) Rev. 23." Ottawa: Government of Canada. https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/rc4088/general-index-financial-information-gifi.html.

10 More details on RDCI 2009 and 2012 data and methodology can be found at: Statistics Canada. 2011. "Research and Development in Canadian Industry: Detailed Information for 2009." Ottawa: Statistics Canada. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=58560; Statistics Canada. 2014. "Research and Development in Canadian Industry: Detailed Information for 2012." Ottawa: Statistics Canada. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=134818.

Sample Selection and Methods

Our analytical approach aligns with existing theoretical frameworks regarding potential selection bias in innovation studies (Savignac 2008; Blanchard et al. 2013). This perspective acknowledges that innovation may not constitute a universal strategic imperative across all firms. Some enterprises may deliberately choose not to innovate, recognizing potential negative market reactions to organizational change. Including such firms in the analysis would introduce systematic bias, as they would not report innovation obstacles due to their deliberate non-innovative stance. Consequently, precise identification of firms with innovation potential becomes fundamental to the methodological framework.

The sampling procedure systematically excludes firms that demonstrate no innovation orientation for reasons unrelated to innovation barriers. The operational definition of innovation engagement encompasses both actual innovation implementation (new or significantly improved products or processes) and encountered innovation obstacles. The inclusion of firms with documented R&D expenditures expands the final sample to 7,092 observations (6,085 unique firms).

The research examines two cohorts (2009 and 2012) of potentially innovative firms[11] – specifically, firms that conduct R&D, have introduced product or process innovations, and have faced some kind of obstacles to innovation. The regression model employed follows Savignac (2008) (see Appendix B for more).

Sample Description

This section focuses on innovation obstacles and the actions taken by firms to mitigate them.[12] This comprehensive analysis examines firm-level data on innovation obstacles and government support program utilization, providing detailed insights into the effectiveness of policy interventions and firms' barrier-mitigation strategies. The findings reveal complex patterns in how enterprises encounter and address innovation challenges, with important implications for policy design and implementation.

Survey evidence reveals a clear hierarchy of innovation barriers affecting Canadian firms. Risks and uncertainties in the innovation process emerge as the predominant obstacle, affecting 42.8 percent of firms (see Table 1). This high prevalence suggests that uncertainty management represents a critical challenge for innovation policy. Skills shortages constitute the second most significant barrier, reported by 31.8 percent of firms, indicating substantial human capital constraints in the innovation ecosystem. Financial constraints follow closely, affecting 30.7 percent of surveyed enterprises.

11 Innovative firms here are defined as those that have introduced, in the past three years, any of the product or process innovations described below. The specific questions in the SIBS are the following: [Q82] Product innovation (good or service): "During the three years 2007 to 2009 (for SIBS2009) or 2010 to 2012 (for SIBS2012), did your enterprise introduce:

a. New or significantly improved goods? (exclude the simple resale of new goods purchased from other enterprises and changes of a solely aesthetic nature)

b. New or significantly improved services?"

[Q46] "Process innovation – During the three years 2007 to 2009 (for SIBS2009) or 2010 to 2012 (for SIBS2012), did your enterprise introduce:

a. New or significantly improved methods of manufacturing or producing goods or services?

b. New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services?

c. New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing?"

12 Appendix A provides a brief description of the firm sample in this study.

In contrast, several potential barriers appear less prevalent than anticipated in policy discussions. Intellectual property (IP) barriers affect only 5 percent of firms, while external collaboration challenges impact 12.1 percent. Competition policy obstacles concern just 5.8 percent of enterprises. Current policy attention needs to ensure it has this distribution in mind as it looks to address the most pressing constraints faced by innovative firms.

Firms demonstrate remarkably active engagement in barrier mitigation, with more than 70 percent of them implementing specific measures when confronted with innovation obstacles. This high response rate indicates a strong organizational commitment to innovation, despite the challenges encountered. However, the perception of the success of these mitigation measures varies substantially across barrier types, revealing important patterns in mitigation effectiveness (see Table 2).

Among firms facing IP protection barriers to innovation, 55.9 percent implemented successful measures – the highest proportion amongst all barriers – suggesting that relatively effective mechanisms exist for addressing these challenges.[13] Success in addressing financing solutions occurred in 52.4 percent of firms that took initiatives to overcome these obstacles, while success in general financing initiatives occurred in 49.6 percent of similar firms. These relatively high success rates may reflect the maturity of financial support systems and institutions.

Conversely, interventions addressing innovation obstacles related to government competition policy prove least successful, with only 19.5 percent of firms succeeding, indicating potential systemic issues in this policy area.

Competition policy barriers are complicated to assess. Overcoming these types of obstacles, or trying to but failing, makes it sound like firms are trying to circumvent the law. In reality, firms may have instead successfully introduced new products and services in a new market, consistent with Schumpeter's notion of creative destruction, or improved their productivity by introducing new business process innovations to help them face competitors. A little less than 44 percent of firms did nothing to try to mitigate the fact that government competition policy was an obstacle to innovation, and nearly 37 percent of firms tried but failed. Unfortunately, there are no available data to identify what constituted successful measures taken to overcome competition policy-related innovation obstacles, which, of course, are there for societal reasons.

Firms that attempted to alleviate market-size constraints succeeded only 25.1 percent of the time, while just 27.2 percent were successful in addressing regulatory barriers.[14] These patterns suggest particular difficulty in addressing structural and policy-related innovation barriers.

