Understanding the Institutional Barriers to Reorienting Innovation Policy Mixes

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Abstract:

Innovation policy scholars have documented path dependent consistency in countries' mixes of innovation policy instruments over time, with successive governments adhering to what the policy mix literature calls 'national policy styles' (Acciai, 2021; Capano & Howlett, 2020; Edmondson, Kern, & Rogge, 2019). What is missing in this literature are comparative case studies illustrating *how* these national policy styles exert this constraining influence on instrument design and implementation (Capano & Howlett, 2020). This article's examination of Canada's Innovation and Skills Plan fills this gap via a case study of a government deliberately trying to reorient its innovation policy mix towards instruments that are inconsistent with its entrenched national policy style. Despite the rhetoric of transformational change, Canada's Innovation and Skills Plan nonetheless resulted in incremental change to the country's overall innovation policy mix (ISED, 2019; OECD, 2021). Over 143 interviews with policymakers, firms, and experts involved in this policy subsystem illustrate how the underdeveloped mechanisms for institutional coordination capacity at the heart of Canada's national style of innovation policymaking functioned to hinder intentional policy reform efforts aimed at transforming the innovation policy mix towards targeted deployment of direct grants and demand-side procurement. These targeted, and demand-side policy instruments require more institutional coordinating capacity to design and deploy at scale than was possible with Canada's fragmented innovation policymaking apparatus, which was attuned for delivering the neutral, and supply-side R&D tax credits and research funding that have long dominated the innovation policy mix. Specifically, the article reveals how three institutional coordinating capacity elements, comprising Canada's perennial national policy style for innovation policy, produced this incremental outcome: 1) low coordination across institutional silos within the government; 2) ad hoc institutional mechanisms for private-public policy coordination; and 3) the uncoordinated politics of regionalism, as institutionalized in Canada's Westminster system.

Introduction

This article explores how a country's institutional foundations can hinder policymakers' efforts to effect transformational change to its innovation policy mix. Specifically, the article synthesizes from the innovation policy literature a typology for conceptualizing how a country's entrenched institutional mechanisms for 1) coordinating industrial strategy across government departments, 2) coordinating with the private sector, and 3) crafting consensus to mediate regional political pressures can function to impede efforts to reorient its innovation policy mix. The operation of this typology is illustrated through a case study that aims to explain why Canada's approach to innovation policy has remained so stable over time despite prolonged underperformance in stimulating private sector innovation. Curiously, after decades of declining business expenditure on research and development (BERD) and numerous attempts at policy reform to address it, Canada's innovation policy mix continues to rely much more than its OECD peer countries on indirect, supply-side, and neutral policy instruments such as R&D tax credits and academic research funding (OECD, 2021; OECD, 2023). This raises the central puzzle this article aims to resolve, namely, explaining why Canada's approach to innovation policy has remained so stable over time despite prolonged underperformance in stimulating innovation. The empirical contribution of this article is illustrating how these three barriers functioned to constrain the design and implementation of the 2017 Innovation and Skills Plan's (hereinafter 'the Plan') targeted, direct grant/contribution programs like the Innovation Superclusters Initiative and the Strategic Innovation Fund, as well as the demand-side procurement program Innovative Solutions Canada. The theoretical contribution to the literature on the evolution of innovation policy mixes is to demonstrate how a country's low level of institutional coordination capacity – emblematic of its 'national policy style' - built up after decades of reliance on a diffusion-oriented innovation policy mix can impede reform efforts to reorient a country's innovation policy mix towards policy instruments that typically comprise 'mission-oriented' innovation policy mixes.

Literature Review

Recent advances in innovation policy scholarship and practice conceptualize an expanded role for the state in facilitating transformational innovation (Schot & Steinmueller, 2018; Wanzenböck, Wesseling, Frenken, Hekkert, & Weber, 2020). This step means that innovation policy practitioners must augment their traditional economic development focus with 'mission-oriented' goals, such as addressing climate change. This requires the state to mobilize a whole-of-government suite of policy instruments visa holistic innovation policy mixes, including demand-side instruments like standards and procurement as well as traditional supply-side inputs like R&D tax credits and academic research funding to target support towards select firms

whose innovation strategies align with solving the stated societal goal (Borrás & Edquist, 2019; Kern, Rogge, & Howlett, 2019; Kuhlman & Rip, 2018; Mazzucato, 2018).

Innovation policy mix studies have begun mobilizing empirical evidence to demonstrate *that* national styles of policy instrument choice are reflected in bi-partisan consistency of policy mixes over time (Acciai 2021). Acciai's longitudinal analysis of policy documents by instrument type identifies France's enduring 'mission-oriented' policy mix style as one consisting of the targeted support of specific sectors with policy instruments characterized by high authoritative force and less automatic delivery methods. Authoritative instruments are regulations and direct expenditures (versus low authoritative fiscal and information instruments). Less automatic instruments are delivered by the state bureaucracy or public agencies, whereas high automatic instruments are delivered by the market, private credit system, or not-for-profits. This stands in contrast with diffusion-oriented policy mixes, which are comprised of automatic instruments (delivered by the market) and low authoritative instruments, such as fiscal tax credits. Specifically, Acciai's document analysis shows *that* "French policymakers show a bi-partisan acceptance of the hegemonic [mission-oriented] R&I policy type, channeling their choices on a more authoritative and less automatic instrument mix" (Acciai 2021, p. 11).

A knowledge gap exists in showing *how* national policy styles exert their continued influence on the evolution of policy mixes. Capano and Howlett's review of the policy mix literature calls for more comparative case studies illustrating the operation of mechanisms that reinforce the perpetuation of national styles of policy mixes:

> "we do not know much about why and how national mix variations develop from a comparative perspective. If different regimes express a preference for particular types of mixes and tools—for example, a U.S. preference for regulation or a Korean preference for "guided competition" in the area of industrial policy and tool choices—then how are these variations in policy styles linked to factors such as national administrative traditions or to the characteristics of bureaucratic and other political institutions? That is, we know that policy styles exist and that national traditions in administration and implementation are crucial determinants of instrument preferences...But what is the meso- and micro-level mechanism which links these macro-level phenomenon to policy mixes and specific tool choices?" (2020, p. 5).

By way on an answer, Capano and Howlett note that "the most intuitive hypothesis is that the institutionalization of policy/implementation styles as well as the characteristics of politico-administrative regimes should create permanent effects and path dependency in terms of instrument adoption" (2020, p. 5). One prominent effort to illuminate the causal mechanisms reinforcing the continuation of national policy styles is Edmonson, Kern & Rogge's theoretical approach focused on the 'co-evolution of policy mixes and socio-technical systems' (2019).

Supporting Capano & Howlett's hypothesis, their explanation focuses on status quo reinforcing 'policy mix feedback effects':

> "policy mixes have resource, interpretative and institutional effects on the evolution of the socio-technical system, and that in turn, developments in the socio-technical system influence the policy mix through a range of feedback mechanisms. These include socio-political, administrative and fiscal feedback mechanisms" (Edmondson, Kern, & Rogge, 2019, p. 4).

Policy mixes sustain themselves via resource effects, where policy mixes create coalitions of target groups who benefit from the status quo mix of instruments advocate for their continuation (Pierson, 1993; Patashnik and Zelizer, 2009). Interpretive effects occur when entrenched policy mixes sustain themselves by changing patterns of cognition, understanding and meaning of actors within the policy subsystem (Pierson, 1993; Edmondson, Kern, & Rogge, 2019). Finally, and most relevant to this article, institutional effects can sustain a policy mix by expanding state capacities to design, implement, and evaluate particular types of policies (Patashnik and Zelizer, 2009), as well as entrenching operating procedures that favour particular information channels and stakeholders over others (Béland, 2010).

What has yet to be studied in the literature on innovation policy mixes is a case like Canada's Innovation and Skills Plan where a government deliberately attempts to reorient a country's innovation policy mix away from a hegemonic policy mix precisely because it has been identified as contributing to chronic innovation underperformance. Examining the policy design and implementation of the Plan provides an opportunity to unpack ***how*** the path dependent institutional frictions associated with Canada's entrenched national style of innovation policy function to stifle policy reform efforts, ultimately reinforcing the country's overarching 'hegemonic' status quo policy policy mix. This article's case study helps fill the innovation policy literature's knowledge gap in understanding how the ability to design and implement demand-side, direct, and targeted innovation policy instruments is facilitated/constrained by country-specific institutions and political traditions (Borrás & Edquist, 2013; 2019). This answers the call for greater engagement between the fields of innovation studies, public policy scholarship on the policy process, and comparative political economy scholarship on institutional change (Storper, Ziegler, Botelho & Ornston, 2022; Edmondson, Kern, & Rogge, 2019). How do country-specific institutional coordination mechanisms function to either facilitate or hinder policymakers' efforts to reorient their innovation policy mixes? This article's attempt to answer this question as it pertains to this Canadian case study responds to the call by innovation policy mix scholars for more attention to be paid to the political and institutional forces shaping policymakers' choices of innovation policy approaches (Breznitz, 2007; Borrás and Edquist, 2013; Edler, Abdullah, Cunningham, & Shapira, 2016, Taylor, 2016; Schott & Steinmueller, 2018).

The primary theoretical contribution of this case study is to highlight the central importance of institutional coordination capacity as a mechanism through which enduring national policy styles exert their influence on the trajectory of a country's innovation policy mix. Specifically, institutional coordination capacity refers to the mechanisms for 1) coordinating innovation policy instruments across government silos, 2) coordinating innovation strategies with innovative entrepreneurs; and 3) coordinating with regional actors to concentrate innovation funding to invest at scale in areas of strength. As figure 1 summarizes, governments in 'neo-developmental' states, the Nordic countries, and the US have long-established mechanisms of institutional coordination capacity to deploy targeted, direct, and demand-side innovation policies. For example, the US national security state fills the coordination gaps in Liberal Market Economy institutions by building collaborative innovation networks in targeted technologies (Weiss, 2014; Mazzucatto, 2013). In contrast, Canadian innovation policy has long lacked institutional mechanisms to coordinate innovation strategies with the private sector, across government departments, and with regional actors (French, 1984; Chandler, 1986; Atkinson & Coleman, 1989; Wolfe, 2015).

