The green growth paradigm in the liberal "hidden developmental state"

a longitudinal analysis of industrial policy agendas in the US and Canada

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draft 1.0 — comments welcome

Abstract

This paper conceptualizes green growth as an economic paradigm that overcomes the environment-economy tradeoff by using industrial policy to "make markets" for sustainable goods and services. Leveraging over two decades of federal budget data from Canada and the United States, the empirical section attempts to estimate federal government spending on "green industrial policy" as a share of total spending on industrial policy. Consistent with the literature on "the hidden developmental state" in liberal market economies, industrial policy is found to be a longstanding, albeit highly decentralized, feature of economic governance in both the US and Canada. Although the share of programs dedicated to making markets for sustainable technology has increased over time, cursory case investigation reveals that green growth is undermined by greenwashing (policy drift) and extraneous programs that support non-sustainable industries (policy layering). The findings highlight difficulties of achieving technological transitions in decentralized systems characterized by competitive veto points.

Keywords: comparative policy agendas; green growth; green industrial policy; paradigms; sustainability; technological transitions

JEL classification: L5, O31, O38, Q5

Introduction

It is now widely recognized that the current economic paradigm is unsustainable, even in the short-term (OECD, 2020). Although status quo incrementalism is considered untenable for biophysical reasons, so too is degrowth for political reasons (Altenburg & Rodrik, 2017). From this perspective, notwithstanding skepticism about its technical feasibility, the only viable alternative is a "green growth" paradigm that overcomes the tradeoff between economic growth and environmental sustainability (Hickel & Kallis, 2020; Perez, 2015; Steer, 2018).

While green growth carries over regulatory instruments from the antecedent modernist-incrementalist paradigm, its defining feature is the advent of "green industrial policy" intended to "make markets" for sustainable technology (Allan et al., 2021; Mazzucato & Perez, 2015; Rodrik, 2014). This paper addresses two questions, one theoretical and one empirical. First, what does market-making green industrial policy entail? Second, to what extent is it happening in North America?

The first part of the paper engages with literature on evolutionary economics and comparative political economy to articulate a behavioural theory of techno-economic paradigm change (cf. Freeman & Jahoda, 1978; Helpman, 1998; Iversen & Soskice, 2015; Perez, 2015). The second part leverages over two decades of federal government budget data to estimate the level and trend of green industrial policy as a share of total spending on industrial policy in Canada and the United States. The findings indicate that, although government support for sustainable technologies has increased over time, a non-trivial share of government support continues to be directed toward non-sustainable industries. Case analysis of government programs suggests two explanatory mechanisms. On one hand, the decentralized nature of the "hidden developmental state" in liberal market economies permits the continuation of extraneous programs that belie the logic of the green growth paradigm (Negoita, 2011; O'Riain, 2014). On the other, many government-supported technologies are at best only marginally more sustainable than their conventional substitutes. In other words, green growth is vulnerable to greenwashing (Altenburg & Rodrik, 2017; Gabor, 2022).

The paper concludes with a discussion that reconciles the empirical findings with theory on the comparative political economy of innovation. Contrary to perspectives that draw a correlation between liberal institutions and incidence of radical innovation, it is argued that achieving paradigm change through creative destruction is especially difficult in decentralized systems because incumbent economic interests may exploit competitive veto points to maintain the status quo by counteracting pressure for change (Birchfield & Crepaz, 1998; Ornston & Schulze-Cleven, 2015; cf. Hall & Soskice, 2001). The result is a tendency for change-oriented policies to revert to the status quo ante via "policy layering" and "policy drift" (Streeck & Thelen, 2005). Only by taking political decentralization seriously is it possible to explain the puzzle of why conservative governments in the United Kingdom have been more successful at implementing green industrial policy than

their liberal counterparts in North America (Allan et al., 2021). Whereas centralization facilitates unilateral executive action that imposes costs on policy losers, decentralization necessitates coalition-building that compensates and co-opts opposition by altering opportunity costs of paradigm change (cf. Keller et al., 2022; Trebilcock, 2014). Implications for "just transitions" policies are discussed.

Green growth as a paradigm

A paradigm is a "way of seeing" that affects "ways of doing" on the part of individuals and groups (Kuhn, 1962; Merton, 1949). Paradigms are thus in some sense conceptually prior to interests and preferences in a causal theory of human action (Argyris & Schön, 1978).[1] When paradigms are widely shared, they solve preference aggregation problems by aligning interests, thereby enabling rational social choice (Blyth, 2013; Hall, 1993). When paradigms are not widely shared, they may nevertheless incentivize consistent behaviour if the paradigm is institutionalized as binding rules that reward compliance and punish defection (Ostrom, 2005). Conversely, when paradigms are not widely internalized or adequately institutionalized, social choice will lack coherence (Arrow, 1951; Streeck & Thelen, 2005). In the latter case, public policy may reflect a "paradigm mix" of competing understandings and interests (Daugbjerg et al., 2017).

Green growth constitutes a paradigm to the extent that it embodies an unconventional way of seeing and interacting with the world. Allan, Lewis and Oatley (2021) juxtapose green growth against the antecedent modernist-incrementalist paradigm, the latter of which is said to be constrained by "compromises" germane to an environment-economy tradeoff the former overcomes by making markets for sustainable goods and services. Although the intellectual and analytical foundations of the green growth paradigm were developed by evolutionary economists in the 1970s (Freeman & Jahoda, 1978), Allan, Lewis and Oatley trace the diffusion of the green growth paradigm to green industrial policies enacted by China and South Korea in the 1990s and 2000s, of which the United Nations became a cheerleader.

Market-making is achieved when public policy affects costs in order to incentivize uptake and diffusion of new technologies (Mazzucato & Perez, 2015). As costs decline, tipping points are reached at which new technologies are adopted en masse (Perez, 2015; Rogers, 2003). Tipping points for individual producers and consumers are modeled as a function of the opportunity costs of switching, which are affected by stranded investments in conventional assets, risk tolerance, error (e.g., sunk cost fallacy) and market

[1] From its genesis, theory on paradigms rejected linear behavioural models in favour of iterative and recursive ones that anticipated later developments in cognitive and social psychology (e.g., satisficing, cognitive dissonance avoidance, in-group identification and primacy effects). Consequently, although paradigms are conceptually prior to preferences, the inverse is also true; the causal arrow points both ways. Although interesting, the distinction is unimportant for our purposes in this paper.

projections (i.e., expectations regarding mutual adjustment on the part of other producers and consumers in the economy) (Scharpf, 1997; Williamson, 1985). Tipping points for the economy as a whole are modeled as a function of social returns to technological diffusion, which are typically conceived as either increasing or diminishing over time (Arthur, 1994). However, returns to diffusion can also be negative, as seen in Figure 1.

