Institutions, Climate Change, and the Foundations of Long-Term Policymaking*

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Abstract: Many policy problems require taking costly action today for future benefits. Examining the case of climate change, this paper examines how two institutions – electoral rules and interest group intermediation – structure the distributional politics of climate change, and as a result drive variation in climate "policy investments" across the high-income democracies. Proportional electoral rules increase electoral safety, allowing politicians to impose short-term costs on voters. Concertation between industry and the state enables governments to compensate losers, defusing organized opposition to policy change. Moreover, the joint presence of both institutions generates complementarities that reinforce their independent effects, pushing countries onto different climate politics trajectories. Newly available data on climate policy stringency provides empirical support for the arguments. Countries with PR and interest group concertation have the highest levels of policy stringency and distribute higher costs toward consumers. The analysis points to causal mechanisms that should structure policy responses to a more general set of long-term challenges.

Keywords: Climate change, long-term policy, institutions, comparative political economy

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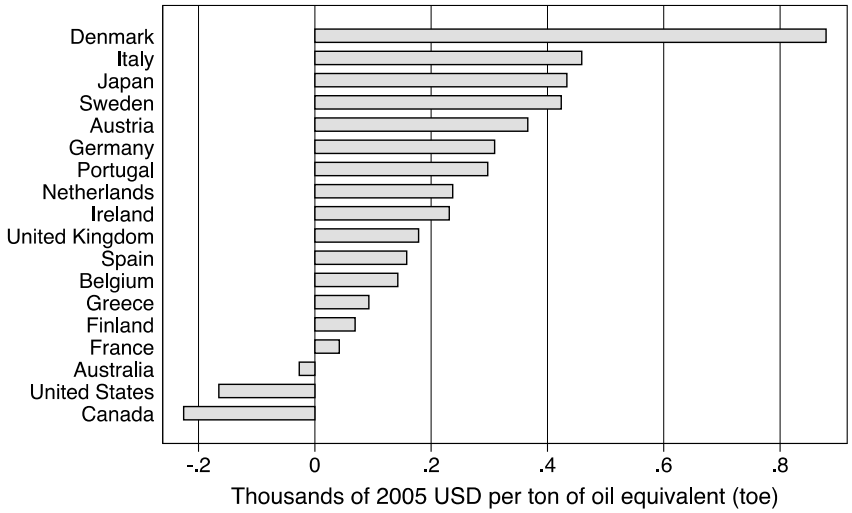
1. Introduction

Long-term policy challenges – pensions, education and skills, biodiversity loss, infrastructure, and economic competitiveness – are everywhere. To address them, politicians are often tasked with imposing costs today on their constituents for benefits that arrive in the future. Climate change is one of the most consequential long-term policy problems. An effective political response poses formidable challenges. In addition to imposing costs, elected officials need to adopt policies that radically transform economic production and consumption, keep measures in place for very long periods of time, and engage in global collective action; and do all of this under conditions of uncertainty (e.g., Hovi, Sprinz, and Underdal 2009; Keohane and Victor 2011; Levin et al. 2012).

One pessimistic conclusion is that we should observe little policy action on climate change, since strictly self-interested countries will have little incentive to reduce emissions (Bernauer, 2013). Yet observing countries' actual policy efforts presents a more complicated story. Governments around the world have adopted 1,800 climate laws and counting (Eskander & Fankhauser, 2020). Across the high-income democracies in particular, we see wide variation in politicians' climate policy efforts (see Figure 1). Government action substantially increases the price of fossil fuels in Denmark and Italy, while policy in Canada and the US subsidizes these energy sources.

This variation is especially puzzling considering that the problem of climate change arrived to all countries as a common shock. In 1992, the affluent democracies signed up to identical emissions reduction goals under the United Framework Convention on Climate Change (UNFCCC). Since then, international negotiations have exerted a common pressure on all of them to act. Indeed, from this common starting point, high-income democracies have diverged along very different policy trajectories. What explains this variation? Why do some countries lead on addressing climate change while others lag?

Figure 1. Climate change policy stringency across high-income democracies



Notes: Measure of the average, economywide climate policy stringency weighted by sector output between 1995 and 2009 from Althammer and Hille (2016). It captures the extent to which government policy increases or decreases carbon-based energy costs relative to an undistorted market price. See Section 4.1 for further details.

While a long tradition in comparative politics focuses on the environment (Duit, 2014; Fiorino, 2011; Jänicke & Jörgens, 1998; Lundqvist, 1980; Schreurs, 2003; Scruggs, 2003; Vogel, 1986; Ward & Cao, 2012), there has been relatively less engagement with the problem of climate change. Most climate politics research has been concentrated in international relations (for a review see Bernauer 2013). Fewer studies have undertaken explicitly cross-national comparative research and theory development (Cao et al., 2014; Keohane, 2015; Purdon, 2015). Early work in this vein provided important descriptions of variation in climate policy and politics across countries (Compston & Bailey, 2008; Harrison, 2007; Harrison & Sundstrom, 2010). More recently, Mildenberger (2020) offers a detailed account of how climate policy preferences cut across traditional left-right cleavages, which enables the "double representation" of decarbonization's opponents in the policymaking processes and stymies policy efforts. Additionally, Lipscy (2018) explains how electoral rules shape energy policy reform

across countries by structuring the extent to which politicians can impose costs on consumers and redistribute revenues to particularistic interests. Scholars have also examined how policy outcomes are shaped by national policy styles (Andersen, 2019), the balance of political power between "green" (low carbon) and "brown" (carbon-intensive) sectors (Aklin & Urpelainen, 2013; Cheon & Urpelainen, 2013; Hughes & Urpelainen, 2015), veto points (Madden, 2014), and countries' locations in international carbon supply chains (Harrison, 2015).

This paper offers an institutional account for why countries vary when it comes to addressing climate change. To do so, it draws on two research traditions that have tended to be overlooked by climate change scholars, comparative political economy (CPE) and long-term policymaking. While not the sole cause of outcomes, institutions mediate and structure political struggles, providing opportunities for, and obstacles to, policy change (Steinmo et al., 1992, Ch 1). A rich CPE scholarship has highlighted how domestic institutions influence a range of policy outcomes, including income inequality (Iversen & Soskice, 2006), consumer prices (Rogowski & Kayser, 2002), taxation (Steinmo, 1989), labor market regulation (Martin & Swank, 2012), vocational training (Thelen, 2004), liberalization (Thelen, 2014), industrial policy (Katzenstein, 1985), corporate governance (Culpepper, 2010; Gourevitch & Shinn, 2005), and varieties of capitalism (Hall & Soskice, 2001). In a similar vein, scholars of environmental politics have consistently pointed to the key role that institutions play in shaping policy outcomes (e.g., Jahn, 2016; Lundqvist, 1980; Neumayer, 2003; Scruggs, 2003).

A more recent literature on the politics of long-term policymaking has analyzed the political conditions under which politicians are able address future challenges. Jacobs (2011; 2016) theorizes that three necessary conditions facilitate "long-term policy investments", or policies that entail short-term costs for greater long-term benefits: electoral safety, expectations of long-term benefits, and capacity to overcome organized opposition.

Drawing inspiration from these literatures, I reconceptualize climate policy as a type of long-term policy investment. By taking seriously the intertemporal tradeoff that climate change mitigation poses for societies, the paper clarifies two distinct axes of distributive conflict that should drive climate politics: intertemporal and cross-sectional. Politicians need to invest enough resources today so that future climate change is mitigated and distribute the associated short-term costs across economic actors in a way that is politically feasible and stable over time.