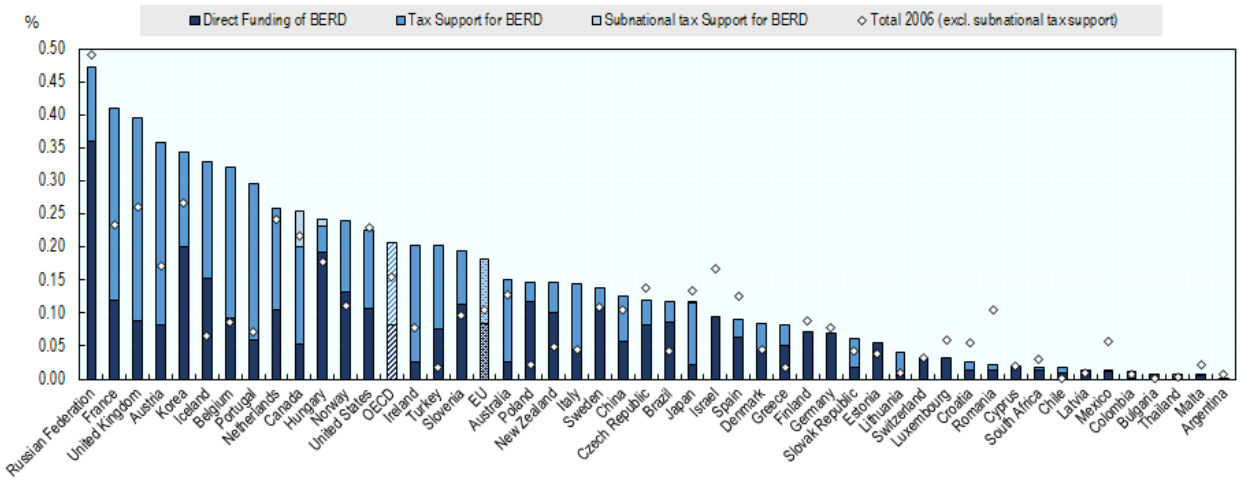
Figure 1: Institutional Coordination Capacity for Targeted, Direct, and Demand-side Innovation Policy

	1) Coordinating innovation strategies with innovative entrepreneurs	2) Coordinating policy instruments across government silos in support of these strategies	3) Coordinating with regional actors to concentrate innovation funding to invest at scale in areas of strength
Neo-Developmental States Japan (Johnson, 1982), Korea (Thurbon, 2016, Thurbon & Weiss, 2021), Taiwan (Breznitz, 2007; 2021), and Israel (Breznitz, 2007; Taylor, 2016; Maggor 2021)	-Korea institutionalized cooperative state-industry relations in strategic industries (Thurbon, 2016) -Israeli OCS' industry embeddedness helped direct R&D grants (Breznitz & Ornston 2016). -The Israeli Industry Center for R&D (MATIMOP) "became a key forum for intragroup coordination and state-business cooperation" (Maggor, 2021, p. 465). -Taiwan's Min. of Economic Affairs organized firms into private-state company (UMC) (Breznitz, 2021)	-Korea's robotics policy mix of procurement, R&D, and export support governed by dedicated coordination agency, backed by legislated strategies, and bipartisan presidential support (ex Robotics Act, KIRIA) (Thurbon & Weiss, 2021) -Israeli OCS mobilized a wide range of policy supports for ICT innovators (ex: venture capital, skills policy) (Breznitz, 2007) -Taiwan's Science and Technology Advisory Group chaired by finance minister, reported to premier (Breznitz, 2021)	-Korea's 'Developmental mindset' sustains consensus on targeting domestic innovators in strategic sectors, despite changing policy instruments (Thurbon 2016) -Korea's regional development investment agreements support subnational strategies with central government funding (OECD, 2021b) -Taiwan's ITRI and Hsinchu Science-based Industrial Park enabled clustering of semiconductor firms via diffusion of public R&D (Breznitz, 2021)
Nordic Countries esp. Finland, Sweden, Denmark (Ornston, 2012; 2018; Borrás & Edquist, 2019)	-Consensus on targeted, co-designed industry strategies facilitated through repurposing pre-existing neo-corporatist institutions via 'creative corporatism' (Ornston, 2012) -Finland's "peak-level fora such as the Science and Technology Policy Council and Tekes' own board of directors enabled policymakers to mobilize support for innovation policy among industrialists" (Ornston & Vail, 2016, p. 13)	-Finland's Science and Technology Policy Council had support from the Prime Minister, enabling it to "coordinate education, scientific research, and economic activity" (ex: coordination between the Academy of Finland and the Tekes in the distribution of R&D funding) (Ornston, 2012) -Sweden's innovation procurement agency (UHM) with cross-government support via innovation council (NIC) chaired by the Prime Minister (Borrás & Edquist, 2019)	-Strong compensatory welfare institutions enable governments to concentrate innovation spending strategically, making it marginally easier to forge consensus to target some regions, sectors, and firms over others (Ornston, 2018) - Finland's S&T Council "mobilized political support for investing in R&D" thanks to its "progressively greater participation by leading firms and representatives from peak-level industry and labor associations" (Ornston, 2012, p. 68).
United States (Weiss, 2014; Weiss and Thurbon, 2021; Block, 2008; Taylor, 2016)	-State-formed consortia of private sector firms and academic, challenge-based grants (ex: DARPA) serve as 'compensatory institutions' to LME model, via relational supplier relationships, impatient capital, innovation networks (Weiss, 2014) -Government procurement was networked with innovative SMEs and leveraged as 'America's Seed Fund' (ex: SBIR) (Block, 2008)	-'Mission agencies' with dual-use mandate: Defence, Energy, Space, Science, Intelligence, and even Health" (Weiss & Thurbon, 2021) -CHIPS: Directorate for Technology, Innovation, and Partnerships -National Science & Technology Council, cabinet-level to the President on S&T, within White House Office of Science and Technology (OSTP)	-Bi-partisan consensus that techno superiority is key to America's national security (Weiss & Thurbon, 2021) -Targeting within universalism programs like SBIR secured regional support (Schrank, 2021) -Multi-level governance of targeted procurement via state-level SBIR matching (Lanahan & Feldman, 2015)
Canada (French, 1984; Chandler, 1986; Atkinson & Coleman, 1989; Wolfe, 2015)	-Impermanent institutions for fostering state-industry coordination (French, 1984; Chandler, 1986) -Industry not organized into peak-level associations (Atkinson & Coleman, 1989) -Industry averse to policy coordination; preference for neutral, supply-side, and indirect innovation policy instruments, like R&D tax credits (Smardon, 2014)	-Paucity of cross-ministry coordination mechanisms to align policy design and implementation of targeted industrial strategies (Chandler, 1986) -Low consensus across institutional silos (esp. Dept. of Finance) on strategic targeting of the innovation policy mix towards domestic firms in select technologies (French, 1984; Atkinson & Coleman, 1989)	-Regionalism, as expressed through Westminster parliament, fuels an impulse to spread investments thinly across all regions and sectors in a neutral manner, making it difficult for the federal government to 'double-down' on strategic emerging technologies (French, 1984; Jenkin, 1983; Chandler, 1986) -Weak provincial-federal collaboration mechanisms (Atkinson & Coleman, 1989; Chandler, 1986)

Case Selection & Methodology

Canada's innovation policy mix is distinct from most other OECD nations in the degree to which it has 1) long-favoured supply-side investments like academic research funding and indirect R&D tax credits (figures 2 & 3), and 2) consistently underperformed in stimulating business expenditure on R&D (see figure 4) (OECD 2023; Nicholson 2018; Edler 2019).

Figure 1: Direct government funding and tax support for business R&D, 2020, As a percentage of GDP



Source: (OECD, 2023)

Figure 3: Higher Education Expenditure on R&D (HERD) as a percentage of GDP, 1990-2021