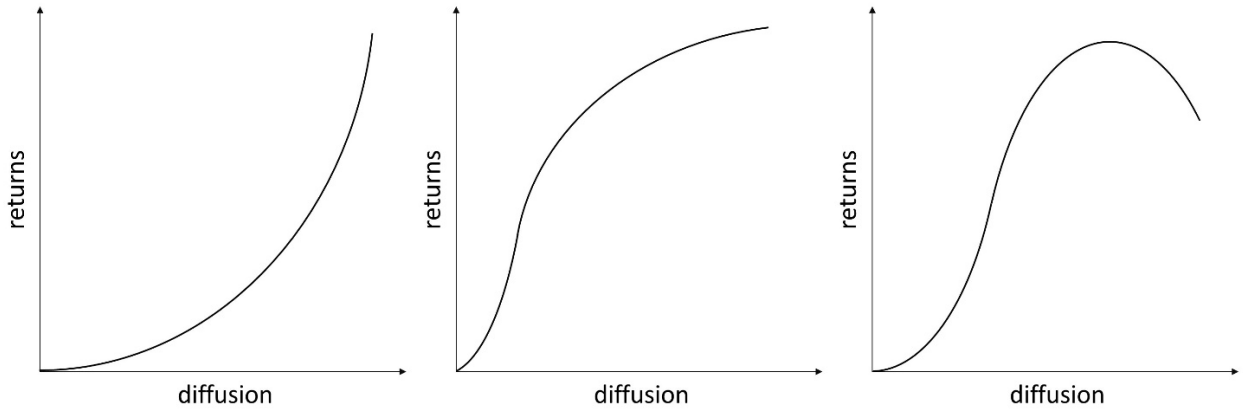

Figure 1: Increasing, diminishing and negative social returns to technological diffusion

If a technology exhibits increasing returns to diffusion, as shown in the left panel of Figure 1, markets will typically develop more or less spontaneously, making any conventional substitutes obsolete in the process (Freeman & Soete, 1997). Behaviourally, incentive to adopt the technology marginally increases with each adoption until the technology has fully diffused throughout the economy (Rogers, 2003). For example, digital information and communication technologies (ICT) exhibit increasing returns to diffusion thanks to steep reductions in factor costs (e.g., silicon), diverse and widespread application, and significant network effects (Kaplinsky, 2021: 133). If a technology instead exhibits diminishing returns to diffusion, as shown in the middle panel in Figure 1, benefits of switching marginally decrease with each adoption, resulting in an economy that exhibits a mix of imperfect substitutes. For example, hydroelectric power runs into diminishing returns as the best dam sites are used up, necessitating a mix of energy sources (Arthur, 1994: 2). Finally, if a technology produces negative externalities, like carbon emissions, there is an inflection point at which marginal social returns become negative, as shown in the right panel of Figure 1.

Historically, techno-economic paradigm change was driven by increasing private returns to diffusion, whereby the role for the public sector was limited to fostering initial conditions for innovation (Arrow, 1962; Helpman, 1998; Nelson, 1959). As such, creative destruction was an unintentional consequence of the market. Green growth is different in that motivation for adopting sustainable technologies is primarily social and intentionally substitutive; the incentive is to avoid negative externalities beyond the inflection point on

the curve in the right panel of Figure 1. Consequently, unlike techno-economic paradigm change driven by increasing returns, green growth cannot be accomplished by relying solely on market forces due to collective action problems (Ostrom, 2005). Rather, green growth requires government action in the form of regulations, green subsidies and public goods that make markets for sustainable goods and services while destroying markets for unsustainable ones (Mazzucato & Perez, 2015). In other words, green growth requires government-induced creative destruction (Aghion et al., 2019).

Of course, policies that promote creative destruction are vulnerable to political resistance by economic incumbents (Frieden & Silve, 2021; Mokyr, 1994). Whether and how incumbent interests resist technological transitions is almost certainly affected by political institutions that distribute veto power, yet two opposite theories dominate the literature on the institutional determinants of innovation. According to one perspective, political economies characterized by a dearth of veto players are more likely to undergo transformative policy change because executives are relatively unconstrained in the policymaking process (Hall & Soskice, 2001; Tsebelis, 2002). Another school of thought, meanwhile, posits that political economies characterized by many veto players are more likely to foster deliberation, cooperation and collective action necessary for transformative change (Birchfield & Crepaz, 1998; Ornston & Schulze-Cleven, 2015).

While each of the aforementioned theories is plausible, both treat policy preferences as exogenous; neither specifies a behavioural theory of political incentives. Here again two competing views can be found in the literature. One perspective is consistent with the premise that few veto players translates to greater propensity for policy change. It posits that "winner take all" plurality-based electoral institutions incentivize policymakers to cater to preferences of client groups, resulting in episodic swings in policy direction that coincide with political turnover (Atkinson & Coleman, 1989; Hacker & Pierson, 2010; Lijphart, 2012). Another perspective, predicated on the median voter theorem, predicts the opposite: political incentives to cater to the preferences the median voter curb the extent of policy change in plurality-based electoral systems (Cox, 1990).

Thankfully, the literature on political agenda-setting has gone some distance toward reconciling the perspectives summarized above (Jahn, 2016). While empirical research has found greater incidence of policy change in political systems with fewer veto players, it has also been recognized that veto points come in several varieties (Jones et al., 2009). The latter finding is consistent with scholarship that distinguishes between cooperative and competitive veto points in the policy process (Birchfield & Crepaz, 1998). From this perspective, coalition governments found in proportional representation systems represent cooperative veto points because policy actors therein are required to negotiate regardless of divergent policy preferences. By contrast, single party governments found in plurality-based electoral systems, along with federalism and bicameralism, constitute competitive veto points, which can be lobbied by constituents

dissatisfied by policy enacted at a different level of government —a tactic known as "venue change" (Baumgartner & Jones, 2002).

Figure 2 arrays advanced industrialized countries on two institutional dimensions pertinent to the discussion above: executive power sharing and federalism. Countries in the bottom right are characterized by cooperative veto points. Countries in the top left quadrant are characterized by competitive veto points. These data lend initial support to the argument that competitive veto points correspond with poorer performance on green growth indicators.