To do so, they require certain political circumstances: insulation from electoral backlash and the capacity to overcome powerful and organized incumbent industries that will pay the costs of decarbonization. The first condition shapes politics between electorally-minded politicians and voters, while the second shapes politics between government and industry. Together they represent two causal channels through which the political economy of climate change plays out.

Institutions structure politics along both channels. Proportional (PR) electoral rules increase electoral safety by decreasing electoral accountability and electoral competition, which in turn enables governments to impose costs on voters. Corporatist institutions for interest group intermediation, particularly concertation, facilitate bargaining between the government and powerful economic actors over compensation for the losers of policy change, helping governments to overcome industry opposition. What is more, the joint presence of both generates complementarities that reinforce their independent effects. PR decreases risks associated with shifting costs toward voters, which opens up room to maneuver when negotiating compensation with cost-bearing groups. Taken together, the arguments demonstrate how long-term climate policy investment emerges from the electorally and institutionally constrained choices of politicians.

While the main thrust of the article is conceptual and theoretical, a set of its observable implications are tested using newly available cross-national data on sector-level shadow carbon prices

from Althammer and Hille (2016) for eighteen high-income democracies between 1995 and 2009 (Figure 1). To my knowledge, this paper is the first in political science to analyze the dataset.

A consistent picture emerges. Across countries, both PR and concertation are associated with higher levels of climate policy stringency. Furthermore, stringency is highest in countries where both institutions are jointly present. To better identify their influence, I examine how institutions affect the distribution of policy costs between producers and consumers. As theorized, I find a distinct distributive profile underlying climate policy investment. PR rules and concertation are associated with higher costs for consumers relative to producers, and this distributional bargain drives overall policy stringency. Conversely, majoritarian rules and interest group pluralism are associated with a more equal distribution of costs between the two groups, which results in comparatively lower levels of stringency. The findings highlight how institutions structure the distributive politics of climate change policy, and by doing so, drive variation across countries.

Additionally, the paper offers broader implications about how institutional diversity produces varieties of climate change politics that push countries onto different decarbonization trajectories. In particular, the arguments suggest stark differences between consensus and majoritarian democracies regarding the distributional profile of policies, policy stability, levels of cross-party consensus, and public conflict.

The paper makes a number of contributions. First, by importing insights from CPE and long-term policymaking it provides a theoretical account of the micro-foundations that link institutions to climate policy outcomes. Whereas previous work has emphasized the way that electoral rules open up possibilities for green parties to win parliamentary seats and influence policymaking (Andersen, 2019; Folke, 2014; Harrison & Sundstrom, 2010; LaChappelle, 2011), I draw attention to their effect on electoral insulation, which is causally prior to partisanship and should structure the incentives of all elected officials. Similarly, I point to one causal mechanism – compensation – that links one feature

of corporatism – concertation – to higher levels of climate policy investment. Doing so, theoretically situates previous findings that highlight the role of peak associations and corporatist bargaining in climate and environmental policymaking (Brand & Pawloff, 2014; Hatch, 1995; Hermann et al., 2016; Jahn, 2016; Meckling & Nahm, 2018; Midttun & Hagen, 1997; Scruggs, 2003).

Second, the paper extends both the CPE and long-term policymaking literatures to the crucial case of climate change. As mentioned, CPE scholars have examined how electoral rules and interest group intermediation influence policy outcomes. However, by analyzing climate policy, I show that they also structure intertemporal politics. Moreover, while existing work on the politics of long-term policymaking has analyzed the role of cognitive biases, ideational factors, and veto points (Jacobs, 2011, 2016; Jacobs & Matthews, 2012, 2017), I draw attention to the way that macro-political institutions structure the necessary conditions for long-term policy investment to occur.

Lastly, the paper contributes practically to the climate policy debate by clarifying how domestic political institutions shape opportunities for, and constraints on, climate policy adoption. This information can inform the design of climate policy instruments that better take account of country-specific institutional settings and political realities, rather than relying on one-size-fits-all prescriptions.

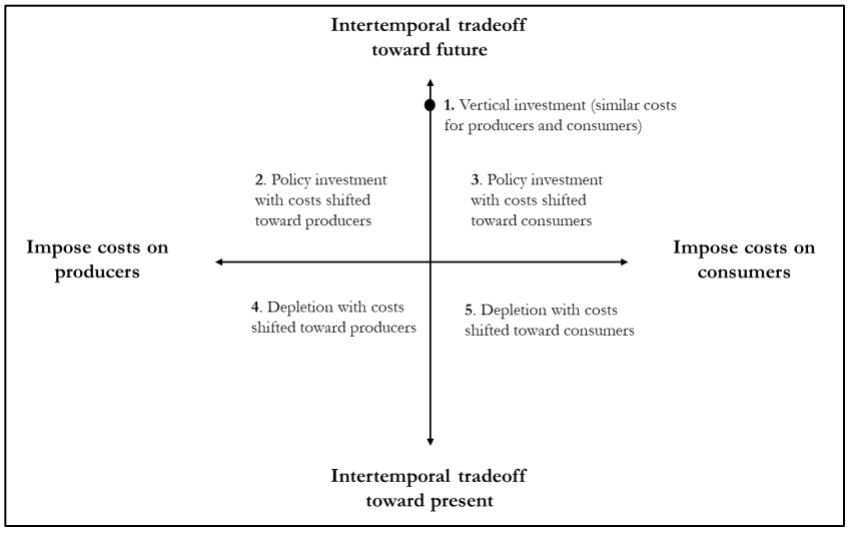
2. Climate change policy as long-term policy investment

The theoretical starting point for this study is a reconceptualization of climate change mitigation policies as long-term "policy investments" (Jacobs 2011). Climate change is the quintessential long-term problem. As such, the costs and benefits of policies to address it engender a distinct temporal structure. They extract resources today from the economy and use them to produce a slowly emerging consumption good – a stable future climate that is hospitable to human life. It is for this reason that they are "investments". Today's resources are invested via policies that, for example, increase prices

for carbon-intensive goods and services (e.g., carbon taxes and emissions trading schemes), subsidize low-carbon technology (e.g., feed-in-tariffs for renewable energy), compel firms to invest in cleaner production process (e.g., performance standards), and increase government R&D expenditure. In all cases, policy entails short-term pain for long-term gain.

Thinking about climate policy in this way recasts its attendant distributional conflict along two axes (see Figure 2). The first is intertemporal (vertical axis in Figure 2). Governments must decide whether and how much of today's resources are to be invested. Conflict arises over the level of policy investment (i.e., the sum of short-term costs imposed across the economy) and is compounded by the considerable uncertainty, complex causal chains, and very long time horizons that characterize both global warming and the effectiveness of policy responses, as well as the global public goods nature of the problem. Levels of climate policy investment can be measured by the stringency of a given country's policy portfolio. This continuous variable is the primary dependent variable of interest in this paper.

Figure 2. Distributional profiles of climate policy investment[1]



[1] Adapted from Jacobs (2011, 20).

After deciding how much of today's resources are to be mobilized to reduce future warming, governments next need to decide which social actors are to bear these costs today. This is the second, or cross-sectional, dimension of the distributional politics (horizontal axis in Figure 2). Conflict arises as governments decide which actors are to pay. For parsimony, there are two primary groups onto which politicians can impose costs. The first are consumers: private households that spend part of their budget on carbon-intensive goods and services, particularly fossil fuels for transportation, natural gas for cooking and heating, and carbon-based electricity. Importantly, in democracies consumers are voters.