Analysis of support program adoption (see Table 3) reveals notable concentration in the use of particular instruments. Tax credits – primarily through the Scientific Research and Experimental Development (SR&ED) program – are the most widely used, with a utilization rate of 34.4 percent. This suggests that firms are both familiar with and prefer tax-based support mechanisms.[15] Direct grants are the next most common, used by

13 Such mechanisms could include non-disclosure agreements by collaborators to protect their IP and finding funds to apply for patents in several countries and regions.

14 A firm that "overcomes" or tries to "surmount" regulatory barriers to innovation generally employs someone or an organization to help them navigate the regulatory landscape in order to better align their innovation activities with the necessary regulations. It does not necessarily imply that the regulation has changed. Some government programs used for this purpose take a mentoring or counselling form rather than a pecuniary one. Such programs may be offered by the federal, provincial, or municipal governments.

15 These mechanisms are refundable for small firms and thus more akin to grants in their case.

Table 1: Proportion of Firms that Faced Specific Innovation Obstacles

Categories of Innovation Obstacles	Firms that Have Faced Innovation Obstacles Related to:	Proportion (percent)
Financial Constraints	Internal financing	27.83
	External financing	17.87
	Internal or external financing	30.72
Knowledge-related Obstacles	Lack of skills within their firm	31.77
	Finding and reaching agreements with external collaborators	12.06
Demand- or Market-related Obstacles	Market size	22.01
	Uncertainty and risk	42.84
	Government competition policy	5.82
Regulation- and IP-related Obstacles	Regulatory issues	20.44
	IP protection	5.00

22.9 percent of firms, while training programs reach 19.7 percent. Support for hiring recent graduates is used by 10.2 percent of firms, indicating moderate uptake of human capital development programs.

The relatively low number of businesses that have taken advantage of government-funded initiatives for innovation-related activities is also reflected in the proportion of companies that have used such programs to address perceived innovation hurdles (see Table 4).

Few potentially innovative firms have utilized government resources in the three years covered by both surveys to help overcome the challenges that limit their innovation potential. The process of applying for these government innovation-support programs appears cumbersome[16] – all the forms to fill out and the information required are different, and therefore, require dedicated and costly resources within an organization.[17] That's a problem.

The results presented below and in the next section of this *Commentary* show that government support programs – when used alongside firms' own efforts – can help overcome some of the barriers to innovation. The government's role, therefore, is not to replace private initiatives but to complement them – acting as a catalyst to enhance their effectiveness and support firms in achieving innovation success.

Firms facing a particular innovation barrier demonstrated consistently higher innovation rates when they used government innovation-support programs, compared to firms not using them (see Table 5). For example, the data reveal that an additional 20.1 percent of firms (bolded in Table

16 Innovation, Science and Economic Development Canada. 2019. *Building a Nation of Innovators*. Ottawa: Government of Canada. https://ised-isde.canada.ca/site/innovation-better-canada/en/building-nation-innovators#9.

17 This process may be particularly problematic for medium-sized firms that no longer benefit from the relatively free support that incubators and similar organizations provide for startups and small firms. Although the data used in this study predate the introduction of a number of programs to help firms scale up, Denney et al. (2023) argue that the current policy mix in Canada fails to support scaleup firms.

Table 2: Proportion of Firms that Did Nothing or Took Successful and Unsuccessful Measures to Overcome Specific Innovation Obstacles

Obstacle to Innovation Related to:	Among the Firms that Faced These Obstacles – Those That…		
	Did Nothing	Took Unsuccessful Measures	Took Successful Measures
	(percent)		
Financial Constraints			
Internal financing	15.56	44.05	40.39
External financing	9.55	38.03	52.42
Internal or external financing	3.28	47.17	49.55
Knowledge-related Obstacles			
Lack of skills within their firm	18.03	35.99	45.98
Finding and reaching agreements with external collaborators	9.47	49.35	41.18
Demand- or Market-related Obstacles			
Market size	28.09	46.85	25.06
Uncertainty and risk	29.35	37.76	32.88
Government competition policy	43.62	36.84	19.54
Regulation- and IP-related Obstacles			
Regulatory issues	29.04	43.76	27.19
IP protection	16.45	27.64	55.92

5) reporting external financing obstacles innovated when they utilized tax credits compared to those that did not use the credits.

There are many strong examples suggesting that government support programs effectively target firms experiencing innovation challenges, though the range is quite wide. As a result, questions remain about program accessibility for firms facing specific barrier types.

Empirical Findings: New Evidence from Firm-Level Analysis

The Impact of Innovation Barriers

Our econometric analysis (see Appendix B for more details) provides robust evidence that financial obstacles significantly impede corporate innovation, with important implications for innovation policy

design. The simultaneous equation modelling approach reveals several critical insights about the relationship between financial constraints and innovation propensity.

First, financial obstacles, both internal and external combined, demonstrate a clear deterring effect on innovation activities, consistent with prior literature on cost-based innovation barriers (D'Este 2012). Compared to firms that did not face these financial constraints, firms that did are 43.1 percent less likely to innovate (see Table 6). This relationship remains stable even when controlling for other innovation obstacles, highlighting the fundamental nature of financial constraints in the innovation process.