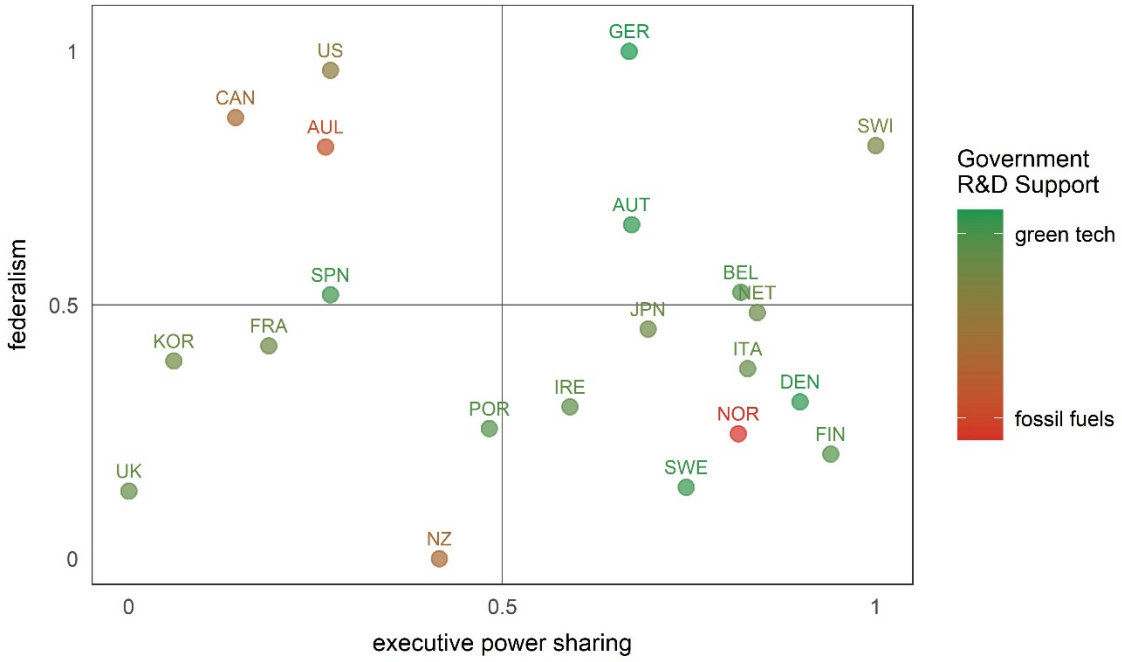

Figure 2: Institutional dimensions of cooperative and competitive veto points

Source: axis values based on Lijphart (2012); Government R&D Support based on OECD Green Growth Indicators: Economic Opportunities and Policy Responses (average values since 1990). AUL = Australia; AUT = Austria; BEL = Belgium; CAN = Canada; DEN = Denmark; FIN = Finland; FRA = France; GER = Germany; IRE = Ireland; ITA = Italy; JPN = Japan; KOR = Korea; NET = Netherlands; NOR = Norway; NZ = New Zealand; POR = Portugal; SPN = Spain; SWE = Sweden; SWI = Switzerland; UK = United Kingdom; US = United States. Click to explore interactive features.

A tentative explanation for the data observed in Figure 2 is that competitive veto points permit "policy layering" whereby different policies cater to different constituencies who adhere to different paradigms. As a result, state objectives are obscured as public policy reflects multiple paradigms (Kay, 2007). Centripetal electoral incentives may also beget "policy drift" whereby the state relaxes environmental stringency to appease polluting constituencies (Shepsle, 1992). The next section attempts to unpack the causal mechanisms at play by investigating the data at the level of industrial policy in the US and Canada.

Green industrial policy in the US and Canada

Before delving into the extent to which governments in Canada and the US engage in green industrial policy, it is necessary to establish to what extent they undertake industrial policy of any sort. Although contention surrounds whether industrial policy is something governments do in liberal market economies, empirical research has found plenty of examples of industrial targeting on the part of the state (Atkinson & Coleman, 1989; Howse & Chandler, 1997; Negoita, 2011; O'Riain, 2014). According to Block (2008), confusion about the existence of industrial policy in the US stems from the fact that industrial policy is "hidden" beneath layers of decentralization and otherwise rendered invisible by myth-making rhetoric about the virtues of free markets. In reality, industrial policy in liberal market economies is primarily carried out via subsidization of private and third sector actors organized into a "developmental network state" (Keller et al., 2022).

Decentralization makes industrial policy in liberal market economies difficult to measure. Quantifying green industrial policy is even more challenging. To our knowledge, neither have been adequately measured to date. For example, OECD green growth indicators presented in Figure 2 are derived from bureaucratic surveys and are thus not directly comparable across geography or time. Policy counts from the New Climate Institute conveyed in Figure 3 below also fall short, as policies coded "economic development" are non-exhaustive.

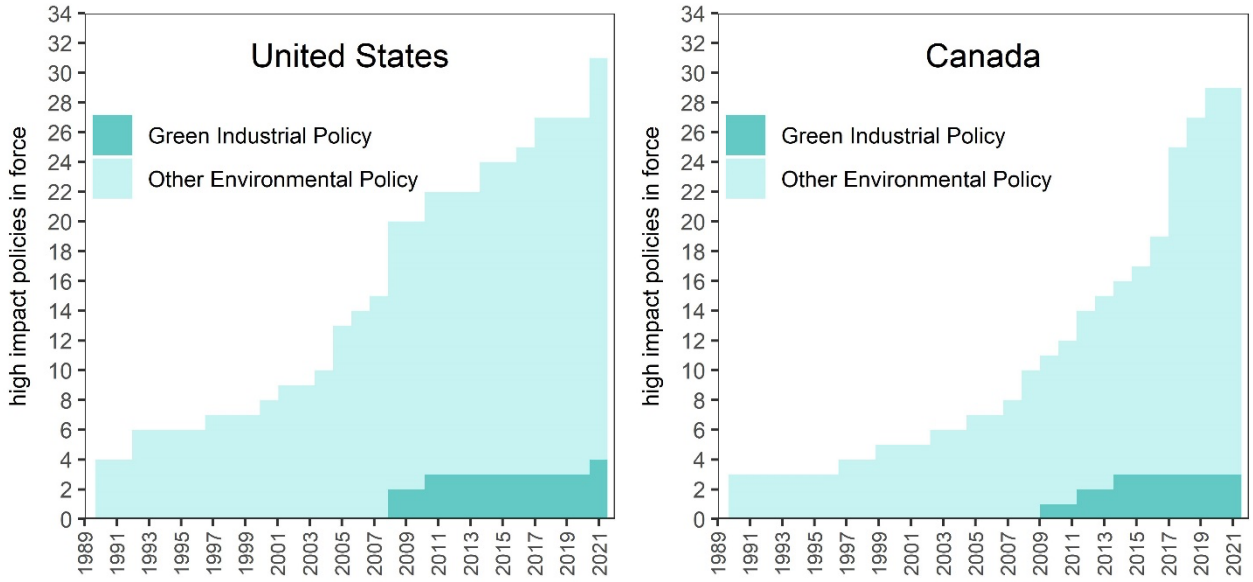

Figure 3: Environmental policies in force since 1989, Climate Policy Database

Source: New Climate Institute Climate Policy Database. Green industrial policy = observations coded "economic development": Saving Energy in Data Centers (US 2008); Builders Challenge (US 2008); Sustainable Communities Regional Planning Grant Program (US 2011); Infrastructure Investment and Jobs Act (US 2021); Investments in Forest Industry Transformation (Canada 2010); Forest Innovation Program (Canada 2012); New Building Fund (Canada 2014).