The second group is producers: industrial actors who produce carbon-intensive goods and services and will therefore bear the costs of policies that aim to reduce carbon pollution. To be sure, a number of different types of firms fall into this category (Kelsey 2018) and their preferences will vary (Colgan et al., 2020; Cory et al., 2020; Downie, 2017; Genovese & Tvinnereim, 2019; Meckling, 2015). However, again for parsimony, I refer broadly to all emissions-intensive firms as "cost-bearing". Notably, this category excludes firms that produce low- or no-carbon goods and services (e.g., clean energy industries), who are policy winners and therefore should not represent a group to be overcome.

For governments wanting to make climate policy investments, there exist three basic distributional choices: (1) impose similar short-term costs on producers and consumers (point 1 in Figure 2),[2] (2) impose higher costs on producers relative to consumers (quadrant 2), or (3) impose higher costs on consumers relative to producers (quadrant 3).[3] Although the first option tends to be the economist's prescription, few countries have taken this approach. The more common route is to

[2] Jacobs (2011) refers to these as "vertical' investments.

[3] I am concerned with the political decision of distributing the direct costs of climate policy. I therefore leave aside a detailed discussion of the secondary question of cost incidence, which will depend on the price elasticity of supply and demand in each sector. Quadrants 4 and 5 in Figure 2 refer to policies that deplete the future resource of a stable climate, such as fossil fuel subsidies.

shifts costs along the lines of options 2 and 3. For example, the UK's Climate Change Levy pushes costs toward producers by exempting consumers, while carbon taxes in Scandinavia have historically shifted costs toward consumers by exempting producers (Andersen, 2019; Midttun & Hagen, 1997; Pearce, 2006). The key point is that during the policy design phase, governments must make deliberate and strategic choices about the level of policy investment, who is to pay, and by how much.

The political economy of climate change will be driven by the political risks and opportunities of distributing costs both intertemporally and cross-sectionally. Politicians need to invest enough resources today so that future climate change is effectively mitigated and distribute the associated costs across producers and consumers in a way that is politically feasible and stable. Importantly, possibilities for the latter determine the opportunities for the former. That is, the level (or stringency) of overall policy investment will depend on the ability of governments to pursue a distributive strategy that allocates short-term costs cross-sectionally between consumers and producers.

The need for governments to impose costs cross-sectionally on consumers and producers represents two distinct causal channel of climate change politics. The first is electoral, linking politicians to voters. The second channel concerns the ability of politicians to overcome opposition from organized groups that stand to pay the costs. The argument here is that *all* climate politics play out along these two channels.

Crucially, there are political risks on both fronts. Increased costs for voters can produce electoral backlash that removes the governing party(ies) from power. Increased costs for industry can cause them to counter-mobilize and expand the scope of conflict in an effort to block policy change. Or they may simply divest and leave the country, taking jobs with them. Both scenarios represent significant political stumbling blocks to any government's plans for long-term decarbonization.

3. Institutions and long-term climate policy investment

With this framework in mind, we can turn to how institutions should structure the political risks of imposing costs along both channels, and by doing so, drive variation in climate policy investment across countries. However, before proceeding it is important to note that the arguments below are concerned primarily with explicating comparative statics, or equilibrium states, across countries. I leave aside a detailed discussion of dynamic processes of change within particular institutional configurations.

3.1. Channel 1: Electoral politics

Policies that increase short-term costs for voters run the risk of being unpopular. This risk is compounded when: (1) the benefits associated with those costs are public goods that arrive in the future and (2) the benefits take the form of reduced losses relative to a counterfactual scenario of runaway climate change rather than additional, highly visible benefits relative to the status quo, such as healthcare, education, or infrastructure.

Individuals exhibit well-documented cognitive patterns that bias them against policy investment. Negativity bias tends to focus individuals' attention on negative information (short-term costs) rather than positive (long-term benefits), while loss-aversion means they tend to weight potential losses more than prospective gains of equal size (Jacobs 2011, Ch. 2; Kahneman, Knetsch, and Thaler 1991). Moreover, individuals tend to have moderately high discount rates, placing more value on consumption today relative to consumption in the future (Frederick et al., 2002; Jacobs & Matthews, 2012). Lastly, survey research consistently finds that individuals dislike climate policies that impose high personal costs (Ansolabehere & Konisky, 2014; Bechtel & Scheve, 2013; Drews & Bergh, 2015; Jagers & Hammar, 2009; Shwom et al., 2010).

As mentioned, the risk for politicians is simple: electoral punishment. If the costs of policy become politically salient, they could elicit a severe backlash that removes the governing party from power at the next election. This should be especially likely when policy imposes direct and highly visible costs on voters, such as fossil fuel taxes (Finnegan, 2018). Therefore, a key condition for politicians to adopt long-term policy investments is electoral safety (Garrett, 1993; Jacobs, 2011). Electoral safety insulates governments against decreases in vote shares that result from unpopular policies. Indeed, it is only governments that feel secure in office that should be expected to engage in the long-terms politics of decarbonization.

One institution that should structure electoral safety across countries is electoral rules. Proportional (PR) rules tend to dampen electoral competition, or the expected probability that the governing party loses it seats plurality in the next election (Kayser & Lindstädt, 2015). They do so by decreasing seats-votes elasticities – the marginal expected gains in a party's seat share in the national legislature for a given increase in the party's national vote total (Rogowski & Kayser, 2002). Lower electoral competition should insulate the governing party(ies) against marginal losses in vote shares. Indeed, for this reason PR rules are associated with higher consumer and energy prices more generally (Lipscy, 2018; Rogowski & Kayser, 2002).

Secondly, electoral rules shape electoral accountability via their effect on clarity of responsibility and the ability of voters to sanction governments. PR rules tend to decrease clarity of responsibility, making it more difficult for voters to assign responsibility for policies they dislike, while majoritarian rules increase it (Powell and Whitten 1993). PR often generates coalition governments, while majoritarian rules usually result in single-party ones. All else equal, voters should find it easier to punish single-party governments (Hobolt et al., 2013). Not least because coalition governments enable governing parties to shift blame for unpopular policies onto their coalition partners. Moreover, dynamics of coalition bargaining under PR means that significant policy decisions tend to enjoy cross-

party consensus. For example, the Danish Energy Agreement law of 2012, an ambitious and costly policy to increase clean energy generation, was supported by virtually all political parties (Toke & Nielsen, 2015). Such broad support further blurs lines of responsibility for voters.

PR rules also make it difficult to sanction governments because even if voters substantially reduce their support for a party, there is no guarantee that it will not end up in the governing coalition after the election; for example, as a result of coalition bargaining. However, a substantial loss of support for the governing party under majoritarian rules will almost certainly remove it from power.

Overall, PR rules should better shield politicians from the ire of unhappy consumers, reducing the political risk of imposing short-term costs on them. Conversely, under plurality rules, politicians from two major parties face highly competitive contests over the median voter, generating strong incentives to pay close attention to these voters' short-term preferences for low prices. This should be especially true for emissions-intensive goods and services (e.g., gasoline and electricity) since they tend to make up a large proportion of household budgets.

3.2. Channel 2: Interest group politics

Even if politicians enjoy electoral safety, they still require the capacity to overcome opposition from organized groups who will bear the costs of policy investments. Indeed, one key obstacle to climate policy is the ability of organized opponents, especially emissions-intensive industries such oil, gas, and coal-fired utilities, to block policy change (Hughes & Urpelainen, 2015; Mildenberger, 2020). To be sure, a number of factors should influence the ability of governments to overcome opposition from these groups, such as institutional veto points, the centralization of policymaking, business preferences, and the proportion of high- to low-carbon sectors (Aklin & Urpelainen, 2013; Cheon & Urpelainen, 2013; Downie, 2017; Jacobs, 2011; Meckling, 2015). Here I explore another: institutions that structure interactions between cost-bearing groups and the government.