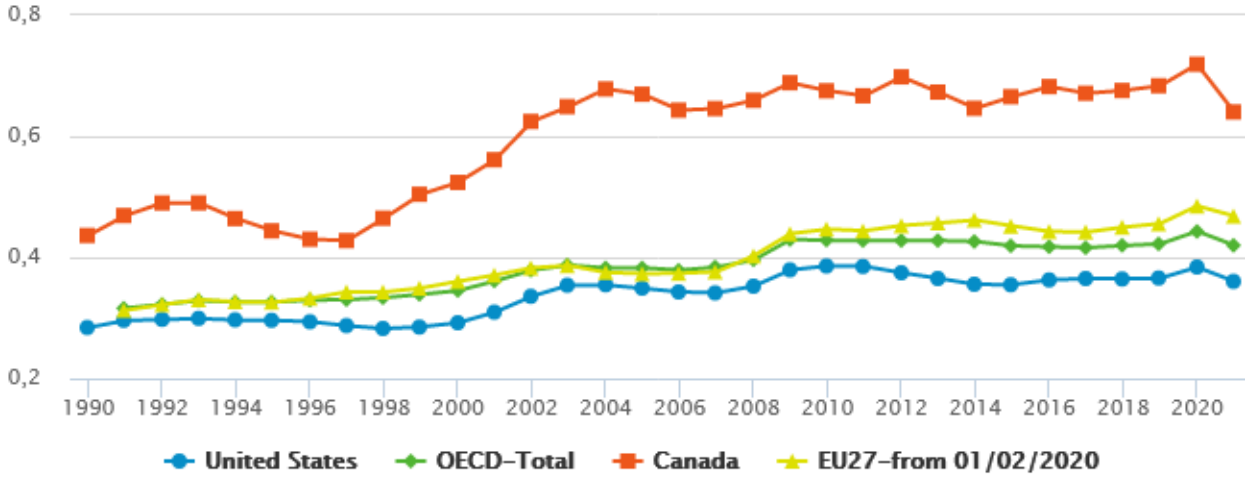
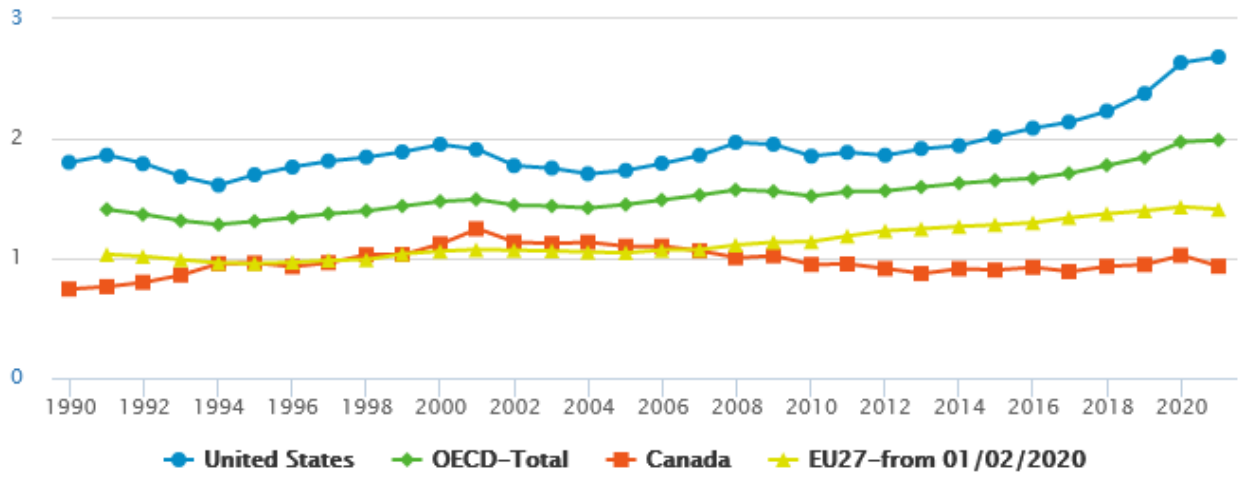


Figure 4: Business Expenditure on R&D (BERD) as a percentage of GDP, 1990-2021



Source: (OECD, 2023)

Canada's 2017 Plan provides the ideal critical case to ascertain how the legacies of entrenched policy mixes exert their path dependent effect as barriers to reorienting innovation policy mixes (Flyvbjerg, 2006). This is because a majority government with the stated intention of enacting a "historic transformation of business innovation programs" by adopting direct, demand-side, and targeted instruments (such as R&D grants and procurement) ran up against Canada's deeply entrenched lack of institutional coordination capacity (ISED 2019, p. 71; Atkinson & Coleman, 1989). Specifically, Canadian political economy research has long identified three entrenched institutional coordinating capacity barriers that have frustrated previous efforts to design and implement targeted industrial policy comprised of demand-side (procurement) and direct instruments (grants), thus sustaining the status quo policy mix of the neutral application of supply-side and indirect investments (R&D tax credits, academic research funding): 1) underdeveloped whole of government coordination mechanisms; 2) ad hoc and siloed public-private coordination mechanisms; and 3) the politics of regionalism, as institutionalized in Canada's Westminster system (Atkinson & Coleman, 1989; Chandler, 1986; French, 1984; Jenkin 1983). This sets the stage for an ideal 'agency versus structure' case study where, given such a uniquely strong impetus for change (sustained innovation underperformance), the degree to which policymakers' change efforts reproduced the same policy mix reveals the truly path-

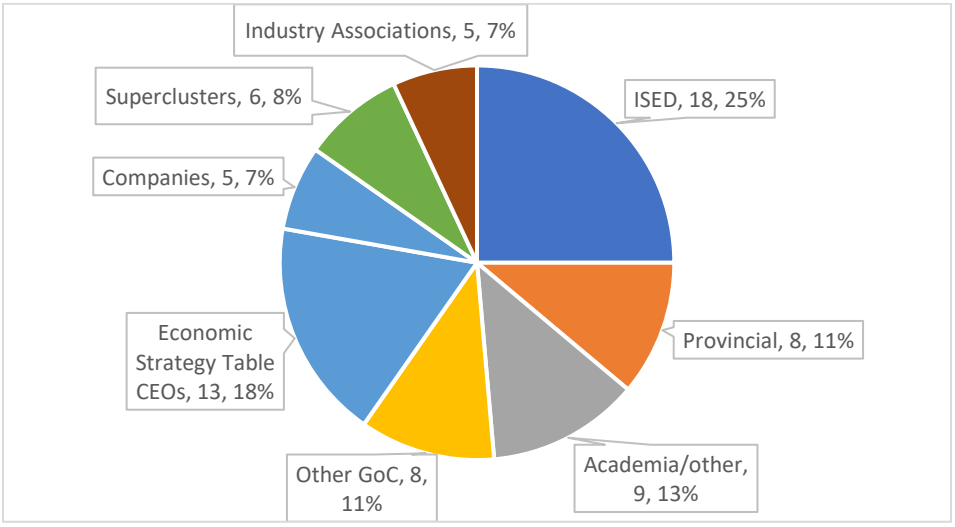
dependant nature of innovation policy mixes, highlighting the friction imposed by decades of underdeveloped institutional coordination capacity (Flyvbjerg, 2006).

The Plan, introduced in Budget 2017 and led by the innovation department Innovation, Science and Economic Development (ISED), introduced targeted, direct grants/contributions to incentivize R&D investments via the Innovation Superclusters Initiative (ISI) and the Strategic Innovation Fund (SIF), as well as its demand-side procurement program – Innovative Solutions Canada (ISC). The $950 million over five-year ISI program offered matched R&D grants to 5 competitively selected consortiums of firms working in related technologies/sectors. The $1.26 billion over five years SIF program consolidated funds from existing automotive and aerospace programs into a competitive/application-based program for large-scale (over $10m) matched contributions (some repayable) to individual company's R&D projects. (SIF) allocated $5263.4M in repayable and non-repayable investments to 101 projects as of July 15, 2022 (ISED, 2022a). Subsequent budgets boosted its funding to $13.90 billion, largely due to Budget 2021's $1B over seven years for life sciences and bio-manufacturing firms, $1.75B over seven years to the aerospace sector, and $5B over seven years to the Net-zero Accelerator (on top of the $3 billion over five years announced in December 2020) (Government of Canada, 2021). Finally, ISC is "modelled on the successful U.S. Small Business Innovation Research (SBIR) program, [and] positions the federal government as a first customer, issuing specific challenges and looking for proposed solutions" (ISED, 2019, p. 49). The program "supports the development of early-stage, pre-commercial innovations" and "the challenges are designed around solutions and desired outcomes, rather than known products or process specifications" (ISED, 2019, p. 49). Awards are given out in phases, with phase 1 recipients receiving up to $150,000 for up to 6 months through grants and contracts "to develop the proof of concept of a solution in response to a challenge" and phase 2 recipients receiving up to $1 million for up to 2 years (ISED, 2022a). Finally, in Phase 3, "a federal department may opt to procure the solution developed from Phase 2" (ISED, 2022a). Resources in this phase are separate than those provided in Phases 1 and 2. Specific challenges have "targeted areas like clean tech solutions and disruptive technologies like artificial intelligence", with 559 applications received for 42 challenges, launched by 14 different federal agencies in the first two years of the program (as of March 2019) (ISED, 2019, p. 49). As

of 2022, “just over 100 grand challenge procurements from the top 10 federal departments” have occurred (Bains & Knubley, 2022, p. 11).

The primary data for this article draws on 143 confidential, semi-structured interviews conducted between 2018 and 2022 with civil servants, firms, and other experts involved in the policy process for Canadian federal innovation policy. These interviews provide a window into the policy process for crafting innovation policy, with a focus on the period from 2015-present. Speaking with both firms and civil servants enables understanding of the policy process from the perspective of both the policy designer and target group as Canada attempted to overhaul its innovation programming in response to decades of low innovation performance. These interviews were collected through two rounds. First, 71 interviews were conducted with scale up CEOs between 2018-2020 as part of my joint research with David Wolfe and Steven Denney at the Innovation Policy Lab. These jointly conducted interviews are referred to as ‘scale-up interviewee[s]’ in this article. Second, 72 interviews were conducted solely by the author between 2019 and 2022 (see breakdown in figure 5). Interview transcripts were analyzed with qualitative analysis software Nvivo for common themes.

Figure 5: Individual Research Interviewees (n=72)

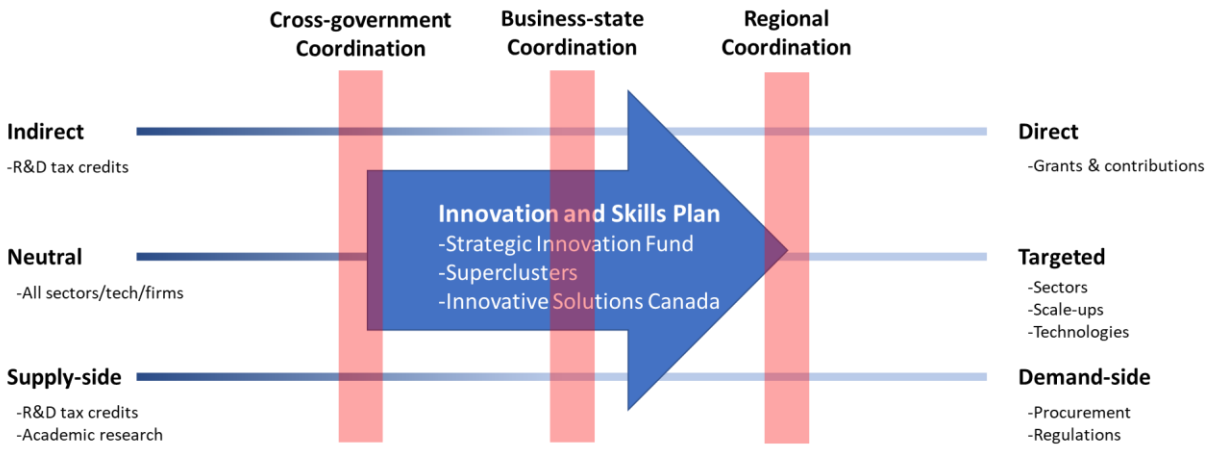


The database of interviews provides numerous qualitative windows into the policy process by those personally involved, which when triangulated with public documents and media reports, provides required evidence to process trace the causal mechanisms catalyzing and hindering the development and implementation of the Plan (George & Bennett, 2005; Beach, 2020).