Incompleteness notwithstanding, indicators for green industrial policy presented in Figure 3 are consistent with the premise that the arrival of green industrial policy coincided with economic stimulus in response to the Great Recession of 2007–2008 (Perez, 2015). Another problem with count data is that they do not capture level of public commitment to green industrial policy. For that, we need to look deeper into the source data, namely regulations, budget estimates and public accounts. Given the difficulties involved with processing regulatory data, government regulations are excluded from consideration in the following analysis, which focuses instead on program spending and monetary transfers. Limitations of the data are taken up in the discussion section.

There are several features that distinguish industrial policy in the United States from industrial policy in Canada and vice versa. Foremost among them is the role of military procurement, which has fostered a massive industry in the United States (Weiss, 2014). Figure 4 conveys the remarkable extent to which military procurement dominates industrial policy in the US. Evidently, US federal spending has followed a consistent countercyclical trend over time, peaking near $300 billion per year during recessions.

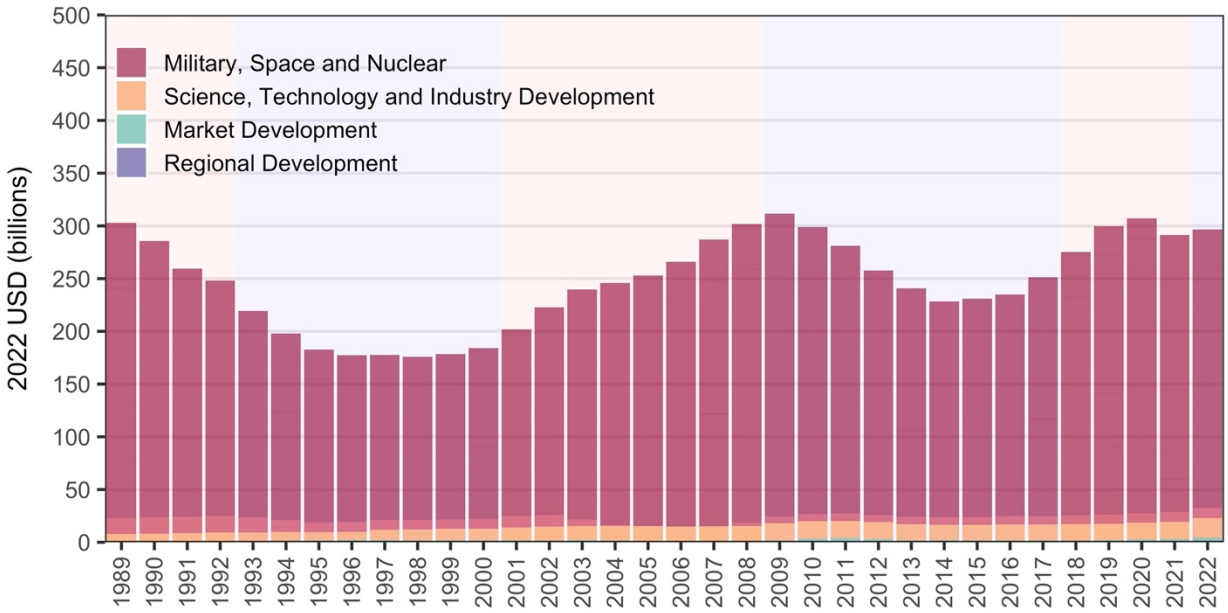

Figure 4: US federal industrial policy program expenditure, 1989–2022

Source: US Office of Management and Budget. Red background = Republican administration; blue background = Democratic administration. Click to explore interactive features.

However, as shown in Figure 5, a closer look at non-military expenditure reveals that US federal spending on industrial policy has increased rather significantly over time. Notably, the US Department of Energy and National Science Foundation (NSF) overshadow the Department of Commerce. Major programs include Department of Energy Advanced Research Projects, National Science Foundation Innovation

Partnerships, and the Department of Commerce Creating Helpful Incentives to Produce Semiconductors (CHIPS) loan program.

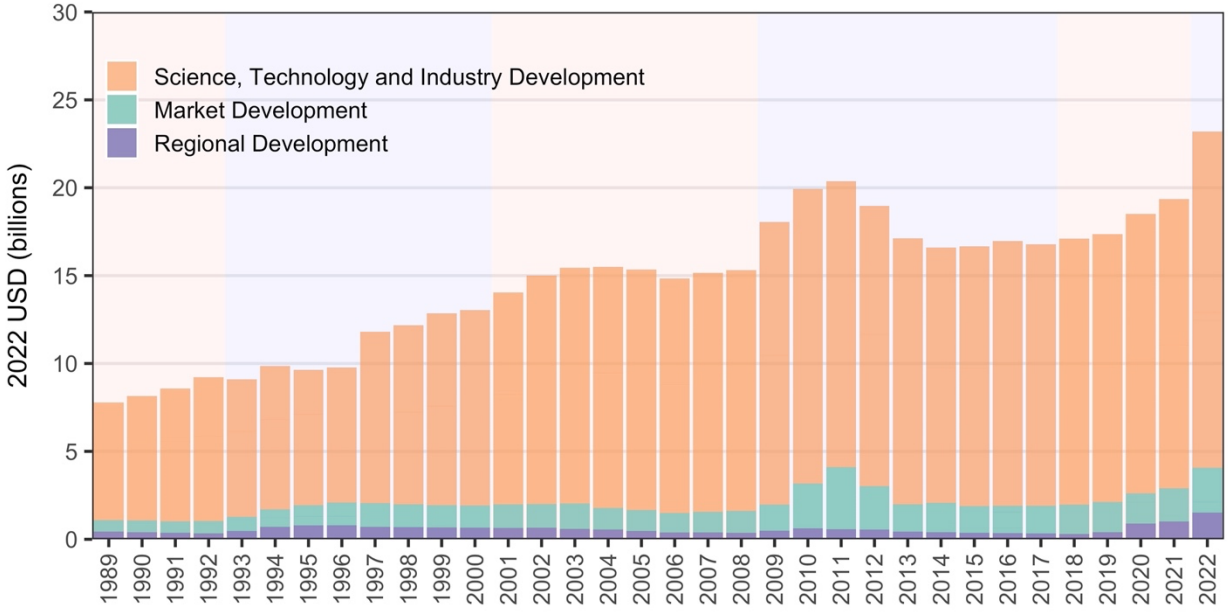

Figure 5: US federal industrial policy expenditure on civilian programs, 1989–2022

Source: US Office of Management and Budget. Click to explore interactive features. Red background = Republican administration; blue background = Democratic administration. Click to explore interactive features.