Concertation describes an institutional arrangement that grants relatively few encompassing, hierarchal, and monopolistic peak associations privileged access to pre-legislative policymaking via long-standing linkages to political parties and the public administration (Baccaro, 2003; Martin & Swank, 2012). Conceptually, concertation constitutes institutionalized political exchange between privileged interest groups and the state (Crouch, 1993; Öberg et al., 2011). Each actor controls resources that the other desires. For example, governments control legislation while organized groups can influence the policy preferences of their members, shaping support for the government's agenda. Concertation involves industry exchanging political support for government policy in return for influence over the shape and rate of policy change. Industry participates in such exchanges because firms have a material interest in maintaining a cooperative regulatory environment. Deviations could unsettle existing policy compromises across a range of other issues important to business.

For governments wanting to make climate policy investments, one mechanism through which concertation should increase the likelihood of success is credible compensation. When undertaking significant reforms, especially those that entail major distributive conflict such as climate policy, governments have two general options for dealing with powerful cost-bearing groups: compensate them or ignore them (Lindvall 2017, Ch.2). In the case of climate policy, compensation can take a variety of forms. Select industries can be wholly or partially exempted from compliance costs or they can receive refunds and subsidies. For example, in Norway emissions-intensive industry have been exempted from paying the full carbon and energy tax rates, while in Denmark 20 per cent of carbon tax revenues are recycled back to business for energy efficiency upgrades to ease adjustment (Andersen, 2019; Mildenberger, 2020).

The challenge for governments is that compensation involves its own set of political costs. It may make the policy less effective (dilution costs), be expensive to administer (deadweight costs), take

too much time and energy to negotiate (transaction costs), or make other important political actors, especially voters, react negatively (audience costs) (Lindvall, 2017, Ch.3).

Crucially, concertation should influence these costs. First, deliberation between the government and a limited number of highly organized peak associations, with the authority to decide on behalf of their members and bind them to the terms of an agreement, should reduce the transaction costs of negotiating a stable and credible long-term distributive bargain (Martin, 2015; Martin & Swank, 2012). Moreover, corporatist networks are based on long-standing and frequent face-to-face interaction between industry, trade unions, and government, which promotes trust – a key ingredient for further reducing transaction costs.

Second, negotiations typically take place in private and outside of the legislative process. Indeed, the threat of legislative action, which would exclude interest group preferences, is often used as a penalty for inaction. Holding negotiations in secret can reduce audience costs (Lindvall 2017, Ch.3). Third, corporatist networks are well-established in many democracies and have long been used to negotiate compensation for policy change. As a result, compensation in the case of climate policy should require little in the way of additional administrative resources and therefore few deadweight costs.

Lastly, compensation agreements are credible. They are usually supported by all political parties, reducing the likelihood that they will be upended by a future government. At the same time, individual firms and unions are bound to them via their representative peak associations. For both sides, deviating from the agreement jeopardizes future cooperation.

Compensatory agreements with cost-bearing groups should lead to higher long-run climate policy investment via three related causal pathways. The first concerns the sequencing of costs for industry. By defusing organized opposition, compensation makes it more likely that governments have early success in enacting climate policy into law. To be sure, these early investments are likely to impose

few costs on carbon-intensive industry. However, they set the scene for ongoing negotiations, through which governments can incrementally increase stringency over time. Indeed, more stringent climate policy often becomes possible only after the adoption of early, moderate, and politically feasible policy options (Kelsey 2018; Meckling et al. 2015). For example, Swedish industry enjoyed large exemptions from the country's carbon tax when it was initially adopted in 1991. However, since then, governments have incrementally increased costs for industry, and beginning in 2019, they pay a similar tax rate to consumers.

Second is electoral politics. Remember that the government exchanges compensation in return for industry's support of their climate policy agenda. Powerful economic actors have the resources and capacity to shape public perceptions of government action on climate change. Eliciting business support means they should be less likely to mobilize public conflict. In particular, they should be less likely to attempt to influence voters' climate policy preferences by drawing attention to short-term policy costs. This works to reduce the political salience of such costs and keep climate change "quiet politics" (Culpepper, 2010). Under these conditions, government should find it less risky to adopt policies that impose costs on voters, which in turn increases the level of overall policy investment.

Last is policy reversal. As mentioned, agreements regarding climate policy investments between government and cost-bearing groups will be long-term in nature and agreed to by all political parties and peak associations for capital and labor. Moreover, cooperative veto points are diffuse, offering all sides a say over future policy change (Birchfield & Crepaz, 1998). Changes will therefore tend to be incremental and negotiated, rather than radical or unilaterally imposed by a new government after an election. The likelihood of wholesale policy reversal is low, which should increase long-run average levels of policy investment.

While related to existing studies, these arguments also diverge in important ways. For example, Mildenberger (2020) contends that corporatism stabilizes the political influence of carbon-intensive

policy losers, which inhibits disruptive, non-incremental policy change and locks in low policy stringency. That is, corporatism is associated with excessive policy dilution costs. However, the assumption is that costs for producers are the most important measure of policy effort. While these costs are surely important, I suggest that the overall stringency of a country's policy portfolio crucially depends on the distribution of short-term costs *between* producers and consumers. Eliciting the political support of industry via compensation can enable governments to increase costs for voters and, over time, incrementally increase costs for industry. The arguments here therefore predict comparatively higher levels of long-run climate policy investment in corporatist settings.

What is more, by offering a causal mechanism – compensation – that links interest group intermediation to climate policy investment, they theoretically situate findings from case studies that have highlighted the role of corporatism in climate policymaking (Brand & Pawloff, 2014; Hatch, 1995; Hermann et al., 2016; Meckling & Nahm, 2018; Midttun & Hagen, 1997). They also explain why governments in countries such as Germany and the Netherlands have been more successful at negotiating voluntary climate change-related agreements with industry compared to the US (Delmas & Terlaak, 2002).

3.3. Institutional complementarities

I have argued that both electoral rules and concertation have independent effects on long-term climate policy investment. Here I theorize how their joint presence generates complementarities that reinforce these effects. Across the high-income democracies, electoral rules tend to go together with forms of interest group intermediation, constituting the institutional basis of democratic and capitalist diversity (Crouch 1993; Iversen and Soskice 2009; Lijphart 2012; Martin and Swank 2012). In "consensus" democracies with coordinated market economies, PR rules co-occur with concertation. Conversely, in

"majoritarian" democracies with liberal market economies, first-past-the-post electoral rules co-occur with interest group pluralism.

The complementarity between PR rules and concertation should simultaneously reduce the political risks of imposing costs on consumers and producers. Because PR rules increase electoral safety, they decrease risks associated with shifting costs toward voters, giving governments the option to do so. This flexibility opens up critical room to maneuver when negotiating compensation with cost-bearing groups. By shifting short-term costs toward consumers, governments can offer policy exemptions to industry and still retain the overall integrity of the policy investment. In this way, the institutional complementary between electoral rules and concertation can prevent excessive dilution costs.