Findings

As illustrated in figure 6, the three low institutional coordination capacities that are hallmarks of Canada's national policy style for innovation policy hindered the design and implementation of the Plan's efforts to reorient Canada's innovation policy mix towards the targeted deployment of direct grants and demand-side procurement.

Figure 6: Institutional Coordination Barriers to Reorienting Canada's Innovation Policy Mix Towards Direct, Targeted and Demand-side Instruments



The operation of each of the three institutional coordination capacities is explored individually in the following sections.

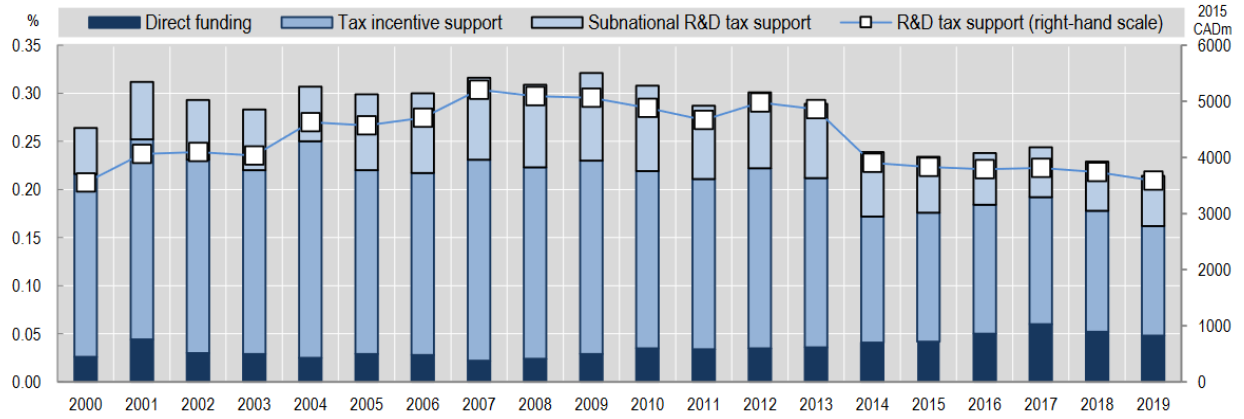
Low Cross-government Coordination Caused Incremental Layering of Direct Grants

The Plan expanded direct grant programs in recognition of the existing policy mix's over-reliance on tax credits:

> The Government recognizes that a reliance on indirect support has not improved Canada's innovation performance and incentivized business investment in R&D to scale. As a result, the Plan's targeted, solutions-oriented programs aim to encourage more business investment in R&D through increased direct support, and not just through tax incentives (ISED, 2019, p. 19).

Despite introducing direct grant/contribution programs (SIF and Superclusters), the Plan represented incremental change in degree to which Canada continues to rely on indirect tax credits in its innovation policy mix.

Figure 5: Direct funding of business R&D versus indirect tax incentives, Canada, 2000-2019, As a percentage of GDP, 2015 prices (right-hand scale)



Source: (OECD, 2021)

Approximately 77% of business innovation supports still flow through the largely neutral, supply-side, and indirect Scientific Research & Experimental Development (SR&ED) R&D tax credits in 2019, approximately the same ratio that characterized the policy mix throughout the decade leading to 2017s Plan (OECD, 2021).

Many interviewees cited the debate between ISED and the Department of Finance as a primary barrier to shifting Canada's innovation policy mix towards direct grants in a larger manner. Specifically, 11 of 18 ISED interviewees noted a difference in thinking between Finance and ISED as a barrier to shifting towards more direct grants/contributions than indirect tax credits. In addition, three more ISED interviews noted differences of thinking as a barrier without specifically noting the Department of Finance. Similarly, all three interviewees from the

Department of Finance similarly noted this difference in perspective vis-à-vis ISED on the merits of direct grants/contribution programs. While both sides acknowledge that the debate is collegial, interviewees in each department have asserted that the other side's position is shaped by their organization's ideological world view, relations with stakeholders, and impulses to protect funding for their programs. Interviewees from Finance described themselves as potentially more neutral than ISED on the direct versus indirect debate: "with ISED, they are the one responsible for implementing the program, so they have a kind of a vested interest in that program" whereas "if the SR&ED program goes away, it doesn't impact us." Similarly, a Finance interviewee noted that line department's preference of direct programs is sometimes influenced by their proximity to specific sectoral stakeholders. Another noted that direct programs have the more general political appeal where "ministers get to tell really good stories when they role out programs, [whereas] we are more skeptical about the public benefit."

ISED Interviewees stressed that SR&ED's continued prominence in the overall policy mix was a by-product of its location within Finance: "part of the problem with SR&ED is that it is resilient because it sits where it sits…every time a SR&ED review comes around, it tends to be handled by Finance with input from other departments, but it seems to go there to die, the policy discussion." The strength of this silo was reflected in program evaluation:

> We are pretty siloed in terms of direct and indirect, and I think innovation policy could be pushed to have a bit more of a holistic picture. I think tax policy is such a unique area within government that it is not as open as other areas….The extent to which we look at a higher level across our innovation policy and ask whether that is still the right objectives, and keep testing it, it is not necessarily the job of the tax policy folks... they do not live in the innovation space on a continuous basis, like ISED would have a bigger picture (government interviewee)

ISED interviewees also emphasised this silo's impact on program evaluation with reference to the fact that Treasury Board's 2017 horizontal review of business innovation programs omitted SR&ED from its analysis, despite it being the largest innovation policy expenditure, with readily available data:

> of the 119 programs that we analyzed, about $2.5 billion worth of spending, that was less than the one program, SR&ED, which was not part of the review, and so it was quite fascinating that we were doing business innovation and yet not looking at the largest program… the fact that it was omitted from the largest performance review was galling to a certain extent…its a real pity…it kind of existed in the vacuum that is held tightly by Finance (ISED interviewee)

Stakeholder pressure was a common explanation offered for Finance's reticence to meaningfully shift away from indirect tax credits. One ISED interviewee suspected this motivated Finance's reluctance to include SR&ED in the horizontal review of innovation supports: "there are far too many companies, both productive ones and non-productive ones, who get access to funding through it that no one wants to be on the other end of the phone call." Stakeholder pressure was also acknowledged as a barrier perceived by Finance interviewees to shifting away from indirect tax credits: "just in general, it's very hard for governments to take something away that already exists, SR&ED is a bit that way, companies have really baked it into their business model… to eliminate SR&ED would be a political issue to manage from a stakeholder management perspective." A similar sentiment was perceived by many firms and academic experts who cited the large industry of SR&ED tax consultants and lobby groups as an explanation for Canada's continued reliance on SR&ED: "there is a strong tax lobby that fights for SR&ED, whether the evaluations show it is effective or not" (academic interview). In sum, while both sides recognized the collegial spirit of the debate, most recognized the institutionalized siloed relationship between ISED and Finance, each with their own stakeholders and interpretive worldviews, was a tension in meaningfully shifting the policy mix away from such heavy reliance on indirect tax credits.

Faced with this resistance, within a broader context of a majority government unafraid to harness deficit spending to spur economic growth, ISED took a pragmatic approach of incremental change through layering: "we thought we would develop the other side first…direct grants…the first step was to build out what a new system could look like" (ISED interviewee). Illustrating the perceived voracity of this resistance, this interviewee concluded: "will somebody be brave enough to tackle SR&ED and see what the cobra effect of that will be?" This

interviewee then reiterated how the gatekeeping function of Finance shielded SR&ED from ISED's desire to reduce it: "frankly, had [ISED] had more control over SR&ED, in the two years following the initial innovation work, we would have worked to adjust it…[but] ISED does not control it." In sum, the Plan's rhetorical framing of 'transformative' change, institutional silo between ISED and the Department of Finance resulted in an incremental layering of new direct grant/contribution programs on top of a largely unaltered innovation policy mix that continued to rely on tax credits (ISED, 2019; OECD, 2021).