Second, our analysis reveals an important nuance regarding firms' adaptive responses to financial constraints. While mitigation efforts do help, they do not fully offset the negative impact. Firms that faced financial constraints but failed in their mitigation efforts were 33 percent less likely to innovate compared to those without such constraints. Even firms that successfully addressed these challenges remained 23 percent less likely to innovate. This 10-percentage-point improvement shows the importance of effective financial management strategies – but also makes clear that such efforts fall short of fully neutralizing the constraints.

Beyond financial obstacles, the analysis identifies that skills shortages, risk/uncertainty concerns and, to a lesser extent, market-size limitations and regulatory constraints all exhibit deterring effects on innovation.

The persistent negative impact of financial constraints, even after mitigation attempts, suggests the potential value of direct innovation funding support, particularly in a period of financial crisis and immediately thereafter. The effectiveness differential between successful and unsuccessful mitigation measures indicates the importance of building firm-level financial management capabilities. The multifaceted nature of innovation barriers suggests the need for coordinated policy responses that address both financial and non-financial constraints.

Table 3: Proportion of Potentially Innovative Firms that Have Used Government Support Programs for Innovation-Related Activities

Government Programs Used	Proportion (percent)
Training	19.71
Grants	22.93
Tax Credits	34.44
Procurements	5.84
Hiring of Recent Graduates	10.19
Government Research Facilities (access to)	3.65
Export Incentives and Services	4.07
Information and Technical Assistance	7.60
Market Information Services	5.88

Note: The proportion accounts for any combination of federal, provincial/territorial, and/or municipal government programs. Firms may use more than one government program, which is why the total does not equal 100 percent.

Government Support and Private Initiative in Innovation: Evidence from Firm-Level Mitigation Strategies

The empirical evidence demonstrates a clear hierarchy of effectiveness in obstacle-mitigation strategies. Unsurprisingly, inaction (see the first column – "Did nothing" – in Table 7) represents the least effective approach, with firms taking no measures to overcome innovation barriers consistently showing reduced innovation propensity across obstacle types. Most firms that faced barriers to innovation (not including financing) and did nothing to try to surmount them worsened their innovation propensity by 8.5 percent to

Table 4: Proportion of Firms that Took Measures (Successful or Not, Governmental or Not) to Overcome Specific Innovation Obstacles

Obstacle to Innovation Related to:	Among the Firms that Faced These Obstacles, Those That…			
	Took Unsuccessful Measures		Took Successful Measures	
	No Government Programs Used	Government Programs Used	No Government Programs Used	Government Programs Used
	(percent)			
Financial Constraints				
Internal financing	38.53	5.52	33.26	7.13
External financing	32.64	5.39	41.28	11.15
Internal or external financing	40.54	6.63	38.12	11.44
Knowledge-related Obstacles				
Lack of skills within their firm	33.40	2.59	40.36	5.62
Finding and reaching agreements with external collaborators	43.21	6.14	38.63	2.55
Demand- or Market-related Obstacles				
Market size	39.35	7.50	20.78	4.28
Uncertainty and risk	33.83	3.93	28.98	3.90
Regulation- and IP-related Obstacles				
Regulatory issues	38.78	4.98	25.22	1.98

Notes: All proportions are calculated using the sampling weights. The small number of observations for the disaggregation by measures taken (successful or not, governmental or not) prevents us from reporting results for obstacles to innovation related to government competition policy and IP protection (i.e., there are fewer than 10 observations in either one of the categories).

13.4 percent (again, first column) compared to their counterparts that did not face the same hurdles.[18]

Similarly, unsuccessful private measures without government support (in the second column) proved nearly as detrimental to innovation outcomes: the probability of innovation (again, not including financing) is worse by between 4.4 percent and 6.5 percent compared to not facing these innovation obstacles.

Government program use shows a clear positive effect in partially mitigating financial constraints, though it does not fully offset them (see the first row of Table 7) when compared to firms that did not face such burdens. Notably, only a small share

18 The vast majority of firms that faced financial constraints took measures to try to alleviate them; hence, the non-significance of the results for this type of obstacle.

Table 5: Additional Proportion of Firms that Have Innovated Despite Facing Obstacles to Innovation When They Used Government Support Programs Compared to Those that Did Not Use These Programs

Government	Internal Financing	External Financing	Financing	Market Size	Lack of Skills
	(percent)				
Training	6.16	8.01	6.42	6.56	7.07
Grants	11.89	16.34	12.58	13.68	13.42
Tax Credits	19.15	20.15	18.94	18.83	18.09
Procurements	9.64	7.24	7.71	7.12	7.67
Hiring Recent Graduates	8.36	10.66	8.28	12.99	10.91
Research Facilities (access to)	12.59	16.14	12.09	17.08	13.02
Export Incentives and Services	13.10	16.30	13.37	13.85	13.08
Information and Technology Assistance	9.48	12.81	10.58	13.24	8.75
Market Information Services	10.63	11.57	11.35	9.14	5.73
Other Programs	11.98	8.18	10.97	9.71	11.15
Government	**Finding Collaborators**	**Uncertainty and Risk**	**Regulation**	**IP**	**Competition Policy**
	(percent)				
Training	9.48	7.99	9.62	-0.16	10.58
Grants	15.33	11.92	13.78	7.14	10.12
Tax Credits	19.58	18.68	21.35	15.14	19.58
Procurements	C*	6.83	7.29	C	4.30
Hiring Recent Graduates	14.71	10.30	12.22	7.97	C
Research Facilities (access to)	C	13.97	15.87	C	C
Export Incentives and Services	C	11.99	15.94	C	C
Information and Technology Assistance	C	10.45	13.06	C	C
Market Information Services	C	10.09	7.38	C	9.44
Other Programs	C	13.92	C	C	C

Notes: All proportions are calculated using the sampling weights. C* Represents results that cannot be divulged because of confidentiality reasons; i.e., there are fewer than 10 observations in either one of the categories. In general, these correspond overall to proportions of less than 20 percent.