At the same time, offering compensation to powerful cost-bearing organized groups reduces the likelihood that distributive conflict enters the public arena or that industry increases the salience of short-term costs for voters, which should make it easier for governments to impose such costs on them. To be sure, this type of policy investment, which distributes higher costs toward voters, is less stringent than one that imposes similarly high costs on both voters and industry. However, I have tried to show that, given its political risks, this type of distributive bargain is difficult for governments, at least initially.

The complementarity between majoritarian electoral rules and interest group pluralism has a different logic. First-past-the-post rules decrease electoral safety and thereby increase the political risk of imposing costs on voters, which will tend to take this distributive channel off the table. For governments serious about climate policy, the only other available channel is to impose costs on industry. But because they lack institutionalized bargaining with cost-bearing groups, and because parties in these governments will rarely rely on the political support of carbon-intensive firms, government will tend to ignore policy losers and shut them out of policy design.

This strategy prevents excessive dilution costs. Since governments will be reticent to impose costs on voters, they have to impose substantial costs on industry or the policy will have little stringency. Additionally, by imposing costs on industry, especially intermediaries such as electricity and fuel suppliers, the link between consumers' short-term losses and the policy that produced them can be obscured, hiding the costs of policy change and decreasing electoral accountability.

However, the risk is that, in an effort to influence policy design from the outside in, industry counter-mobilizes and expands the scope of conflict. The fundamental problem is that a strategy of ignoring losers, which will be politically attractive in this institutional setting, does not reconcile distributive conflict, but instead amplifies and expands it. Furthermore, given the winner-take-all nature of elections, polluters will have strong incentives to simply wait until their party returns to power, at which policy is likely to be reversed.

The overall result should be a deeply adversarial and conflict-ridden policy process with little cross-party consensus and frequent policy reversal. As a consequence, we should expect relatively lower levels of long-run climate policy investment in these institutional environments.

4. Empirical analysis

4.1. Research design and data

I am interested in explaining why some high-income capitalist democracies do more than others to address climate change. To do so, I employ a comparative, cross-national research design that examines between-country differences in climate policy investments, as well as within-country differences over time when data allows.

The first step is to collect a valid cross-national measure of long-term climate policy investment. Conceptually, policy investment is the amount of today's resources that are devoted to the provision of a stable future climate. This "amount" can be measured by policy stringency, or the short-term costs that policy imposes on economic actors today. More stringent policies are more costly and therefore represent a larger investment of today's resources.

To measure policy stringency I utilize new data from Althammer and Hille (2016) who estimate the "shadow price" of carbon-based energy for 33 sectors (all primary, secondary, and tertiary sectors) between 1995 and 2009.[4] Shadow prices are intended to reflect actual private sector abatement costs. Government policy drives a wedge λ_E between an economic actor's shadow price Z_E for an additional input of carbon-intensive energy E and the energy source's "undistorted" world market price p_E, so that:

$$Z_E = p_E + \lambda_E \tag{1}$$

The wedge λ_E is then a measure of all government policy that changes the cost of carbon-intensive energy inputs. Althammer and Hille use sector-specific prices for seven energy carriers (electricity, coal, natural gas, diesel, gasoline, heavy fuel oil, and light fuel oil) and sector-specific energy usage to estimate weighted average costs for emissions-relevant energy use for each sector *s* in country *i* in year *t*. A positive wedge indicates that policy raises the cost of carbon-intensive energy inputs above the "undistorted" market price, thereby increasing abatement costs. A negative wedge indicates that policy subsidizes energy usage, decreasing abatement costs.

[4] Thank you to Erik Hille for making the data available to me.

The benefit of this approach is that it captures all policies that affect the cost of carbon-intensive energy inputs (e.g., taxes, subsidies, regulations, and cap-and-trade schemes) and summarizes the stringency of a country's climate policy portfolio across the economy regardless of its multidimensionality. Because I am first interested in a single economy-wide measure of policy investment I calculate the average wedge λ_E across all sectors *s* in country *i* in year *t*. To account for sectoral heterogeneity across the sample of countries (e.g., larger tourism sector in Spain and larger steel sector in Japan), I weight this economywide score by sector output using data from Althammer and Hille. Throughout the paper I refer to this variable as "overall climate policy investment". To validate it, I test whether it increases in countries of the European Union (EU) after the implementation of the EU Emissions Trading System (EU ETS) and find that it does (see online appendix).

A key benefit of the data is that it can be disaggregated by sector. Most important for my purposes are the separate stringency estimates for each producer and consumer sector. Because the producer estimates rely on industrial energy prices and the services estimates on household prices, I use each as a proxy for the distinct short-term costs imposed on industry ("costs for producers") and voters ("costs for consumers"), respectively.[5] Lastly, I calculate the difference between them to measure the distribution of costs between consumers and producers. When this measure is zero, equal costs on are imposed on both groups. However, higher values indicate higher costs for consumers relative to producers. Conceptually, it provides a proxy for the level of compensation enjoyed by producers.

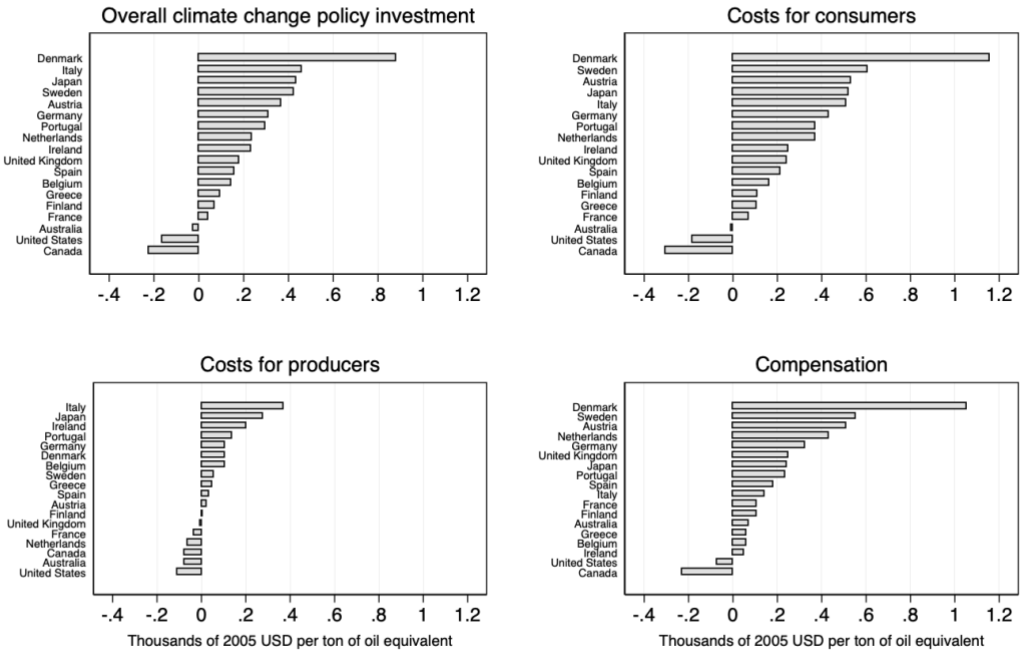
[5] For complete sector coding see online appendix.

For the cross-national analysis, I measure long-term, average climate policy stringency by calculating mean values across the sample period. However, the results are unchanged if stringency values for only the first year (1995) or last year (2009) of the sample are analyzed (see online appendix).

To my knowledge, this paper is the first in political science to use this data. A key limitation of previous quantitative cross-national studies is the measurement of climate policy, whether as a count of climate-related laws (Fankhauser et al., 2015), a scoring of policy stringency (Madden, 2014), or a measure of general environmental policy stringency (Rafaty, 2018). By relying on objective and comparable sector-level energy price data, the shadow price approach overcomes these previous barriers. To date, it is the most detailed measure available of climate policy stringency. Though one drawback is that it does not capture policies that have no effect on the price of carbon-intensive energy inputs, such as voluntary measures undertaken by firms. Nor does it measure policies that target greenhouse gases apart from carbon dioxide.