Low Cross-government Coordination Caused Incremental Layering of Demand-side Procurement

Interviews note that Innovative Solutions Canada, essentially a copy of the US SBIR program, was largely an incremental change, as it has seen low cross-departmental compliance and does little to mobilize the Government of Canada's nearly $22 billion in annual procurement as an innovation incentive. ISC was met with resistance and skepticism from other departments who resented ISED being empowered via ISC to tell them what to do with their procurement budgets. These interviewees noted that interdepartmental cultural differences and risk aversion, particularly by the Public Services and Procurement Canada (PSPC) and Department of National Defence (DND) served as barriers to harnessing procurement as a demand-side innovation policy instrument in a more ambitious fashion than ISC's one percent of each department's 2015 procurement and R&D budgets (approximately $113.8m per year). One ISED interviewee reflected that "at Innovation Solutions Canada, our biggest challenge was the departmental politics with Public Works [Public Services and Procurement Canada (PSPC)]." PSPC had been administering the Build in Canada Innovation Program since 2010, which was a procurement-style program where companies could propose late-stage precommercial innovations for testing by federal departments. BCIP was less of a demand-side innovation policy than its successor ISC because it relied less on issuing challenges. By "proposing ISC, we started then to walk on the feet of the folks at [PSPC] and that then set the stage for…tactful negotiation with that department around how those two could co-exist" (ISED interviewee). BCIP was transferred to ISED from PSPC and merged with ISC in 2019 stemming from the 2018 horizontal review of the

innovation programs, where Treasury Board agreed with ISED's proposal to "aggregate all of that in ISED as a core program" (ISED interview). Navigating these interdepartmental tensions was complicated by the fact that ISED was still reliant on PSPC to implement the program it had just inherited from them. ISED, via the ISC secretariat "oversees the program's day-to-day operations, a core function of which is to assist ISC organizations to develop and release challenges and test promising prototypes", whereas "officials at the National Research Council's Industrial Research Assistance Program (IRAP) and Public Services and Procurement Canada (PSPC) support ISC's implementation and delivery" (ISED 2022c).

The incremental nature of the ISC is evident in the slow uptake of the program by various departments. While many departments eventually issued challenges, project awards by each department have fallen below their required allocation of one percent of procurement budgets. Canadian departments consistently fall well short of their obligation to spend 1 % of 2015/16 procurement + intramural R&D (ISED, 2022b). To wit, as of July 1, 2022, the total awards announced by all departments in the nearly 4 years since the program's inception amounted to roughly half ($68,013,618.99) of the amount the government is required to spend each year ($113.8m) (ISED, 2022b). The Department of National Defence's $10.2m in award spending as of July 1, 2022 represents 15% of all awards, meaning DND's spending has fallen drastically short of the $65m it is mandated to spend each year (ISED, 2022b; ISED, 2022c). In contrast, in 2014, the last year that the US SBIR reported award amounts, the US Department of Defense's $953m in awards represented approximately 41% of all SBIR awards (approximately $2.3b) for that year (Small Business Administration, 2022). One potential reason for this is that DND independently created a very similar program around the same time that ISED created ISC. Innovation for Defence Excellence and Security (IDEaS) was developed as part of the 2017 defence policy *Strong, Secure and Engaged* and intends to spend 1.6B over 20 years (Department of National Defence, 2017). IDEaS sources challenges from approximately 18 DND entities, through which Canadian SMEs and innovation networks can receive 1.2-1.5m of grants to develop and test their technologies (Department of National Defence, 2021). Overall, low cross-government coordination hampered the rollout of ISC, as well as the mobilization of general and defense procurement as a demand-side innovation policy. Interviews with civil servants who noted that

ISED's call for other departments to mobilize procurement as a market-shaping demand-side innovation policy via the ISC program revealed interpretive differences institutionalized in public and defense procurement organizations, who have long conceptualized their procurement mandate as strictly getting the best product for the lowest price from existing 'trusted suppliers', not as a tool to facilitate innovation within Canadian companies. Overall, without a cross-government, cabinet-level coordination mechanism to ensure buy in, institutionalized siloes of resistance and inertia within each department were able to minimize the mobilization of government-wide procurement as an innovation policy instrument.

Low Business-state Coordination Caused Incremental Layering of Direct Grants

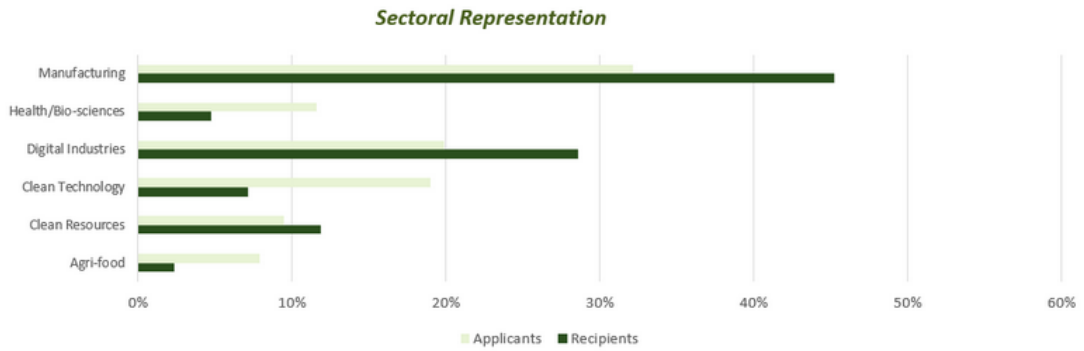
Arguably the Plan's most deliberate attempt to build coordination mechanisms into the relationship with the state and innovative firms is the Economic Strategy Tables (ESTs). The Economic Strategy Tables were created on the advice of the Advisory Council on Economic Growth in 2017 to serve as "a new model for collaboration between industry and government, focused on turning Canadian economic strengths into global advantages" (Government of Canada, 2018). The Tables included 90 CEOs and were chaired by industry leaders in six key sectors: advanced manufacturing, agri-food, clean technology, digital industries, health/bio-sciences and resources of the future. Each Table was composed of up to 15 CEOs, collectively reflecting a balance of gender and diversity, including Indigenous CEOs. During 2017 and 2018, the Tables held 34 meetings (about 6 per table), 67 engagements sessions with businesses across the country, and 8 meetings with provincial, territorial, and federal governments; they also invited public submissions and comments (Government of Canada, 2018).

ISED Interviewees described the ESTs turn towards consulting individual firms as a recognition of the limitations of Canada's established industry associations, which while still valuable, are less attuned to the specific needs of high-technology firms and more focused on policy for more general competitiveness issues. In general, almost all EST interviewees saw tremendous potential in the tables to facilitate cooperation in support of more targeted, direct, and demand side innovation policy. Many of these CEOs described the value of the ESTs serving

as collision spaces to facilitate mutual learning and cooperation in joint pursuit of more strategically targeted innovation policy. However, twelve of the thirteen confidential interviews with members of the ESTs felt that the EST process was *ad hoc* in the sense that the tables did not feel like they were part of a larger, *ongoing/strategic* relationship in service of a larger industrial strategy. Participants lamented a lack of follow up opportunities to contribute via monitoring progress on implementing recommendations and contributing further input as needed. For example, one EST CEO noted "the impact? I have never been asked anything, no follow up, no nothing, you are the first person to contact me" (EST member). Another noted that "selectively things have been done, but its not a systematic approach to an innovation and economic strategy, an industrial strategy. Its ad hoc" (ISC member). These echo Canada's historical experience of lacking institutionalized coordination between industry and government on innovation policy (French, 1984; Atkinson & Coleman, 1989).

A legacy of low institutional coordination capacity with the private sector hindered the Strategic Innovation Fund's ability to reorient the government's main large-scale R&D granting apparatus away from path dependent bets on automotive and aerospace towards making equally large bets other emerging sectors. SIF tried to create ongoing/strategic relationships with innovative firms in emerging sectors of the economy. This required the department to broaden its analytical expertise and sector knowledge: "at the beginning, we [ISED] did not have people like the digital sector who knew the sector from the perspective of firm level investments well enough that we were confident to make those investments early on, we actually had to build up capacity inside to have the expertise to provide the advice we needed to make those assessments" (ISED interviewee). An April 2021 review of SIF by ISED's Audit and Evaluation Branch reported found that while SIF had opened to other sectors, a large portion continued to be in the manufacturing "sectors targeted by the legacy programs" (ISED 2021a, p. 17). See figure 6 for a sectoral breakdown of the 1,100 applications, 66 projects, and $2.1b of funding as of March 31, 2020. Almost half of funded projects were for SMEs and 41% were foreign direct investment projects.

Figure 6: Sectoral Breakdown of SIF Funding



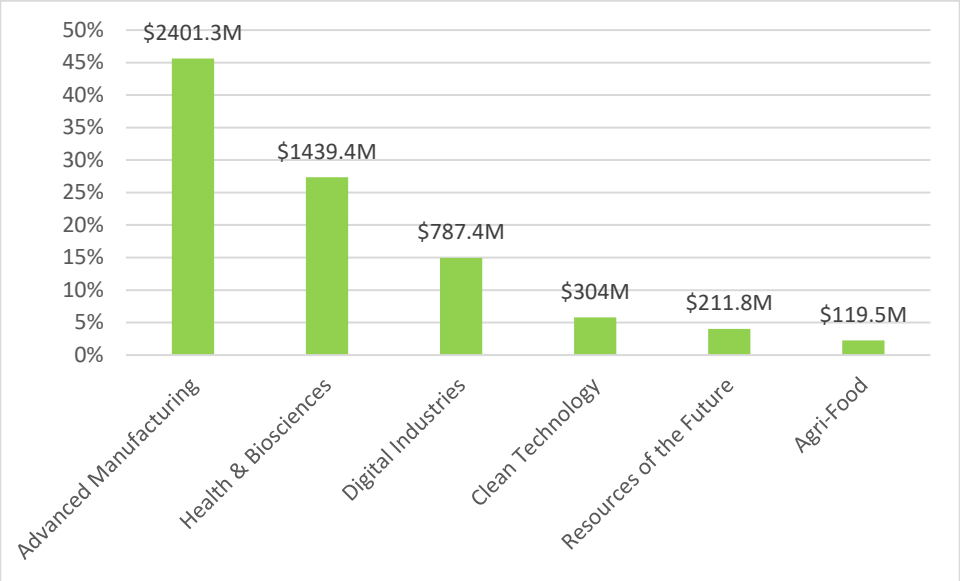
Sectoral Representation

Sector	Applicants	Recipients
Manufacturing	31%	50%
Health/Bio-science	13%	3%
Digital Industries	28%	31%
Clean Technology	13%	5%
Clean Resources	6%	9%
Agri-food	9%	2%

Source: ISED 2021

As of August 18th 2021, nearly a third—more than $1.4 billion—of the $4.8 billion allocated across 98 projects "has gone to seven companies that have received more than one award" and that "none of those firms completed their existing projects before the federal government approved fresh funding" (Hemmadi, 2021). Figure 7 shows how manufacturing continued to be the prominent sector as of July 2022.