Table 6: Difference in the Probability of Innovating for Firms That Faced Specific Innovation Obstacles Compared With Those That Did Not

Obstacles to Innovation Related to:		Difference in Probability of Innovating (percent)	
Financial Constraints	Internal or external financing	-43.14	**
Knowledge-related Obstacles	Lack of skills within their firm	-8.57	**
	Finding and reaching agreements with external collaborators	0.22	
Demand- or Market-related Obstacles	Market size	-6.11	*
	Uncertainty and risk	-9.14	***
Regulation- and IP-related Obstacles	Regulatory issues	-7.06	*

Notes: ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Regressions are estimated on 6,896 firms. The difference in the probability of innovating is calculated using the marginal effects evaluated at the means. The small number of observations for the disaggregation by measures taken (successful or not, governmental or not) prevents us from reporting results for obstacles to innovation related to government competition policy and IP protection.

of firms – 6.6 percent with unsuccessful mitigation measures and 11.4 percent with successful measures (see Table 4) – reported using government programs specifically for financial barrier mitigation.[19] This adds to the notion that while government support can help ease financial constraints, it does not fully eliminate them.

However, government support should not replace private efforts to overcome financial barriers. Nevertheless, our results indicate a slight improvement in the probability of innovating when firms ask for help. Firms that took successful measures to address financial barriers, when also backed by government support programs, increased their probability of innovating by nearly 6.5 percentage points compared to financially unconstrained firms (based on the difference in the first row of Table 7 between the fifth and third columns: -17.3 percent versus -23.7 percent).

The effectiveness of mitigation strategies varies significantly depending on the type of barrier. In the realm of skills and regulatory barriers, both successful private measures and government programs effectively yield similar[20] innovation performance as unconstrained firms (or those that do not report facing these particular barriers). Still,

19 Comparing the first row of the fourth and fifth columns yields a counterintuitive result in which innovation falls further when a government program is successfully used to overcome a financial constraint than when it is unsuccessfully used. This result is entirely due to the low sample size of firms (about 2 percent) that have used government programs and have taken unsuccessful measures to mitigate financial constraints. As a consequence, the difference between successful and unsuccessful measures should not be considered.

20 The coefficients of these variables in the regression analysis are not statistically different from firms that did not face these obstacles to innovation.

regulation is undoubtedly very sector-specific, and not all firms will face such challenges.[21]

For market-size barriers, government program utilization shows clear positive effects, with successfully implemented non-governmental measures combined with government support demonstrating the strongest positive impact. Firms that took successful measures and used government programs to overcome market-based innovation barriers increased their probability of innovating by 13.7 percent (fifth column, Table 7) compared with firms that did not face such barriers.

Private initiatives appear more effective on their own than when combined with government programs for collaboration-related obstacles, principally because the sample of firms that took successful mitigation measures and used government programs is too small (only 2.6 percent of firms reported in Table 4) to yield an adequate level of significance.[22] Government support shows particular efficacy in uncertainty and risk mitigation, especially for firms with otherwise unsuccessful measures and those facing financial constraints.[23] However, once again, small sample sizes for specific program-success combinations limit statistical power in these areas.

In all cases explored, while mostly not significant, the large size of the negative coefficients in columns three and five suggests that none of the "successful" mitigation measures taken by firms manage to completely compensate for the combined negative impact of also facing financial constraints (see Table 8).

These findings, combined with the earlier data on usage, suggest several important considerations for innovation policy design. First, evidence indicates a disconnect between firms' perceived purpose of government programs and their actual effectiveness in barrier mitigation. Second, the strongest positive outcomes often emerge from combining successful private measures with government support, suggesting the importance of program designs that complement private initiatives.

The next section explores the specific government programs and their support of firm innovation.

Government Program Effectiveness and Innovation Support: Analysis of Specific Policy Instruments

The empirical evidence presented in Table 9 demonstrates positive innovation effects from both training programs and graduate hiring initiatives. These human capital-focused interventions show statistically significant positive associations with innovation propensity: firms that used government training programs increased their probability of innovating by 6.4 percent, while those that accessed programs designed to help them hire recent graduates increased their likelihood of innovating by 10.5 percent compared to firms that did not. We remind readers that while these programs enhance the probability of innovation, they do not necessarily elevate firms above the baseline innovation levels of companies facing no skills-related obstacles.

21 The limited sample size prevents detailed sector-specific analysis of regulatory effects.

22 Although not specifically identified in the survey, government programs that may be used for this purpose are those for university-industry collaboration from the Natural Sciences and Engineering Research Council and Mitacs, a non-profit national research organization. These are often part of a package organized by research and innovation intermediaries, such as the Consortium for Research and Innovation in Aerospace in Quebec, in building their collaborative projects.