Althammer and Hille estimate shadow prices for 28 countries. However, because my arguments are concerned with the high-income democracies, I drop 10 middle-income and formerly Eastern Bloc countries from the sample. Figure 3 shows the average level of overall climate policy investment across the remaining 18 countries between 1995 and 2009 (top left quadrant). Government policy in almost all countries increases the price of carbon-based energy above its market price. However, the amount to which it does so varies considerably, from an average of 655 USD (2005 dollars) per ton of oil equivalent (toe) in Denmark to 13 USD in France. In Australia, Canada, and the US, government policy acts as a subsidy. Rather than being an investment (an intertemporal tradeoff toward the future), policy generates an intertemporal tradeoff toward the present, depleting the future resource of a stable climate.

Figure 3. Climate change policy investment across countries



Notes: Values are averages from 1995-2009 and weighted by sector output. Compensation is difference in costs imposed on consumers relative to producers.

Examining the distribution of costs between consumers and producers reveals that almost all countries distribute some costs toward consumers, except Canada and the US where again policy subsidizes the use of carbon-based energy for voters (top right quadrant). The case for producers is mixed. In some countries policy imposes costs on industry, while in others it acts as a subsidy (bottom left quadrant). Lastly, we see that in almost all countries consumers pay more of the short-term costs of climate policy investment, except for Canada and US where producers pay more than consumers (bottom right quadrant).

To measure the disproportionality of electoral rules I use data from Lijphart (2012) for average long-run electoral disproportionality from 1981-2010. I use long-term averages in order to capture

equilibrium levels. Electoral proportionality is only substantively meaningful across countries, since few countries change electoral rules over time.[6] The measure is therefore time-invariant.

To measure the degree of concertation between the government and economic actors I use data from Visser (2015) on the routine involvement of employers and labor unions in policymaking between 1988 and 2013. Again, I utilize long-term averages in an effort to capture equilibrium levels. The variable ranges from 0-2. Conceptually, it should provide a valid proxy of the degree to which organized groups enjoy privileged access to climate policymaking. Unlike electoral rules, levels of concertation vary in substantively meaningful ways both between countries and within them over time.[7]

Before using the data, I make one change. Visser (2015) codes Japan as zero for all years of the sample. This is due to the country's unique system of "corporatism without labor" (Lehmbruch, 1984). However, case studies have documented the close relationship between highly organized industry associations and the government, especially the Ministry of Economy, Trade and Industry (METI) (Lipscy, 2018; Mildenberger, 2020). Because this is the phenomenon I am looking to measure, rather than whether employers *and* labor unions are routinely involved in policymaking, I recode Japan as two.[8]

[6] Japan and Italy changed electoral rules during the sample period, in 1996 and 2005 respectively. However, having only two countries with few years either before or after the change prevents any meaningful estimate of its effect.

[7] Concertation varies over time within 9 of the 18 countries in the sample: Australia, Austria, France, Germany, Ireland, Italy, Portugal, Spain, and Sweden.

[8] The results do not significantly change when Visser's (2015) coding is used. See online appendix.

4.2. Method and controls

I test the arguments in three steps. First, I use scatter plots to observe bivariate relationships between electoral rules, concertation, and climate policy investments. Second, I estimate regression models and include a set of potentially confounding variables to investigate the robustness of the scatter plot results. Last, I examine the causal mechanisms that link institutions to climate policy.

Theory and data structure drives the selection of regression models. Because my arguments seek to explain cross-national variation, I employ cross-sectional OLS models with averaged variables in the first instance. In addition, when analyzing the concertation data, which varies within countries over time, I utilize two-way fixed effects models.

There are a number of variables that may confound the relationship between my institutional variables of interest and climate policy investment. However, given the small sample size, I select a parsimonious set of controls. The first is EU membership. The EU has been active in promoting climate change policy in its member states, especially after 2000.[9] However, recent studies find an ambiguous relationship between the EU and domestic climate policy (Avrami & Sprinz, 2019). Moreover, it is unclear to what extent EU decisions are exogenous to the domestic politics of the member states. Indeed, the EU's policy agenda is set by the European Council, which is comprised of the heads of member states, and policy changes require its approval to become EU law.

A second set of confounders are institutional veto points, especially those that constitute competitive veto points which can enable climate policy opponents to block policy change (Birchfield & Crepaz, 1998; Harrison & Sundstrom, 2010; Karapin, 2016; Madden, 2014). These include

[9] Most importantly, the EU has adopted the Renewable Electricity Directive in 2001, ratified the Kyoto Protocol in 2002, and launched the EU Emissions Trading Scheme in 2005.

federalism, strong bicameralism, and presidentialism. To control for these institutional features in a parsimonious way, I generate an additive index using data from Armingeon et al. (2016).

To control for differences in politicians' climate policy preferences across countries I include a measure of the "greenness" of governments' ideology using data from Jahn (2016). It measures the extent to which governing party(ies) are green- versus growth-oriented based on data from the Comparative Manifestos Project. In addition to capturing green policy preferences, the variable should provide a proxy for underlying voter preferences regarding the environment (if we assume that party preferences track voter preferences). A valid cross-national measure of public opinion for the time period under analysis is not available.[10]

A country's production of fossil fuels may shape the power and influence of polluting sectors and therefore the willingness of governments to increase the price of carbon-based energy (Harrison, 2015; Hughes & Urpelainen, 2015; Ward & Cao, 2012). I therefore control for domestic fossil fuel (coal, oil, and natural gas) production per capita. Additionally, I include real GDP growth to control for differences in general macroeconomic conditions.[11] Lastly, the fixed effects specifications control for all unobserved country-specific and time-specific confounders, such as international climate change negotiations, increasing public awareness, and common energy and economic shocks.

While this set of controls offers the most parsimonious modelling strategy, the fixed effects results are robust to the inclusion of a wide variety of additional variables, including the government's left-right position, unemployment, GDP per capita, industry value added, carbon intensity of energy supply, political constraints, and perceptions of corruption (see online appendix).

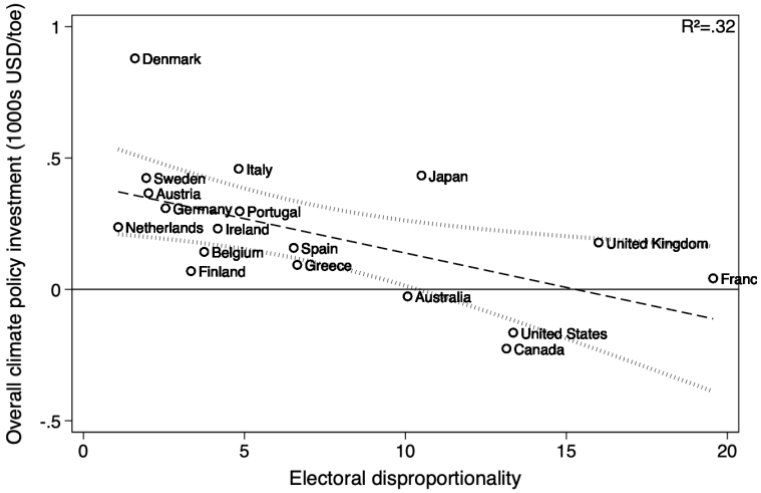
[10] See online appendix for an analysis of available measures of public opinion. I find no evidence of a cross-national relationship between public opinion and climate policy stringency.