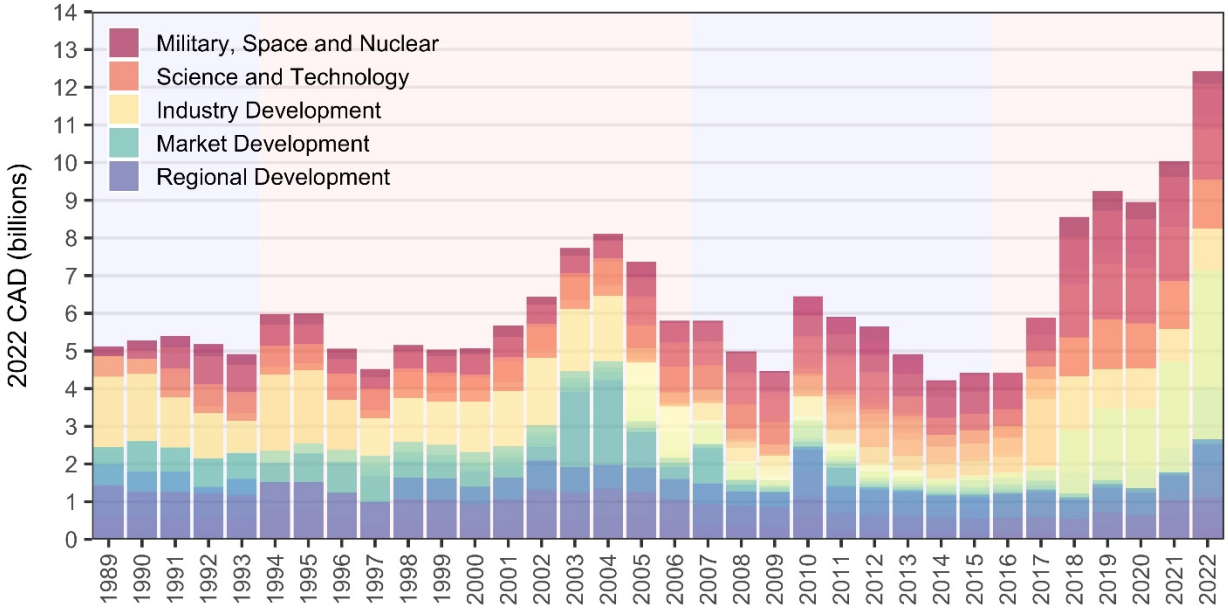

Figure 6: Canadian federal industrial policy program expenditure, 1989–2022

Source: based on Canadian Federal Budget Estimates. Click to explore interactive features. Red background = Liberal administration; blue background = Conservative administration. Click to explore interactive features.

As shown in Figure 6, Canadian industrial policy expenditure is not dominated by military procurement like it is in the United States. Rather, industrial policy spending is mainly the purview of the Ministry of Innovation, Science and Economic Development (ISED) (formerly the Department of Industry), the National Research Council (NRC), and regional federal development agencies. Major programs include ISED's Net Zero Accelerator, Superclusters Initiative and contributions to Sustainable Technologies Canada (a non-profit), as well as NRC's Industrial Research Assistance Program (IRAP).

Although data for the US and Canada are not directly comparable due to different currencies and Canada's drastically smaller size, an approximate comparison can be made by dividing US values by ten.[2] In both countries, federal industrial policy has been longstanding, decentralized, and countercyclical. With our sample total industrial policy spending on hand, we may inquire further as to the share of green industrial policy. As mentioned previously, green industrial policy is difficult to measure and aggregate. One option, however crude, relies on term searches to differentiate green industrial policy from other priorities.

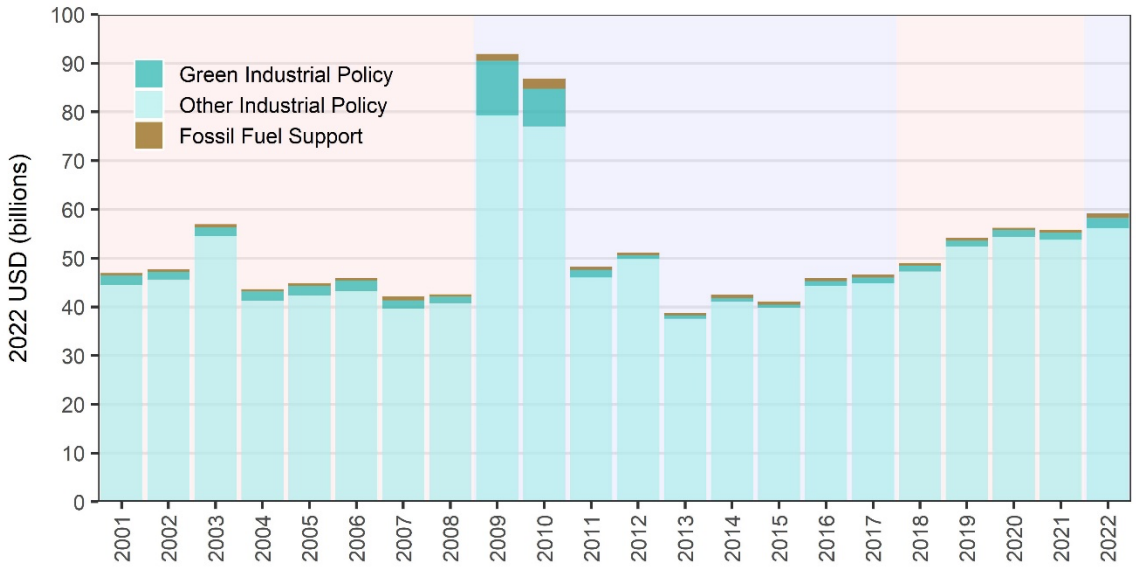

Figure 7: US federal transfer payments by type of industrial policy 2001–22

Source: USAspending.gov. Green industrial policy = programs or recipients featuring variations of the following terms: environment, sustainable, green, renewable, climate change, eco, ethanol, emissions, clean. Fossil fuel support = programs or recipients featuring variations of the following terms: petroleum, oil, gas, coal. Red background = Republican administration; blue background = Democratic administration. Click to explore interactive features.

[2] The GDP of the United States is approximately ten to twelve times that of Canada's over the 1989-2022 period, which varies with the strength of the US dollar relative to Canada's.