23 Out of the 42.84 percent of firms that reported risks and uncertainties as an obstacle to innovation, 7.83 percent used government programs to overcome these obstacles (18.28 percent of these firms). While there is a role for these programs, government interventions should balance the issues regarding socializing the risks of innovation while privatizing the profits of those innovations.

Table 7: Difference in Innovation Likelihood for Firms Facing Obstacles, by Type of Mitigation Strategy

Individual Obstacles Taken Separately	Did Nothing		No Government Programs Used				Government Programs Used			
			Unsuccessful Measures		Successful Measures		Unsuccessful Measures		Successful Measures	
	(percent except *, **, ***)									
Financial Constraints										
Internal or external financing	-42.29		-38.13		-23.72	**	-8.25	***	-17.28	***
Knowledge-related Obstacles										
Lack of skills within their firm	-13.32	***	-5.91	***	2.93		0.15		5.63	
Finding and reaching agreements with external collaborators	-12.52	**	-6.48	*	9.90	***	9.80		14.22	
Demand- or Market-related Obstacles										
Market size	-13.41	***	-5.96	***	6.17	**	12.80	***	13.68	***
Uncertainty and risk	-12.91	***	-5.78	***	4.63	**	11.28	***	5.41	
Regulation- and IP-related Obstacles										
Regulatory issues	-8.49	***	-4.42	**	3.54		5.90		11.34	

Notes: ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Regressions are estimated on 6,896 firms. The difference in the probability of innovating is calculated using the marginal effects evaluated at the means. The small number of observations for the disaggregation by measures taken (successful or not, governmental or not) prevents us from reporting results for obstacles to innovation related to government competition policy and IP protection.

Unsurprisingly, government grants and tax credits emerge as foundational elements of the innovation-support landscape, as they are designed to help mitigate the complex and uncertain nature of the innovation process. While they only partially mitigate financial constraints, these instruments demonstrate consistent positive effects on innovation propensity. The analysis supports previous research indicating that high-performing Canadian firms often benefit from combined support through SR&ED tax credits and direct funding mechanisms. The firms in our analysis that have used such programs have increased their probability of innovating by 11.3 percent (tax credits) and 11.8 percent (direct grants).

Access to government research facilities, although seldom used by firms (3.6 percent of the sample in Table 3), demonstrates a strong positive impact on innovation propensity. The network of the National Research Council facilities and regional research centres appears to provide meaningful support for industrial innovation. Similarly, export-support programs, despite limited uptake at the time (4.1 percent of firms in Table 3), show significant positive effects on innovation outcomes for participating firms.

Government information and technical assistance programs, as well as market information services programs, both demonstrate a positive association with an increased innovation propensity for firms that use this support, though the latter show weaker significance. This finding provides an interesting contrast to traditional innovation barrier studies, as it examines information access through the lens of support programs rather than information deficiency as an obstacle.

Public procurement, while theoretically promising for innovation acceleration, shows no significant impact in the analysis. This finding likely reflects the early stage of innovative procurement policies in 2009-2012 and potential measurement challenges in distinguishing between traditional and innovation-oriented activities.

These findings suggest several important considerations for innovation policy design – for example, the need to maintain and potentially expand successful traditional support mechanisms. Moreover, where our results show less significance, one must decide whether the program should be improved or dropped. As an example in support of the former, over time we could evaluate the success of Innovative Solutions Canada, a recent federal government procurement program, at Innovation, Science and Economic Development Canada (ISED). Previous innovative procurement programs have been shown elsewhere to accelerate the adoption and diffusion of innovation (Edler and Yeow 2016).[24]

The value of research infrastructure access – which we show has a strong positive effect – as a complement to direct financial support needs further investigation. The potential for expanded export-support programs, given their positive

24 We note, however, that while in 2007-2009 and 2010-2012, respectively, 4.2 percent and 7 percent of firms reported to have used public procurement for innovation-related purposes (see: Statistics Canada. 2014. "Innovation and Business Strategy, Use of Government Support Programs for Innovation." Table 27-10-0091-01. Ottawa: Statistics Canada. https://doi.org/10.25318/2710009101-eng), these proportions drop in more recent surveys to 2 percent, 2 percent, and 1.9 percent in 2015-2017, 2017-2019, and 2020-2022, respectively (see Statistics Canada. 2024. "Use of Government Programs to Aid Innovation Activities, by Industry and Enterprise Size." Table 27-10-0238-01. Ottawa: Statistics Canada. https://doi.org/10.25318/2710023801-eng). Assessing whether this is a drop in popularity or in availability needs further investigation.