Figure 7: Sector Allocation of SIF Funding ($5263.4M as of July, 15, 2022)



Source: Author's calculations, (ISED, 2022d)

Dan Breznitz has criticized the SIF's inability to pivot support to new innovative firms, noting that "it's the same companies that get it again and again and again, and if you look back, you will find that [they] were always receiving very large sums from the federal government…I would call it the 'Business as Usual in Innovation Fund'" (Hemmadi, 2021).

This path dependent investment pattern was a product of decades of weak institutional mechanisms for knowledge flows with firms outside of automotive and aerospace, which eroded ISED's capacity to assess projects from emerging sectors. The residual influence of decades of operation of legacy programs reproduced the investment footprint of the policy mix in a manner that resembles institutional feedback effects, where previous policies expand state capacities to design, implement, and evaluate those particular types of policies (Patashnik and Zelizer, 2009), as well as entrenching operating procedures that favour particular information channels and stakeholders over others (Béland, 2010). Interviewees described the tension within ISED on the degree to which direct innovation supports offered by SIF should be balanced between legacy programs focused on automotive and aerospace and new sectors such as ICT, health, and agri-food: "that was a tremendous battle within the department…[agnostic] believed [they] had won the war but it turns out [they] won the battle and not the war given it very quickly reverted back

to a relatively strong focus on some of those larger incumbent players" (ISED interviewee). When asked what the cause of this reversal was, this same interviewee described this difficulty in transitioning the investment portfolio into new sectors as a product of both stakeholder influence as well as limited in-house expertise within the department outside of automotive and aerospace:

> there was more comfort within the department and more of an understanding of how those parts of the economy functioned…We have a department that literally had an aerospace division and had an automotive division. The digital division had been created, if I'm not mistaken, in 2016…the capacity was weakest in new fields as opposed to those older ones and so It's not a question of capture so much as it is of proximity or emphasis that we have got civil servants who in a completely objective fashion just happened to be able to empathize more with certain types of companies than others. I think that drives an investment pattern that is easier to go where you have been before than it is to take leaps of faith elsewhere (ISED interviewee).

This same interviewee described how the conceptualization of innovation and the risk-adverse formula for approving projects that fall outside of it were informed by evaluators' experience with automotive and aerospace sectors, as "[SIF] was set up primarily with staff from existing [auto and aerospace] programs" (ISED interviewee). This led to difficulty in applying existing risk profile models to assessing digital companies, "whose growth is measured on the basis of the growth of subscribers or maybe not basic revenue" (ISED interviewee). Therefore, there was "a real disconnect between the people and their experience, and ultimately the companies who we have now said 'hey, come to the table'" (ISED interviewee). In sum, the SIF represents the government's desire to bring ISED's R&D grant portfolio into closer proximity with scale-up firms in emerging sectors. However, the process of converting sector-specific legacy manufacturing funds also revealed the path dependent nature of the federal government's direct innovation support capability and institutionalized conceptualization of innovation and risk. These have been shaped by decades of minimal coordination mechanisms outside of legacy sector programs.

A legacy of low institutional coordination capacity also hindered the rollout of the Innovation Superclusters Initiative. A central goal of the ISI is catalysing the formation of collaborative innovation networks among formerly isolated private sector actors, catalyzed via matched R&D grants (Bains & Knubley, 2022, p. 10). ISED held a competitive bid process for consortiums of firms to receive a portion of the $950M funding to allocate to collaborative R&D projects amongst their member firms over 5 years. The winning bids were Digital Technology (British Columbia), Protein Industries Canada (Prairies), Next Generation Manufacturing (Ontario), Scale Artificial Intelligence, or Scale AI (Quebec), and Ocean (Atlantic Canada). As of Feb. 2022, "for every government $1, business is investing $1.40 [via] new partnerships around the five cluster areas with over 7,000 members" (Knubley & Bains, 2022, p. 10). Linking large multinationals with Canadian SMEs whose innovative solutions can solve their problems is a key element of the ISI (Bains & Knubley, 2022). A conscious effort was made by ISED to reach out to new segments of the private sector. In the 2016 lead up to the announcement of the Superclusters in Budget 2017, ISED began to "actually get out to the field and activate potential participants, and in the broadest possible sense because we really had no idea what would come in…the idea that we need to get out there" (ISED interviewee).

A common sentiment heard from participants described the low trust relationship between ISED and the private sector-led superclusters. One CEO with insight into the process described the risk averse, low-trust ethos underpinning ISED's rigid approach to the superclusters: "the lawyers and other people in government who want to protect them from risk, say, well, 'we're not going to fund it until ALL of the private sector money is shown in a bank balance some place.' The people said 'we're not writing a check, yet, like you go first.' So there's been an order of operations problem." Multiple interviewees attributed a significant portion of this reluctance to release control to the pressure and scrutiny ISED was under from the Treasury Board, which in turn was a product of diminished coordination capacity for direct grant programs, reinforced by decades of a policy mix dominated by indirect tax credits: "the delivery muscle is a muscle they really have not used for a decade or more. The Harper government sort of pushed all that out off to the side…stakeholders would say 'can you believe what they are making us do?'…they were just deathly afraid, like everything was blamed on the Treasury

Board" (provincial interviewee). This interviewee noted that "they are so afraid of backlash from picking the winners, they had to make the process, I think too stringent and too unrealistic and too textbook." This tension played out in the form of delays in setting up the supercluster organizations and ultimately funding projects. Deputy Minister John Knubley recently reflected that hesitancy and lack of trust on the government side was potentially too strong: "the Government of Canada introduced requirements that were perhaps too rigorous, some driven by the Treasury Board, concerning board composition, how to flow funding, and annual reporting, focusing on accountability to taxpayers. In hindsight, there might have been more flexibility as Superclusters were set up. This flexibility was intended by government officials using a principles-based rather than a prescriptive set of requirements" (Knubley, 2021, p. 9). Taken collectively, these interviewees illustrate how the ISI's bumpy rollout reflected the mutual scepticism that has long characterized public-private coordination of Canadian innovation policy, reinforced by a paucity of institutionalized coordination mechanisms (Atkinson & Coleman, 1989).

Low Regional Coordination Caused Incremental Layering of Direct Grants

Regional cleavages have historically caused the Canadian federal government to shy away from making large, targeted innovation investments (Jenkin, 1983; Chandler, 1986). Regionalism gains institutional expression through Canada's Westminster parliamentary system where the legislature is comprised of members of parliament who represent the interests of territorially-defined ridings under the first-past-the-post, single member plurality voting system (Atkinson & Coleman, 1989). Regionalism particularly dominates cabinet in the Canadian Westminster parliamentary system, as there has never been a successful attempt to overcome reactive, ad-hoc regional political considerations with elaborate planning mechanisms at the cabinet level to coordinate anticipatory, whole of government industrial strategies (Atkinson & Coleman, 1989; French, 1984). Bureaucrats in this context have low autonomy to counter regionalism's short-term, partisan foundations by devising their own long-term planning with producer groups (Atkinson & Coleman, 1989, p. 61-62). Instead, Westminster Parliament's "adversary politics

conducted in a broadly representative institution does not provide much scope for developing a political consensus on macro-industrial policy" (Atkinson & Coleman, 1989, p. 58).

Interviews with innovation policymakers and others involved in the policy process for the Plan corroborated the continued operation of regionalism as a powerful barrier restricting Canada's ability to make large, strategically targeted innovation investments. Interviews demonstrate that federal bureaucrats 1) perceived the pressures of regionalism and that 2) these pressures resulted in a less concentrated allocation than originally intended. Overall, just under half of all interviewees (33 of 72) specifically identified the political pressures of regionalism as a barrier to the federal government making large, strategically targeted innovation investments. Importantly, most ISED bureaucrats (13 of 18) and other Government of Canada (4 of 7) civil servants shared this perspective. Notably, 18 interviewees used the specific phrase "spreading the peanut butter" to criticize Canadian innovation policy's aversion to making large, strategically targeted innovation investments. This relationship is strengthened given that nearly half of interviewees cited regionalism as a main barrier to making targeted innovation investments despite the interview questions not specifically mentioning it.

The policy design and implementation of the superclusters program illustrates how regionalism continues to inhibit Canada's efforts to coordinate large, targeted innovation investments with regional actors. Interviewees confirm that regional considerations have caused Supercluster funding to be spread thin in implementation across regions and across sectors within each supercluster, contrary to the original intent of making a small number big bets. One ISED interviewee noted that the original plan of picking one to three was expanded to the five regions to avoid political backlash:

> There is a political reality, absolutely…it is the nature of our federation in that we have very strong regional pulls…we can make it politically very, very difficult for any government if we do that [double down], and I have not seen any that can fully do that. We got it to five…There was not one for every province…we started to say three for the clusters, we actually said one to three, and then it quickly became three, and then it became three to five, because we could probably do it, if we do it regional, we will get less backlash.

Another ISED interviewee noted that the inability to target large bets via the Superclusters "is dominated by Canada's regional nature to the extent that a decision like that has a regional colouring. That is what weighs against it." They noted that "if you look at the supercluster thing, guess what, five regions, five superclusters. Nobody is terribly surprised… I think politically it is, 'if you make five large scale bets, you are bankrupt'. And we just do not have the ability to say "by god, this is centered in Toronto" and "swallow it" to the rest of the country." One ISED interviewee summarized that "from a regional lens, we tend to distribute like peanut butter our funding, so scale is a huge issue…and then of course superclusters, which really hollowed out an experiment trying to double down in terms of focusing on five specific priority areas with regional centers and with large scale." Provincial interviewees lamented a lack of intergovernmental coordination in the design and implementation of the ISI. In sum, the absence of developed institutional regional coordination capacity to concentrate federal and provincial resources at scale put the federal government in the politically impossible position of unilaterally 'picking winners' among the regions, which ultimately resulted in 'spreading the peanut butter' equally across all five regions.