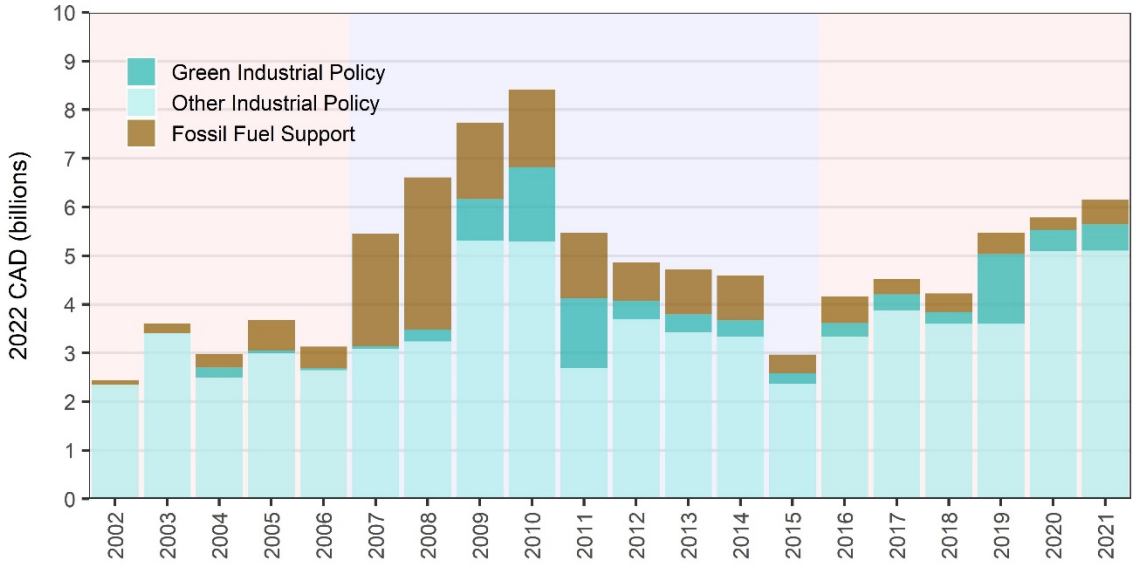

Figure 8: Canadian federal transfer payments by type of industrial policy 2002–21

Source: based on Canadian Federal Public Accounts. Green industrial policy = programs or recipients featuring variations of the following terms: environment, sustainable, green, renewable, climate change, eco, ethanol, emissions, clean. Fossil fuel support = programs or recipients featuring variations of the following terms: petroleum, oil, gas, coal. Red background = Liberal administration; blue background = Conservative administration. Click to explore interactive features.

Figures 7 and 8 are generated from federal transfer data, whereby transfers are coded as "green industrial policy" if program names or recipient names feature terms associated with sustainability. Likewise for "fossil fuel support" (see coding details in the figure footers). According to this scheme, the vast majority of industrial policy transfers fall in the "other industrial policy" category. Regarding green industrial policy, major spending began in the context of the Great Recession (i.e., 2008–2011). This observation is consistent with both the green growth literature and the pattern observed in Figure 3 based on New Climate Institute policy counts (cf. Perez, 2015). However, contrary to the image gleaned from Figure 3, green industrial policy comprises a greater share of post-recession spending in Canada than it does in the United States according to Figures 7 and 8. Regarding federal government support for fossil fuel industries, the Canadian federal government appears to be much more active than its American counterpart due to a statutory obligation to reimburse the province of Newfoundland for royalties collected on offshore oil. With these payments omitted, the share of fossil fuel support is similar to that in the United States.

Regarding limitations of the coding scheme used to produce Figures 7 and 8, on one hand, green industrial policy estimates are arguably too conservative because they do not capture programs and recipients without the key words in their names. On the other hand, the same measures are arguably too liberal because they equate sustainability with titles. For instance, $700 million in Canadian federal transfers in support of Algoma Steel's clean steel initiative are not counted as green industrial policy in Figure 8. While

proponents of clean steel would argue these transfers should be counted, those skeptical of clean steel's credentials as a sustainable technology would argue these transfers should not be counted as green industrial policy. Further analysis at the case level is therefore required to assess whether policies are truly sustainable.

Looking at the substance of green stimulus in response to the last two recessions, federal governments in both the US and Canada made significant investments in construction retrofitting, green energy and capital upgrades to make traditional sectors more sustainable (e.g., forestry, pulp and paper, ethanol fuel, automobiles). In the US, the 2008 recession prompted the creation of the Advanced Research Projects Agency for Energy (ARPA–E) modeled after the historic Defense Advanced Research Projects Agency (DARPA), which is credited for major technological breakthroughs of the twentieth century (foremostly the internet). Likewise, the 2020 recession prompted plans for the creation of ARPA–C dedicated to technologies to combat climate change. Although the Canadian federal government was slower to create a dedicated innovation agency, the 2020 recession prompted the creation of the Canada Innovation Corporation modeled after the ARPA alphabet agencies in the US. The Canada Innovation Corporation is intended to complement ISED's Net Zero Accelerator and Clean Growth Hub, the latter of which consists of seventeen federal departments and agencies.

In terms of continued support for fossil fuel industries, federal governments in both the US and Canada have invested rather heavily in liquified natural gas and carbon capture as a means of "greening" fossil fuel industries in lieu of winding them down. The Government of Canada also purchased the controversial Trans Mountain Pipeline from Kinder Morgan 2018 and began expanding the project in 2019. Support for pipelines, along with over $9 million in federal transfers to the Suncor Energy Oil Sands Limited Partnership, is a prime example of government tendencies to layer policies, even when their objectives appear to work at cross-purposes (cf. Streeck & Thelen, 2005). .

Assistance to fossil fuel and other conventional industries (e.g., steel, forestry, agriculture) is made possible by sector-specific strategies that characterize a decentralized approach to industrial policy. Accordingly, federal departments in both countries have implemented critical mineral strategies, clean steel initiatives, and biofuel directives under the banner of green growth, all of which have drawn ire from environmental groups for alleged greenwashing. Notably, although the Government of Canada announced its withdrawal of support for fossil fuel projects, those involving Indigenous participation or service to remote communities continue to qualify for federal subsidies. Similarly, notwithstanding criticism from experts and environmental groups for their negative environmental impacts, both countries continue to support biofuels made from food crops (although not to the extent lobbyists would like). Prior research has attributed differences in government support for biofuels in the US and European Union to institutions that promote policy drift (i.e., competitive veto points) (Skogstad & Wilder, 2019).

Discussion

The data examined in the previous section are limited in several regards. In particular, tax incentives and regulations are not captured by budget data, yet loom large in green industrial policy and sustainable transitions. The findings are therefore far from definitive.

Tentatively, the data support the hypothesized correspondence between competitive veto points and incidence of policy layering and policy drift. These mechanisms permit the continuation of the status quo and thus undermine the institutionalization of a transformative green-growth paradigm in Canada and the United States. Such findings challenge conventional wisdom that liberal market economies have an institutional comparative advantage when it comes to radical innovation (cf. Hall & Soskice, 2001). By taking decentralization seriously, it is however possible to explain why competitive veto points negate collective action necessary for paradigm change (cf. Ornston & Schulze-Cleven, 2015). As per the concept of "venue change" from the agenda setting literature, incumbent economic interests may appeal to the political opposition or an alternative level of government to maintain the policy status quo, rather than bear costs of adjustment (Baumgartner & Jones, 2002). Aware of this this, politicians have incentive to relax the stringency of environmental policies. Decentralization yields tendencies toward policy layering, while plurality-based electoral systems yield tendencies toward policy drift (Cox, 1990; Shepsle, 1992; Streeck & Thelen, 2005). Both phenomena undermine paradigm change in liberal market economies.