Table 8: Difference in the Likelihood of Innovating for Firms Facing Both Financial Constraints and Other Innovation Obstacles, By Type of Mitigation Strategy Compared with Firms Not Facing These Obstacles

Combined Impact of Also Facing Financial Constraints[a]	Did Nothing		No Government Programs Used				Government Programs Used			
			Unsuccessful Measures		Successful Measures		Unsuccessful Measures		Successful Measures	
	(percent except *, **, ***)									
Knowledge-related Obstacles										
Lack of skills within their firm	-47.63	***	-38.89	***	26.80		-30.84		-22.66	
Finding and reaching agreements with external collaborators	-47.68	**	-40.65	*	-16.95	***	-17.12		-8.98	
Demand- or Market-related Obstacles										
Market size	-48.71	***	-39.96	***	-22.78	**	-11.09	***	-9.36	***
Uncertainty and risk	-46.12	***	-37.62	***	-23.06	**	-11.85	***	-21.84	
Regulation- and IP-related Obstacles										
Regulatory issues	-41.38	***	-36.33	**	-25.32		-21.70		-12.54	

Notes: ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Regressions are estimated on 6,896 firms. The difference in the probability of innovating is calculated using the marginal effects evaluated at the means. The small number of observations for the disaggregation by measures taken (successful or not, governmental or not) prevents us from reporting results for obstacles to innovation related to government competition policy and IP protection.

a Facing financial constraints always yields a negative and significant effect.

impact despite limited current utilization,[25] show promise as both an incentive to innovate and to explore new markets. The latter is particularly important in the current geopolitical climate.

Our research provides granular insights into the effectiveness of specific government innovation-support programs, while acknowledging important data limitations in matching programs to particular innovation obstacles. The analysis reveals nuanced patterns in program utilization and impact across different innovation-support mechanisms.

Recommendations

This *Commentary* advances our understanding of innovation barriers and policy effectiveness through novel empirical evidence on firm-level mitigation strategies and government support-program outcomes. Our analysis reveals valuable insights about the interplay between private initiative and public support in fostering innovation capacity. Furthermore, the periods studied – 2007-2009 and 2010-2012 (during and immediately after a financial crisis) – are directly relevant to today's post-pandemic, post-inflationary, and post-high-interest rate period. The findings show that during times of a financial crisis, firms never manage to completely mitigate financial constraints to improve their probability of innovating to be on par with that of unconstrained firms.

This research makes two primary contributions. First, it provides novel empirical evidence on how firms actively respond to and mitigate innovation obstacles through various strategies. Second, it offers the first systematic assessment of government support programs' effectiveness in addressing specific innovation barriers within the context of firm-level mitigation efforts.

Our analysis reveals that firms exhibit significant agency in addressing innovation barriers, particularly financial constraints. Proactive firms demonstrate an increased capacity for innovation compared to their peers. This effect strengthens significantly when mitigation efforts succeed. Government support programs play an important

Table 9: Difference in the Likelihood of Innovating for Firms that Have Used Government Support Programs for Innovation-Related Activities Compared with Those that Did Not Use Such Programs

Government Programs Used	Difference in Probability of Innovating (percent)	
Training	6.42	**
Grants	11.77	***
Tax Credits	11.32	***
Procurements	4.63	
Hiring of Recent Graduates	10.53	***
Government Research Facilities (access to)	14.59	***
Export Incentives and Services	9.46	**
Information and Technical Assistance	13.06	***
Market Information Services	8.96	*

25 Overall, 2.2 percent and 5.8 percent of firms in 2007-2009 and 2010-2012, respectively, used government export incentives and services (see: Statistics Canada. 2010. "Innovation and Business Strategy, Use of Government Support Programs for Innovation." Table 27-10-0091-01. Ottawa: Statistics Canada. https://doi.org/10.25318/2710009101-eng). More recent surveys (see: Statistics Canada. 2025. "Use of Government Programs to Aid Innovation Activities, by Industry and Enterprise Size." Table 27-10-0238-01. Ottawa: Statistics Canada. https://doi.org/10.25318/2710023801-eng) amalgamate this type of government support in the category "Other government programs, which includes: programs and activities not included elsewhere such as access to facilities, export incentives, technical assistance, market information or loans." In 2015-2017, 2017-2019 and 2020-2022, respectively, 3.7 percent, 2.9 percent, and 3.4 percent of firms used these "other" government programs.

complementary role, though their effectiveness varies significantly across intervention types. This finding suggests a complementary relationship between private initiative and public support, with neither serving as a complete or standalone solution.

Traditional instruments such as R&D tax credits and subsidies yield broad positive impacts, while newer mechanisms like public procurement show more limited results. This variation suggests the need for carefully calibrated policy approaches that recognize the heterogeneous nature of innovation barriers and firm responses.

These findings suggest several key considerations for policymaking. First, innovation-support programs should be designed to complement and reinforce private mitigation efforts rather than operate in isolation.

Second, more targeted interventions may be needed for specific barrier types, particularly those showing persistent deterring effects. Third, there is a need for improving coordination among different support instruments to maximize their combined impact.

In a time of budget constraints and geopolitical uncertainty, governments must make tough decisions about maintaining domestic programs while monitoring global events. Our research highlights the value of evidence-based program evaluation. Programs that effectively drive innovation, especially those that align with private efforts, deserve top priority for continued funding and expansion.

Recommendation 1: Improve coordination of innovation support

Recommendation 1.1: Coordinate and decompartmentalize government programs to support innovation activities

Our study finds that, with varying degrees, almost all government innovation-support programs significantly increase firms' innovation propensity. To address the challenges faced by businesses, we recommend improved coordination and collaboration among program organizations. Collaboration among these organizations, with shared resources and databases, could lead to the elimination of redundancies, maximizing business support. Proactive planning can prevent rash decisions when financial pressures increase.