Conclusion

The Innovation and Skills Plan illustrates how in the absence of central coordinating mechanisms for whole-of-government alignment, an innovation ministry-led (ISED) 'innovation agenda' sparked resistance and inter-departmental tension over efforts to shift from indirect tax credits (housed within the Department of Finance) to direct grant/contribution programs (housed within ISED) and mobilize demand-side procurement instruments (housed within PSPC and DND). Also, Canada's legacy of ad hoc institutional mechanisms for state-industry coordination functioned to constrain the Plan's ability to target direct (SIF) and demand-side (ISC) innovation supports to innovators in emerging sectors outside of outlier legacy sectors like automotive and aerospace where these coordinating mechanisms had previously existed. Finally, in the absence of intergovernmental coordination mechanisms, the politics of regionalism, institutionally expressed through Canada's Westminster parliamentary system and cabinet, functioned to

dilute efforts to concentrate innovation spending on making a select few 'big bets' on emerging opportunities (ISI) in favour of regional equality.

The article's theoretical contribution to the nascent comparative literature on the politics of innovation policy highlights how country-specific institutional coordinating capacities make changing innovation policy mixes an inherently path dependent and political - rather than merely technocratic - exercise (Breznitz, 2007; Flanagan, Uyarra, & Laranja, 2011; Taylor, 2016). The contribution can by synthesized by noting that different innovation policy instruments require different minimum levels of institutional coordinating capacity – mechanisms and capabilities to align efforts of actors in the private sector, other government departments, and other levels of government - to deploy them (see figure 8).

Figure 8: Different Innovation Policy Instruments Require Different Minimum Levels of Institutional Coordinating Capacity

	Low Coordination Instruments (automatic, low authority, neutral application)	High Coordination Instruments (bespoke, high authority, targeted application)
Supply-side	-R&D tax credits -Academic research funding -Investment tax credits -Fund of funds VC finance	-R&D grants & loans -Production tax credits -Advisory & matchmaking
Demand-side	-Consumer incentives -Regulation	-Procurement -Mega-project infrastructure -Standards -Competition policy

Mohnen summarizes the choice between grants and tax credits as hinging on determining whether "the State [has] the capacity and the mandate to choose which among many promising projects ought to be supported first" (Mohnen, 2018, p. 71). Jones notes that relying on tax credits "means there's no need for the government to make any decisions about what kind of R&D to support; there's no danger of being accused of trying to 'pick winners'. This means that the scheme is very cheap to administer, and there is no need for the government agencies to have any specialist expertise or to develop a strategy" (Jones, 2023, p. 25). In contrast,

procurement, grants, and loans require more direct proximity, information flow, and opportunity to influence the strategies of individual firms. Production tax credits (like those in the US Inflation Reduction Act) need to be custom calibrated to the particular production economics of specific industries/technologies, which are gleaned by coordinated, real-time information flows with the private sector. Of course, while high collaboration would likely benefit design and implementation all instruments in the chart (ex: regulation), a country with underdeveloped coordination capacities can more easily deploy a policy mix comprised mostly of low coordination instruments.[1]

This case study can serve as a springboard for comparative research to ascertain the degree to which countries with similarly underdeveloped institutional coordinating capacity (such as other mid-sized Liberal Market Economies) encounter similar path dependent institutional frictions in their efforts to transform their innovation policy mixes (Hall, 2015). One implication for policymakers is the insight that deeper engagement with political economy literature on country-specific institutional legacies can provide indicators of the type of institutional and political barriers they should expect to face in their efforts to reorient innovation policy mixes. This case study supports the finding that oftentimes reformers' in institutionally restrictive contexts strategically resort to policy layering as a mode of institutional design (Capano, 2019).

The targeted deployment of direct grants and demand-side procurement are instruments often associated with 'mission-oriented' policy mixes (Acciai 2021, Mazzucato 2018). However, the Plan's embrace of targeted, direct, and demand-side instruments was for the primary purpose of boosting the country's chronic innovation underperformance, rather than solving a clearly defined 'mission' - notwithstanding the recapitalization of small programs geared towards clean technology (SDTC), as well as some discussion of harnessing procurement for 'grand challenges' via Innovative Solutions Canada (ISED 2019). Therefore, the Plan falls somewhere closer to the traditional 'innovation for growth' and 'national systems of innovation' framing for

[1] Not all low coordination instruments are low authority and always neutral (ex: regulation), although most are neutral and automatic, ie: horizontal framework policies not applied on a firm-by-firm basis

innovation policy rather than the newer 'transformative change' framing (Schot & Steinmueller, 2018). As such, the Plan encountered the same institutional coordination barriers that have plagued previous Canadian attempts to craft an innovation-based industrial policy comprised of targeted, direct, and demand-side instruments (French, 1984).

While outside of the chronological scope of the interviews collected for this article (which were primarily focused on the period 2015-2021), Budgets 2021, 2022, and 2023 appear to have accelerated the linking of innovation policy with an overarching net-zero carbon emissions strategy. The new net-zero innovation focus articulated in these budgets has signaled an expansion of both direct (grants/contributions) and indirect (tax credits) innovation policy instruments, rather than a shift towards the former. Budget 2021 gave the Strategic Innovation Fund's new Net-Zero Accelerator its largest increase ($5 billion), which was on top of the $3 billion it received in 2020 (Government of Canada, 2021). Budget 2022's $15B Canada Growth Fund is similarly targeted towards net-zero growth and innovation as it will be "investing in the growth of low-carbon industries and new technologies across new and traditional sectors of Canada's industrial base" (Government of Canada, 2022, p. 60). Finally, Budget 2022's 'Building Capacity to Support Green Procurement' initiative has potential to ramp up demand-side innovation policy, as it aims "to accelerate the transition to a net-zero economy by purchasing goods and services with a reduced environmental impact, and by adopting new, clean technologies" via the announcement that "Public Services and Procurement Canada (PSPC) will develop new tools, guidelines, and targets to support the adoption of green procurement across the federal government" (Government of Canada, 2022, p. 96). This has the potential to mobilize the government's entire $20 billion in procurement as a demand-side innovation policy, far outweighing the impact of Innovative Solutions Canada's (unfulfilled) $113.8 million a year spending requirement (ISED, 2022c). Finally, in response to the US Inflation Reduction Act, Budget 2023 introduced $54.4 billion over 10 years of investment tax credits ranging from 15-40% of capital expenditure for net-zero related projects (ex: CCUS, renewable energy, clean technology manufacturing) (Government of Canada, 2023).

Future research should examine how the design and implementation of mission-oriented net-zero industrial policy by countries with similar national policy styles (ex: Liberal Market

Economies like the UK and Australia) are hindered by their low institutional coordinating capacity. Combining this with an extension of this article's Canadian case study would contribute to the nascent literature on the potential for missions to foster the development of institutional coordination capacity (Janssen, Wesseling, Torrens, Weber, Penna & Klerkx 2023). Specifically, missions have been shown to serve as 'boundary objects' (BOs) "around which heterogeneous communities—comprising but not limited to policymakers—gather and craft together shared understandings of what is at stake, what means are necessary, and what processes should ensue" (Janssen, Wesseling, Torrens, Weber, Penna & Klerkx 2023, p. 3). This would help answer the critical question of how policymakers overcome the coordination challenges inherent in shifting their policy mixes towards mission-oriented policy mixes (targeted, direct, and demand-side instruments) in the context of national policy styles that historically favour diffusion-oriented policy mixes comprised of supply side R&D tax credits and academic research funding deployed in a largely neutral fashion.

References

Acciai, C. (2021). "The politics of research and innovation: Understanding instrument choices in complex governance environments–the case of France and Italy." *Research Policy*, 50(9), 104254.

Atkinson, M. M., & Coleman, W. D. (1989). *The State, Business, and Industrial Change in Canada.* University of Toronto Press.

Béland, D. (2010). Reconsidering policy feedback: How policies affect politics. *Administration & society*, *42*(5), 568-590.

Bains, N. & Knubley, J. (2022). Getting Canada Back on Track after COVID-19 with a Comprehensive Innovation Plan. Public Policy Forum. https://ppforum.ca/publications/getting-canada-back-on-track-after-covid-19-with-a-comprehensive-innovation-plan/?output=pdf

Beach, D. (2020). Causal case studies for comparative policy analysis. In B. G. Peters & G. Fontaine (Eds.) *Handbook of Research Methods and Applications in Comparative Policy Analysis* (pp. 238-253). Edward Elgar Publishing.

Block, F. (2008). Swimming Against the Current: The Rise of a Hidden Developmental State in the United States. *Politics & Society*, 36(2), 169–206.

Borrás, S. & Edquist, C. (2013). The choice of innovation policy instruments. *Technological Forecasting & Social Change*, 80(8), 1513-1522.

Borrás, S., & Edquist, C. (2019). *Holistic innovation policy: theoretical foundations, policy problems, and instrument choices.* Oxford University Press.

Breznitz, D. (2007). *Innovation and the state : political choice and strategies for growth in Israel, Taiwan, and Ireland.* Yale University Press.

Breznitz, D. (2021). Innovation in Real Places: Strategies for Prosperity in an Unforgiving World. Oxford University Press.

Capano, G. (2019). Reconceptualizing layering—From mode of institutional change to mode of institutional design: Types and outputs. *Public Administration*, 97(3), 590-604.

Capano, G., & Howlett, M. (2020). The knowns and unknowns of policy instrument analysis: Policy tools and the current research agenda on policy mixes. *Sage Open*, *10*(1), 2158244019900568.