[11] For summary statistics see the online appendix.

4.3. Electoral rules and climate policy investment

I first test the relationship between electoral rules and climate policy investment by plotting electoral disproportionality against overall policy stringency (Figure 4). We see a negative relationship, as expected. Countries with more proportional rules have higher levels of overall climate policy investment.

Figure 4. Electoral rules and climate policy investment

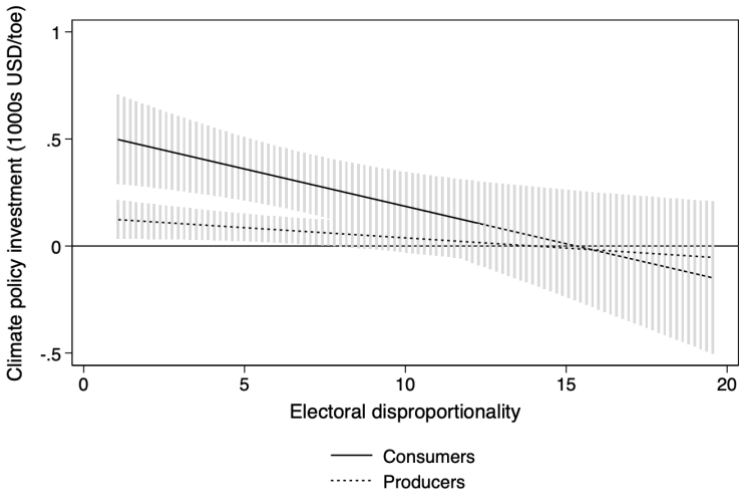


Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Electoral disproportionality is averaged from 1981-2010. Fitted line with 95% confidence interval indicated by dotted lines.

To better identify the influence of electoral rules, let us examine their impact on the distribution of costs between consumers and producers. My arguments predict that PR rules are associated with higher costs for consumers, but not necessarily producers. Similarly, as rules become more disproportional politicians should distribute short-term costs more evenly between the two groups. Plotting fitted lines for electoral rules separately against costs for producers and consumers, we find evidence for these arguments (Figure 5). When rules are more proportional, voters pay more

than industry. However, this difference shrinks as rules become more disproportional (i.e., more majoritarian). At levels of disproportionality over ten, there is no statistical difference between costs imposed on consumers versus producers.

Figure 5. Electoral rules and the distribution of costs



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Electoral disproportionality is averaged from 1981-2010. Fitted lines with 95% confidence intervals indicated by shaded areas.

Estimates from cross-sectional OLS models confirm the robustness of these results (Table 1). Countries with more disproportional electoral rules have lower overall climate policy investment, holding constant a variety of potentially confounding variables (Model 1). Additionally, electoral rules have a differential impact on costs for consumers versus producers, as expected. An increase in disproportionality is associated with a much larger decrease in costs for consumers (Model 2), compared to those for producers (Model 3).

As a last step, I test the two mechanisms that I argue link electoral rules to climate policy investment: electoral competition and accountability (see online appendix). As expected, lower levels of electoral competition are associated with higher levels of overall policy stringency. Furthermore,

Table 1. Institutions and climate policy investment: Cross-national OLS models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Overall	Costs for consumers	Costs for producers	Overall	Costs for consumers	Costs for producers	Compensation	Overall	Costs for consumers	Costs for producers	Compensation
Electoral disproportionality	-0.0184***	-0.0262***	-0.00602*								
	(0.00581)	(0.00780)	(0.00291)								
Concertation				0.173*	0.248**	0.00841	0.239**				
				(0.0787)	(0.0981)	(0.0420)	(0.0845)				
First principal component								0.103**	0.148**	0.00952	0.138**
								(0.0420)	(0.0540)	(0.0207)	(0.0490)
EU membership	0.0981	0.186	-0.142**	0.190	0.317*	-0.130**	0.447**	0.125	0.224	-0.134**	0.358**
	(0.128)	(0.164)	(0.0551)	(0.136)	(0.175)	(0.0567)	(0.152)	(0.116)	(0.146)	(0.0572)	(0.127)
Institutional constraints	-0.0301	-0.0294	-0.0214*	-0.0225	-0.0183	-0.0245*	0.00626	-0.0210	-0.0158	-0.0232*	0.00733
	(0.0249)	(0.0324)	(0.0107)	(0.0230)	(0.0295)	(0.0134)	(0.0267)	(0.0239)	(0.0310)	(0.0123)	(0.0284)
Green policy preferences	-0.0103	-0.0165*	0.00184	-0.0112	-0.0179*	0.00261	-0.0205**	-0.0116*	-0.0185**	0.00233	-0.0208**
	(0.00590)	(0.00763)	(0.00291)	(0.00690)	(0.00908)	(0.00312)	(0.00781)	(0.00641)	(0.00829)	(0.00304)	(0.00680)
Real GDP growth	-0.0909	-0.124*	-0.0131	-0.0743	-0.101	-0.0109	-0.0896**	-0.0805	-0.109	-0.0111	-0.0983**
	(0.0582)	(0.0685)	(0.0391)	(0.0511)	(0.0568)	(0.0404)	(0.0313)	(0.0542)	(0.0616)	(0.0395)	(0.0386)
Fossil fuel production	-0.000940	0.00635	-0.0261***	0.00905	0.0207	-0.0260**	0.0467*	0.00310	0.0122	-0.0260***	0.0383
	(0.0208)	(0.0261)	(0.00793)	(0.0233)	(0.0293)	(0.00858)	(0.0255)	(0.0210)	(0.0263)	(0.00796)	(0.0225)
Constant	0.574**	0.672**	0.377***	0.0962	-0.0121	0.339*	-0.351	0.351*	0.352	0.345***	0.00719
	(0.196)	(0.251)	(0.0902)	(0.257)	(0.315)	(0.166)	(0.250)	(0.173)	(0.213)	(0.105)	(0.168)
R^2	0.654	0.668	0.509	0.712	0.741	0.491	0.727	0.694	0.721	0.494	0.688
N	18	18	18	18	18	18	18	18	18	18	18

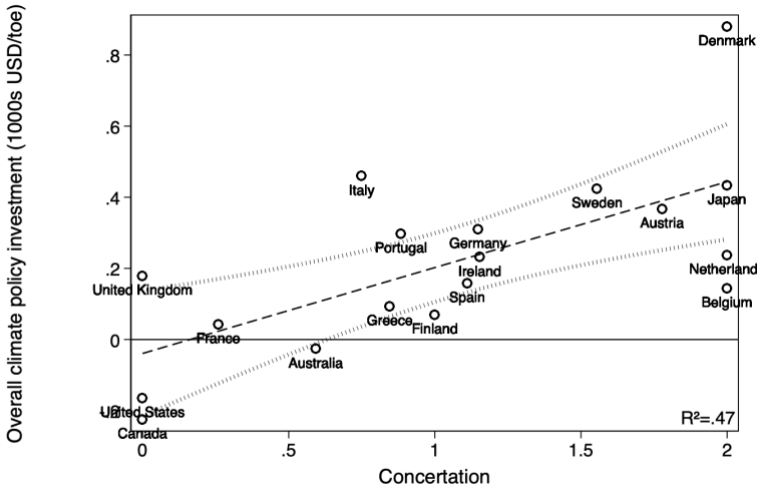
Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

when competition is low, politicians shift costs toward consumers. The results are similar for electoral accountability. Countries with fewer single-party governments (and therefore lower clarity of responsibility) have higher levels of overall climate policy investment and impose higher costs on consumers relative to producers. Taken together, the evidence provides strong support for the argument that electoral rules structure the distributional politics of climate policy investments across countries by shaping levels of electoral safety.