The theory sketched above partly explains differential performance on green growth indicators across countries observed in Figure 2. From the perspective of the theory, cooperative veto points that facilitate collective action, compensation and adjustment explain the cluster of green-growth oriented countries in the lower right quadrant of Figure 2, while competitive veto points explain the cluster of poorly-performing countries in the upper left quadrant. But what explains the comparatively high values on green growth indicators in the United Kingdom in the lower left quadrant of Figure 2? Here, the conventional theory that links dearth of veto players to swift executive action may apply (cf. Tsebelis, 2002).

Empirically, the green transition in the UK featured both compensation and the imposition of transition costs by strong, single-party executives. On one hand, the Thatcher Conservative government unilaterally shut down the domestic coal industry, thereby imposing significant transition costs on industrial interests and workers (Glyn & Machin, 1997). On the other hand, Conservative and Labour governments in the UK both provided compensation, however inadequate, in the form of transition assistance (Henderson & Shutt, 2004). More recently, Conservative governments in the UK pursued a centralized industrial policy administered by a super-ministry —the Department of Business, Energy and Industrial Strategy— which has also arguably contributed to a more

focused "just transitions" policy in that country compared to other liberal market economies (Allan et al., 2021; United Kingdom, 2021).

The UK case illustrates two routes to green growth, both of which use public policy to alter the opportunity costs of economic incumbents. One route entails binding executive action that imposes transition costs on economic incumbents. The other route involves compensation for transition costs. Fully implementing a green growth paradigm in decentralized systems like Canada and the US will likely require compensation to incumbent interests in traditional sectors of the economy. This is the intention of current "just transitions policies" (recently rebranded "sustainable jobs policies" in Canada), although it remains to be seen how effective they will be at swaying the interests of economic incumbents in favour of green growth. According to the theory presented in this paper, compensation must match opportunity costs of the status quo, which can be very high, especially during economic booms. Moreover, it is likely that competitive veto points raise the amount of required compensation, but this is a question best left for further research.

Conclusion

The green growth paradigm differs fundamentally from previous episodes of techno-economic paradigm change. Rather than being characterized by increasing private returns to technological diffusion, the impetus for green growth stems from a desire to mitigate negative environmental externalities. Transitioning to a green growth paradigm is a large-scale public goods and common pool resource problem that requires collective state action to make markets for sustainable goods and services (Mazzucato & Perez, 2015; Ostrom, 2005). Green industrial policy is thus a necessary component of sustainable transitions in market economies (Altenburg & Rodrik, 2017)

A longitudinal comparison of industrial policy agendas in Canada and the United States found that green industrial policy has increased over time in both countries, but not steadily or unequivocally. Rather, reversion to the status quo ante via "policy layering" and "policy drift" is evident in the data (cf. Streeck & Thelen, 2005). Cursory case analysis linked these phenomena to competitive veto points and centripetal electoral incentives (cf. Birchfield & Crepaz, 1998; Cox, 1990). The findings support the argument that green industrial policy thrives during economic downturns because that is when opportunity costs of economic incumbents are most favourable to change (Perez, 2015). By contrast, opportunity costs of technological transitions rise during economic booms, which incentivizes incumbent economic interests to avoid transition costs by lobbying dispersed veto players in decentralized systems (Baumgartner & Jones, 2002). Consequently, Canada and the US score more poorly on green growth indicators than other countries.

Notably, our findings are unexpected by theories that predict radical innovation to predominate in liberal market economies (cf. Hall & Soskice, 2001). However, by taking

decentralization seriously, it is possible to explain why Canada, the US and Australia perform more poorly than other liberal market economies on green growth indicators. Competitive veto points beget venue change, policy layering and policy drift, which ultimately leads to a paradigm mix in the US and Canada. By contrast, high performers on green growth exhibit one of two countervailing tendencies: compensation or binding executive action.

Compensation required to effect paradigm change is likely to be higher in systems with many competitive veto points for two reasons. One is that a larger market for political representation may bid up the opportunity costs of economic incumbents by increasing their bargaining leverage. Another is that risk associated with lack of credible commitment in winner-take-all systems increases switching costs. Indeed, incoming governments in liberal market economies have decimated green energy industries by repealing feed-in-tariff policies previously implemented by governments controlled by their political opponents. These musings have important implications for "just transitions" policies, and should investigated in future research.

Another area for further research lies on the data side. Given the crudeness of the analysis herein, there is a real need to thoroughly code green growth policies, including regulations and tax incentives, for use in quantitative comparative analysis. So doing would improve existing climate policy databases and move forward research on comparative policy agendas. Major questions remain about the characteristics of environmental conditions attached to government transfer payments, including their stringency and enforcement.

Aghion, P., Hepburn, C., Teytelboym, A., & Zenghelis, D. (2019). Path dependence, innovation and the economics of climate change. In R. Fouquet (Ed.), *Handbook on green growth* (pp. 67–83). Edward Elgar.

Allan, B., Lewis, J. I., & Oatley, T. (2021). Green industrial policy and the global transformation of climate politics. *Global Environmental Politics*, *21*(4), 1–19.

Altenburg, T., & Rodrik, D. (2017). Green industrial policy: Accelerating structural change towards wealthy green economies. In T. Altenburg (Ed.), *Green industrial policy: Concept, policies, country experiences*. (pp. 2–20). United Nations.

Argyris, C., & Schön, D. (1978). *Organizational learning*. Addison-Wesley.

Arrow, K. J. (1951). *Social choice and individual values*. Wiley.

Arrow, K. J. (1962). Economic welfare and the allocation of resources for invention. In R. Nelson (Ed.), *The rate and direction of inventive activity: Economic and social factors* (pp. 609–626). Princeton University Press.

Arthur, W. B. (1994). *Increasing returns and path dependence in the economy*. University of Michigan Press.

Atkinson, M., & Coleman, W. (1989). Strong states and weak states: Sectoral policy networks in advanced capitalist economies. *British Journal of Political Science*, *19*(01), 47–67.

Baumgartner, F. R., & Jones, B. D. (Eds.). (2002). *Policy dynamics*. University of Chicago Press.

Birchfield, V., & Crepaz, M. M. L. (1998). The impact of constitutional structures and collective and competitive veto points on income inequality in industrialized democracies. *European Journal of Political Research*, *34*(2), 175–200.