Recommendation 1.2: Encourage companies to take steps to reduce or overcome these barriers

Companies that take successful non-government action or use government programs to overcome non-financial barriers have a similar innovation probability as those without such barriers. Although the success of their initiatives is not known ahead of time, encouraging and supporting companies that have not applied for or accessed these programs is essential. They would benefit from being coached and mentored to improve the success of their endeavours to overcome these challenges, but identifying these companies is not a straightforward task. Informing and highlighting the benefits of using available resources, via regional or industrial associations, of bodies such as the Conseil de l'innovation du Québec, can help promote innovation and growth for these firms.

Recommendation 1.3: Promote and focus on innovation-support programs that increase the propensity to innovate

Our research has also highlighted cases where the actions of companies or government programs have improved the likelihood of innovating beyond that of companies that did not face non-financial barriers. It is clear that these programs do more than just overcome hurdles; they help all firms innovate more, especially those facing barriers like market size, risk, and uncertainty. The next step is to identify specific programs that outperform expectations. In-depth studies can help governments choose which innovation-support

programs to enhance. Effective governance is crucial for companies to overcome barriers and innovate beyond expectations. Government agencies must clarify their roles and responsibilities to ensure seamless coordination.

Recommendation 1.4: Coordinate non-governmental support and government programs to support innovation activities, focusing on financial constraints

Companies that address non-financial barriers can thrive, but only if they do not also face financial constraints. Therefore, aligning innovation-support programs to effectively eliminate these financial constraints is important. The government can play an effective complementary role alongside the private sector without replacing private initiatives that should remain the main driver.

Recommendation 2: Raise awareness of and improve programs for reducing innovation risks

Recommendation 2.1: Take advantage of public procurement

Risks and uncertainties hindered innovation for more than 40 percent of innovative companies. Removing these risks is crucial. In these earlier samples (2009, 2012), public procurement's impact on innovation propensity was minimal (non-significant) despite being used by 4.2 percent and 7 percent of firms in 2007-2009 and 2010-2012, respectively. It is doubtful results will have changed much with utilization in more recent surveys (2015-2017, 2017-2019, and 2020-2022), dropping to 1.9 percent to 2.2 percent. Nonetheless, in sectors where the public sector is an early adopter, such as construction, transport and healthcare, testing and validating technology in the public sector reduces innovation risks. In these sectors, we suggest using public procurement to mitigate some risks and uncertainties related to emerging technologies.

Recommendation 2.2: Continue to modernize the regulatory system

Regulation plays an important role in many innovative sectors. Increased collaboration in both the early and upstream phases of innovation is not only desirable but can also improve and accelerate the development and deployment of innovation.

Recognized national bodies can facilitate a rapid and effective regulatory process, allowing Canadian innovations to become global standards. Licensed technology minimizes risks and uncertainties, providing a boost to innovators. As innovative companies continue to face financial constraints, improved regulation could effectively leverage investment by reducing risk.

Recommendation 3: Understand why companies fail to innovate

Recommendation 3.1: Understand why some companies do not try to overcome innovation barriers

Recommendation 3.2: Understand why certain measures taken by companies fail, whether they are governmental or non-governmental in nature

Recommendation 3.3: Equip businesses and innovation intermediaries with the necessary resources to address obstacles to their innovation potential

To ensure that more companies succeed, it is imperative to correct the failure to innovate at several levels. We do not fully understand why some companies initiate actions to overcome these obstacles, while others do not. We also lack information on specific measures companies have taken beyond government programs. Our study could not find information on the organizations or groups that help firms navigate government programs. More detailed questionnaires and interviews are needed to address this issue. This

form of innovation survey, combined with business strategies, has a promising future in differentiating government innovation-support programs from other company actions to overcome innovation obstacles.

Recommendation 3.4: Match government programs and measures used by companies in databases

The fact that surveys generally fail to match specific suites of government programs with the barriers they have helped to alleviate hampers our understanding of how businesses overcome them. While this can be partially remedied by careful matching of surveys with various government programs (Statistics Canada's Business Innovation and Growth Support database is a good example), data collection at the provincial, regional, and municipal levels is more complex to implement.

In light of the results and the questions raised by them, it is imperative that the community interested in these issues – including industry leaders, policymakers, and academics – identify the programs that work, the impact of their combined effect, how to improve those that partially achieve their objectives, while studying the behaviour of companies and the support they obtain from their ecosystem when they try to innovate.

Conclusion

This *Commentary* advocates for a unified strategy that combines government innovation programs, enhances business-led innovation efforts, and leverages robust innovation systems. This approach will drive Canadian innovations to global markets, including beyond the US market.

The recommendations outlined here aim to improve our understanding of the combined effects of these government support programs for innovation, the role of innovation ecosystems, and the actions taken by companies to overcome financial constraints and non-financial barriers. They will be critical to better coordinate and optimize these programs in light of their multiplier effect on innovation. By reaching more firms and increasing their chances of success, we move closer to a more innovative and prosperous Canada.

APPENDIX A – FIRM CHARACTERISTICS

The surveyed sample comprises a diverse range of potentially innovative enterprises, with an average employment of 115 workers and mean profits of $8.7 million. Unsurprisingly, the data indicate a robust innovation rate of 70.8 percent, representing firms that introduced new or significantly improved products or processes during the three-year survey period. This high innovation rate suggests considerable dynamism in the Canadian business sector.