Chandler, M. (1986). "The State and Industrial Decline: A Survey." In A. Blais (Ed.), *Industrial Policy* (pp. 171-209). University of Toronto Press.

Department of National Defence. (2017). *Strong, Secure, Engaged: Canada's Defence Policy.* https://www.canada.ca/en/department-national-defence/corporate/policies-standards/canada-defence-policy.html

Department of National Defence. (2021). 2019-2020 Annual report – Innovation for Defence Excellence and Security Program. https://www.canada.ca/en/department-national-defence/corporate/reports-publications/ideas-2019-2020-annual-report.html

Edler, J., Abdullah, G. Ã., Cunningham, P., & Shapira, P. (2016). Introduction: Making sense of innovation policy. In J. Edler, P. Cunningham, & A. Gök (Eds.), *Handbook of innovation policy impact* (pp. 1-17). Edward Elgar Publishing.

Edler, Jakob. 2019. A Costly Gap: The Neglect of the Demand Side in Canadian Innovation Policy. IRPP Insight 28. Montreal: Institute for Research on Public Policy.

Edmondson, D. L., Kern, F., & Rogge, K. S. (2019). The co-evolution of policy mixes and socio-technical systems: Towards a conceptual framework of policy mix feedback in sustainability transitions. *Research Policy*, *48*(10), 103555.

Flanagan, K., Uyarra, E., and Laranja, M. (2011). "Reconceptualising the 'policy mix' for innovation." *Research Policy*, 40(5), pages 702-713.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry*, 12(2), 219-245.

French, R. (1984). *How Ottawa Decides: Planning and Industrial Policy-Making 1968-1984*. Lorimer.

George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social sciences.* MIT Press.

Government of Canada. (2018). *Canada's Economic Strategy Tables.* https://ic.gc.ca/eic/site/098.nsf/eng/h_00020.html

Government of Canada. (2021). *Budget 2021: A Recovery Plan for Jobs, Growth, and Resilience.* https://www.budget.gc.ca/2021/home-accueil-en.html

Government of Canada. (2022). *Budget 2022: A Plan to Grow Our Economy and Make Life More Affordable.* https://budget.gc.ca/2022/home-accueil-en.html

Government of Canada. (2023). *Budget 2023: A Made-in-Canada Plan: Strong Middle Class, Affordable Economy, Healthy Future.* https://www.budget.canada.ca/2023/home-accueil-en.html

Hall, P. A. (2015). The changing role of the state in liberal market economies. In The Oxford Handbook of Transformations of the State. In S. Leibfried, E. Huber, M. Lange, J. D. Levy, F. Nullmeier, & J. D. Stephens (Eds.). *The Oxford handbook of transformations of the state* (pp. 426-444). Oxford University Press: Oxford.

Hemmadi, M. (2021, August, 18). Flagship federal innovation fund awards hundreds of millions to past recipients. *The Logic*. https://thelogic.co/news/flagship-federal-innovation-fund-awards-hundreds-of-millions-to-past-recipients/

Hemmadi, M. (2022, February 22). Ottawa's program for buying from startups falling far short of Liberal government's promise, financials show. *The Logic.* https://thelogic.co/news/ottawas-program-for-buying-from-startups-falling-far-short-of-liberal-governments-promise-financials-show/

Innovation, Science and Economic Development Canada. (2019). *Building a Nation of Innovators.* http://www.ic.gc.ca/eic/site/062.nsf/eng/h_00105.html

Innovation, Science and Economic Development Canada. (2021a). *Evaluation of the Strategic Innovation Fund (SIF). Audit Evaluation Branch.* https://www.ic.gc.ca/eic/site/ae-ve.nsf/eng/h_03942.html

Innovation, Science and Economic Development Canada. (2022a). *Innovative Solutions Canada.* https://www.ic.gc.ca/eic/site/101.nsf/eng/home

Innovation, Science and Economic Development Canada. (2022b). *Innovative Solutions Canada: Annual Report 2020–21.* https://www.ic.gc.ca/eic/site/101.nsf/eng/00159.html

Innovation Science and Economic Development Canada. (2022c). *Innovative Solutions Canada awarded companies.* https://ic.gc.ca/eic/site/101.nsf/eng/00065.html

Innovation, Science and Economic Development Canada. (2022d). *Funded Projects.* https://www.ic.gc.ca/eic/site/125.nsf/eng/00012.html

Janssen, M. J., Wesseling, J., Torrens, J., Weber, K. M., Penna, C., & Klerkx, L. (2023). Missions as boundary objects for transformative change: understanding coordination across policy, research, and stakeholder communities. *Science and Public Policy*, scac080.

Jenkin, M. (1983). The Challenge of Diversity: Industrial Policy in the Canadian Federation. Ottawa, ON: Supply and Services Canada. https://issp.uottawa.ca/sites/issp.uottawa.ca/files/background_study_no._50_-_the_challenge_of_diversity_-_industrial_policy_in_the_canadian_federati.pdf

Johnson, C. (1982). *MITI and the Japanese miracle: the growth of industrial policy, 1925-1975*. Stanford University Press.

Jones, R. A. L. (2022). Science and innovation policy for hard times: an overview of the UK's Research and Development landscape Productivity Insights Paper No. 014, The Productivity Institute. https://www.productivity.ac.uk/research/science-and-innovation-policy-for-hard-times-an-overview-of-the-uks-research-and-development-landscape/

Kern, F., Rogge, K. S., & Howlett, M. (2019). Policy mixes for sustainability transitions: New approaches and insights through bridging innovation and policy studies. *Research Policy*, 48(10), 103832.

Knubley, J. (2021). *Building Superclusters for Canada*. Brookfield Institute for Innovation+ Entrepreneurship.

Kuhlmann, S., & Rip, A. (2018). Next-Generation Innovation Policy and Grand Challenges. *Science and Public Policy*, 45(4), 448–454.

Lanahan, L., & Feldman, M. P. (2015). Multilevel innovation policy mix: A closer look at state policies that augment the federal SBIR program. *Research Policy*, *44*(7), 1387-1402.

Maggor, E. (2021). The Politics of Innovation Policy: Building Israel's "Neo-developmental" State. *Politics & Society*, 49(4), 451-487.

Mazzucato, M. (2013). *The entrepreneurial state : debunking public vs. private sector myths*. Anthem Press.

Mazzucato, M. (2018). "Mission-oriented innovation policies: challenges and opportunities," *Industrial and Corporate Change*, 27/5: 803–15.

Mohnen, P. (2018). Effectiveness of Direct and Indirect R&D Support. In J. Niosi (Ed.) *Innovation Systems, Policy and Management* (pp. 53-79). Cambridge University Press.

Nicholson, P. (2018). Facing the facts: reconsidering business innovation policy in Canada. *Institute for Research on Public Policy.*

OECD (2021). *R&D Tax Incentives: Canada, 2021.* Directorate for Science, Technology and Innovation, December 2021. https://www.oecd.org/sti/rd-tax-stats-canada.pdf

OECD (2021b). *Perspectives on Decentralisation and Rural-Urban Linkages in Korea*, OECD Rural Studies, OECD Publishing, Paris, https://doi.org/10.1787/a3c685a7-en.

OECD. (2023). *OECD Science, Technology and Innovation Scoreboard*. Directorate for Science, Technology and Innovation. https://www.oecd.org/sti/scoreboard.htm

Ornston, D. (2012). *When small states make big leaps: institutional innovation and high-tech competition in Western Europe*. Cornell University Press.

Patashnik, E., & Zelizer, J. E. (2009). When policy does not remake politics: The limits of policy feedback. In *APSA 2009 Toronto Meeting Paper*.

Patashnik, E. M., & Zelizer, J. E. (2013). The struggle to remake politics: Liberal reform and the limits of policy feedback in the contemporary American state. *Perspectives on Politics*, *11*(4), 1071-1087.

Pierson, P. (1993). When effect becomes cause: Policy feedback and political change. *World politics*, *45*(4), 595-628.

Schot, J., & Steinmueller, W. E. (2018). "Three frames for innovation policy: R&D, systems of innovation and transformative change," *Research Policy*, 47/9: 1554–67.

Schrank, A. (2021). Design Principles for American Industrial Policy. *Issues in Science and Technology*, 37(3), 79–85.

Small Business Administration. (2022). *Award Data.* https://www.sbir.gov/sbirsearch/award/all

Smardon, B. (2014). *Asleep at the switch: The political economy of federal research and development policy since 1960*. McGill-Queen's Press-MQUP.

Storper, M., Nicholas Ziegler, J., Botelho, A. J. J., & Ornston, D. (2022). On Mariana Mazzucato's Mission Economy: a Moonshot Guide to Changing Capitalism, London, Allen Lane, 2021. *Socio-Economic Review*, *20*(3), 1501-1511.

Taylor, M. Z. (2016). *The politics of innovation: Why some countries are better than others at science and technology*. Oxford University Press

Thurbon, E. (2016). *Developmental mindset: The Revival of Financial Activism in South Korea.* Cornell University Press.

Thurbon, E., & Weiss, L. (2021). Economic statecraft at the frontier: Korea's drive for intelligent robotics. *Review of international political economy*, 28(1), 103-127.

Wanzenböck, I., Wesseling, J. H., Frenken, K., Hekkert, M. P., & Weber, K. M. (2020). A framework for mission-oriented innovation policy: Alternative pathways through the problem–solution space. *Science and Public Policy*, *47*(4), 474-489.

Weiss, L. (2014). *America Inc.?.* Cornell University Press.

Weiss, L., & Thurbon, E. (2021). Developmental state or economic statecraft? Where, why and how the difference matters. *New Political Economy,* 26(3), 472-489.

Wolfe, D. A. (2015). Introduction. In R. Harris *Trade, Industrial Policy and International Competition* (2nd ed.). McGill-Queen's University Press.