Block, F. (2008). Swimming against the current: The rise of a hidden developmental state in the United States. *Politics & Society*, *36*(2), 169–206.

Blyth, M. (2013). Paradigms and paradox: The politics of economic ideas in two moments of crisis. *Governance*, *26*(2), 197–215.

Cox, G. W. (1990). Centripetal and centrifugal incentives in electoral systems. *American Journal of Political Science*, *34*(4), 903–935.

Daugbjerg, C., Farsund, A. A., & Langhelle, O. (2017). The resilience of paradigm mixes: Food security in a post-exceptionalist trade regime. *Journal of European Public Policy*, *24*(11), 1698–1715.

Freeman, C., & Jahoda, M. (1978). *World futures: The great debate*. M. Robertson.

Freeman, C., & Soete, L. (1997). *The economics of industrial innovation* (3rd ed.). Routledge.

Frieden, J., & Silve, A. (2021). *The Political Reception of Innovations* (SSRN Scholarly Paper ID 3848203). Social Science Research Network.

Gabor, D. (2022). Green central banking. In Heinrich Böll Foundation, (Ed.), *Making the great turnaround work: Economic policy for a green and just transition* (pp. 39–45). Heinrich Böll Foundation.

Glyn, A., & Machin, S. (1997). Colliery closures and the decline of the UK coal industry. *British Journal of Industrial Relations*, *35*(2), 197–214.

Hacker, J. S., & Pierson, P. (2010). Winner-take-all politics: Public policy, political organization, and the precipitous rise of top incomes in the United States. *Politics & Society*, *38*(2), 152–204.

Hall, P. (1993). Policy paradigms, social learning, and the state: The case of economic policymaking in Britain. *Comparative Politics*, *25*(3), 275–296.

Hall, P. A., & Soskice, D. W. (Eds.). (2001). *Varieties of capitalism: The institutional foundations of comparative advantage*. Oxford University Press.

Helpman, E. (Ed.). (1998). *General purpose technologies and economic growth*. MIT Press.

Henderson, R., & Shutt, J. (2004). Responding to a coalfield closure: Old issues for a new regional development agency? *Local Economy*, *19*(1), 25–37.

Hickel, J., & Kallis, G. (2020). Is green growth possible? *New Political Economy*, *25*(4), 469–486.

Howse, R., & Chandler, M. (1997). Industrial policy in Canada and the United States. In K. Banting, G. Hoberg, & R. Simeon (Eds.), *Degrees of freedom: Canada and the United States in a Changing World* (pp. 231–266). McGill-Queen's University Press.

Iversen, T., & Soskice, D. (2015). Democratic limits to redistribution: Inclusionary versus exclusionary coalitions in the knowledge economy. *World Politics*, *67*(2), 185–225.

Jahn, D. (2016). *The politics of environmental performance: Institutions and preferences in industrialized democracies*. Cambridge University Press.

Jones, B. D., Baumgartner, F. R., Breunig, C., Wlezien, C., Soroka, S., Foucault, M., François, A., Green-Pedersen, C., Koski, C., John, P., Mortensen, P. B., Varone, F., & Walgrave, S. (2009). A general empirical law of public budgets: A comparative analysis. *American Journal of Political Science*, *53*(4), 855–873. x

Kaplinsky, R. (2021). *Sustainable futures: An agenda for action*. Polity.

Kay, A. (2007). Tense layering and synthetic policy paradigms: The politics of health insurance in Australia. *Australian Journal of Political Science*, *42*(4), 579–591.

Keller, M. R., Block, F., & Negoita, M. (2022). What makes a developmental network state durable? *Sociology Compass*, *16*(1), n/a.

Kuhn, T. (1962). *The structure of scientific revolutions*. University of Chicago Press.

Lijphart, Arend. (2012). *Patterns of democracy: Government forms and performance in thirty-six countries*. Yale University Press.

Mazzucato, M., & Perez, C. (2015). Innovation as growth policy: The challenge for Europe. In J. Fagerberg, S. Laestadius, & B. Martin (Eds.), *The Triple Challenge for Europe* (pp. 229–264). Oxford University Press.

Merton, R. K. (1949). *Social theory and social structure*. Free Press.

Mokyr, J. (1994). Cardwell's Law and the political economy of technological progress. *Research Policy*, *23*(5), 561–574.

Negoita, M. (2011). To hide or not to hide? The Advanced Technology Program and the future of U.S. civilian technology policy. In F. L. Block & M. R. Keller (Eds.), *State of innovation: The U.S. government's role in technology development* (pp. 77–95). Paradigm.

Nelson, R. R. (1959). The simple economics of basic scientific research. *Journal of Political Economy*, *67*(3), 297–306..

OECD. (2020). *Beyond growth: Towards a new economic approach*. OECD Publishing.

O'Riain, S. (2014). *The rise and fall of Ireland's Celtic tiger: Liberalism, boom and bust*. University Press.

Ornston, D., & Schulze-Cleven, T. (2015). Conceptualizing cooperation: Coordination and concertation as two logics of collective action. *Comparative Political Studies*, *48*(5), 555–585.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.

Perez, C. (2015). Capitalism, technology and a green global golden age: The role of history in helping to shape the future. *The Political Quarterly*, *86*, 191–217.
Rodrik, D. (2014). Green industrial policy. *Oxford Review of Economic Policy*, *30*(3), 469–491.
Rogers, E. M. (2003). *Diffusion of innovations* (http://go.utlib.ca/cat/5079760). Free Press.
Scharpf, F. (1997). *Games real actors play: Actor-centered institutionalism in policy research*. Westview Press.
Shepsle, K. A. (1992). Bureaucratic drift, coalitional drift, and time consistency: A comment on Macey. *Journal of Law, Economics, & Organization*, *8*(1), 111–118.
Skogstad, G., & Wilder, M. (2019). Strangers at the gate: The role of multidimensional ideas, policy anomalies and institutional gatekeepers in biofuel policy developments in the USA and European Union. *Policy Sciences*, *52*(3), 343–366.
Steer, A. (2018, April 18). Green growth for the commonwealth: Ready for phase three. *World Resources Institute Insights*.
Streeck, W., & Thelen, K. (2005). Introduction: Institutional change in advanced political economies. In *Beyond continuity: Institutional change in advanced political economies* (pp. 1–39). Oxford University Press.
Trebilcock, M. J. (2014). *Dealing with losers: The political economy of policy transitions*. Oxford University Press.
Tsebelis, George. (2002). *Veto players: How political institutions work*. Princeton University Press.
United Kingdom. (2021). *Aligning UK international support for the clean energy transition*. Her Magesty's Stationary Office.
Weiss, Linda. (2014). *America inc? Innovation and enterprise in the national security state*. Cornell University Press.
Williamson, O. E. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. Free Press.