Table A1: General Descriptive Statistics of the Study Sample of Potentially Innovative Firms

Indicator	Average
Number of employees	114.71
Profit	8,676,606
Debt-to-equity ratio	2.24
Firm's market share	18.35%
Age of the long-term strategy focused on low-price and cost leadership (i.e., the mass market)	11.40
Number of the nine innovation obstacles faced	1.86
Number of the 10 different programs used by the firm, regardless of the government level that provides the service	1.16
Proportion of Firms that:	**Proportion (percent)**
Have introduced a new product or a new process innovation*	70.78
Have a long-term strategy focused on low price and cost leadership (i.e., the mass market)	11.34
Have a focus on regularly introducing new or significantly improved goods and services	24.10
Seek mainly to introduce new or significantly improved business activities or processes	41.35
Use any advanced technology (equipment or software)	45.30
Have introduced new methods of organizing external relations with other firms or public institutions (i.e., first use of alliances, partnerships, outsourcing or subcontracting, etc.)	19.80
Have outsourced (contracted out) R&D to foreign independent organizations	7.81
Have performed or relocated R&D activities abroad	0.16
Gained market share for its highest-selling good or service in its main market	34.94
Have intangible capital assets	26.67
Ownership	
Subsidiary	16.20
Subsidiary of another Canadian company	10.19
Subsidiary of a foreign company	6.00

Note: * As defined in the Olso Manual 2005.

Table A1: Continued

Sector	
Resource-based	5.72
Labour-intensive	7.09
Scale-based	5.09
Specification-based	3.20
Science-based	1.23
Knowledge-intensive	8.82
Location	
Atlantic provinces	3.76
Quebec	28.40
Ontario	37.91
Western provinces as well as the three Territories	29.93

Advanced technology adoption reaches 45.3 percent of firms, indicating significant technological sophistication. Intangible capital holdings account for 26.7 percent of the sample, reflecting a substantial investment in knowledge-based assets. Ownership structure shows moderate international integration, with subsidiary status characterizing 16 percent of the sample, split between domestic (10.2 percent) and foreign ownership (6 percent).

Appendix B – Model description

According to Savignac (2008), the likelihood of undertaking innovative initiatives in the face of particular constraints, such as internal and external financing, is likely to be influenced by common factors of unobservable heterogeneity. This suggests that the choice to undertake innovation and the method of financing it are likely interconnected. In light of Savignac's findings, we propose a simultaneous equation model to examine the desire to innovate and the likelihood of encountering financial constraints. The underlying latent variable structure can be described as follows:

$$Y_{1i}^{*} = X_{1i}\beta_1 + Y_{2i}\gamma_1 + \varepsilon_{1i} \quad (1)$$

$$Y_{2i}^{*} = X_{2i}\beta_2 + Y_{1i}\gamma_2 + \varepsilon_{2i} \quad (2)$$

Where and represent, respectively, the (unobserved) expected return of innovative initiatives and the intensity of financial constraints[26] accounts for the traditional and new drivers of innovation – in our case, this includes barriers to innovation beyond financial constraints – while are explanatory factors that contribute to the financial risk of an investment, as reflected in the balance sheet, including the head office's location, profits (or losses) and debt-to-equity ratio. However, as Savignac points out, a model that takes these factors into account is inconsistent and requires some restrictions on the coefficients to ensure logical consistency. However, a bivariate probit model can be estimated after identification by setting =0. The model then becomes:[27]

$$Y_{1i}^{*} = X_{1i}\beta_1 + Y_{2i}\gamma_1 + \varepsilon_{1i} \quad (1)$$

$$Y_{2i}^{*} = X_{2i}\beta_2 + \varepsilon_{2i} \quad (2)$$

Furthermore, we propose that the error terms are independently and identically distributed as bivariate normal. As Savignac (2008) states, "no additional restrictions on the parameters to achieve the identification of this bivariate probit model with an endogenous dummy regressor." The likelihood of the bivariate probit is not affected by the endogenous aspect in the first equation. The probability of undertaking innovative activities ("Have introduced a new product or a new process innovation" – see Appendix A) or of experiencing financial constraints ("Have faced financial constraints related to internal or external financing" – see Table 2) can be expressed using the normal cumulative distribution function, as in a standard bivariate probit model without endogeneity.[28]

The barriers to innovation, included in, were interacted with the measures taken, their success or not, and whether these measures included government programs or not, as indicated in Table B1 on the next page.

26 Internal and external financial constraint were both considered separately and combined; the latter is the focus of this *Commentary*.

27 For identification purposes, it is necessary to adopt the standard normalization of the error variance (Savignac 2008).

28 See Savignac (2008) for more details on the econometric conditions of this model. We note that the year dummy variable included in the regression analysis was generally non-significant, hinting that the control variables in the model contribute to explaining the particularities in each period. For this reason, we decided to stick to the pooled sample of the two cohorts. We also note that the variables are normalized in the regression analysis and have been tested for the potential influence of outliers. Lastly, we ensure no multicollinearity issues.

Table B1: Creation of the Dummy Variables Interacting Obstacles, Taking Measures and the Success of These Measures with the Use of Government Programs

The Firm Faced Obstacle to Innovation ×		Used Government Support Program to Overcome Obstacle to Innovation ×	
		No	Yes
No Measures Taken		NMT×	N/A
The Measures Taken to Overcome Innovation Obstacles Were	Unsuccessful	noGovMTU×	GovMTU×
	Successful	noGovMTS×	GovMTS×

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