4.4. Interest group intermediation and climate policy investment

I turn next to testing arguments about the relationship between interest group intermediation and climate policy investment. I first plot the cross-national association between policy stringency and concertation (Figure 6). As expected, we observe a positive relationship. In countries where organized interests are routinely involved in policymaking, climate policy is more stringent.

Figure 6. Concertation and climate policy investment



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Concertation is averaged from 1988-2013. Fitted line with 95% confidence interval indicated by dotted lines.

Secondly, I estimate regression models with controls. The cross-national specification confirms that concertation is associated with higher overall policy investment, though the coefficient is significant at the 10% level (Table 1 – Model 4). Because the concertation data varies within countries over time, I conduct further tests using two-way fixed effects models (Table 2). We observe strong evidence that, within countries, higher levels of concertation are associated with higher levels of overall climate policy investment (Table 2 - Model 1). The result is important because it helps to address concerns of omitted variable bias by controlling for country- and time-specific confounders. Furthermore, the result is robust to an alternative specification using between-within models (Bell & Jones, 2015) (see online appendix).

In the case of producers, my arguments predict that concertation enables governments to impose comparatively higher costs on business. Neither the cross-national nor fixed effects estimates provide evidence for this (Table 1 – Model 6 and Table 2 – Model 3). I explore the relationship between concertation and costs for producers further using scatter plots (see online appendix). We observe a positive relationship with two outliers: Italy and the Netherlands. Italy imposes much higher costs on producers than its level of concertation would predict while the Netherlands imposes much lower costs. Beyond outliers, one reason for the weak evidence may be the widespread use of negotiated agreements in corporatist countries. Since the early 1990s, governments in countries such as Denmark, the Netherlands, and Germany have relied on voluntary commitments by industry to reduce CO_2 emissions instead of implementing policy, such as fossil fuel taxes (Delmas & Terlaak, 2002). As mentioned, one drawback of the policy stringency data is that it does not capture these types of government actions. That said, the results can also be interpreted as lending support to Mildenberger's (2020) arguments. By embedding polluters in the policymaking process, corporatism may limit possibilities for radical policy change that imposes costs on business.

Last, I turn to investigating the mechanism of compensation. I predict that concertation generates higher levels of policy investment by enabling governments to compensate producers. As mentioned above, I measure compensation by subtracting the costs imposed on producers from costs imposed on consumers. Higher values indicate that politicians are shifting costs away from industry. Estimates from both the cross-national models (Table 1 – Model 7) and the fixed effects models (Table 2 – Model 4) provide strong evidence consistent with the theory. Higher levels of concertation are associated with higher levels of compensation for producers.

Taken together, the results offer strong support for the argument that institutions for interest group intermediation structure climate policy investment. Concertation is associated with higher levels of climate policy stringency. What is more, these high levels of policy investment are driven by a distinct distributive profile. Concertation has a much larger and statistically significant influence on costs for consumers compared to those for producers (Table 1 – Models 5 and 8; Table 2 – Models 3 and 5). The evidence of this cost shift supports the argument that governments are using compensatory bargains to secure industry's support.

The dynamic can be seen clearly if we plot compensation against policy stringency (Figure 7). It is precisely those countries that offer high levels of compensation to producers, which have the highest overall levels of climate policy investment. Denmark is the extreme example. It has the highest average overall stringency in the sample. Consumers there paid on average 1,000 USD more per unit of carbon-based energy than producers.

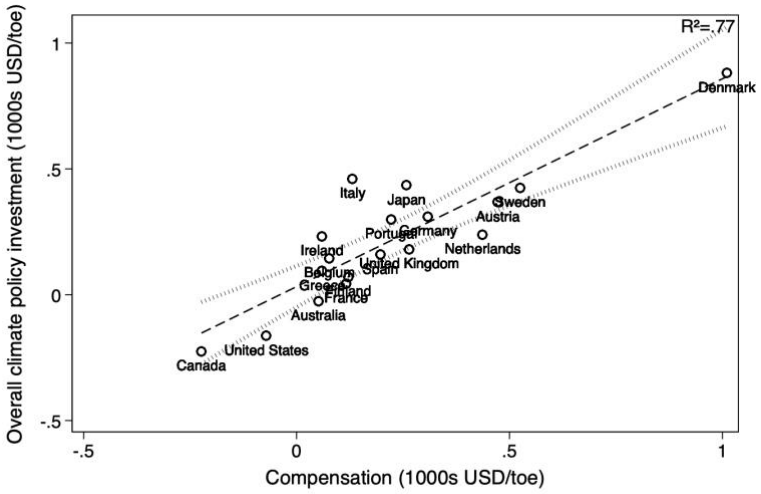
Lastly, the evidence suggests that close and institutionalized relationships between industry and government can facilitate stringent climate policy. This finding complicates accounts that posit business as a perennial opponent of policy change, highlighting instead the crucial role that institutions play in structuring the incentives of industry to oppose or cooperate with the government.

Table 2. Institutions and climate policy investment: Fixed effects models

	(1) Overall	(2) Costs for consumers	(3) Costs for producers	(4) Compensation	(5) Overall	(6) Costs for consumers	(7) Costs for producers	(8) Compensation
Concertation	0.0603**	0.0767**	0.0202	0.0565**	0.116***	0.140***	0.0553**	0.0847**
	(0.0217)	(0.0290)	(0.0122)	(0.0205)	(0.0338)	(0.0427)	(0.0228)	(0.0296)
Electoral disproportionality					0.00163	0.00245	-0.00134	0.00379
					(0.00302)	(0.00388)	(0.00121)	(0.00356)
Concertation*Electoral disproportionality					-0.00848*	-0.00975*	-0.00525	-0.00450*
					(0.00446)	(0.00478)	(0.00374)	(0.00218)
Green policy preferences	-0.00276	-0.00267	-0.00236	-0.000308	-0.00232	-0.00220	-0.00190	-0.000297
	(0.00202)	(0.00229)	(0.00174)	(0.00173)	(0.00158)	(0.00188)	(0.00143)	(0.00172)
Fossil fuel production	0.00253	0.00512	-0.00546	0.0106	0.00568	0.00849	-0.00250	0.0110
	(0.0163)	(0.0174)	(0.00905)	(0.0145)	(0.0152)	(0.0160)	(0.00928)	(0.0134)
Real GDP growth	-0.00466	-0.00750	0.000472	-0.00797	-0.00557	-0.00850	-0.000280	-0.00822
	(0.00530)	(0.00845)	(0.00297)	(0.00881)	(0.00535)	(0.00830)	(0.00344)	(0.00862)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 – within	0.405	0.407	0.300	0.312	0.448	0.447	0.351	0.333
R^2 – between	0.531	0.530	0.338	0.279	0.402	0.445	0.047	0.312
R^2 – overall	0.333	0.326	0.284	0.207	0.349	0.363	0.111	0.240
Countries	18	18	18	18	18	18	18	18
N	269	269	269	269	269	269	269	269

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 7. Compensation and climate policy investment



Notes: Compensation is difference in costs imposed on consumers relative to producers averaged from 1995-2009 and weighted by sector output. Overall climate policy investment is averaged from 1995-2009 and weighted by sector output. Fitted line with 95% confidence interval indicated by dotted lines.

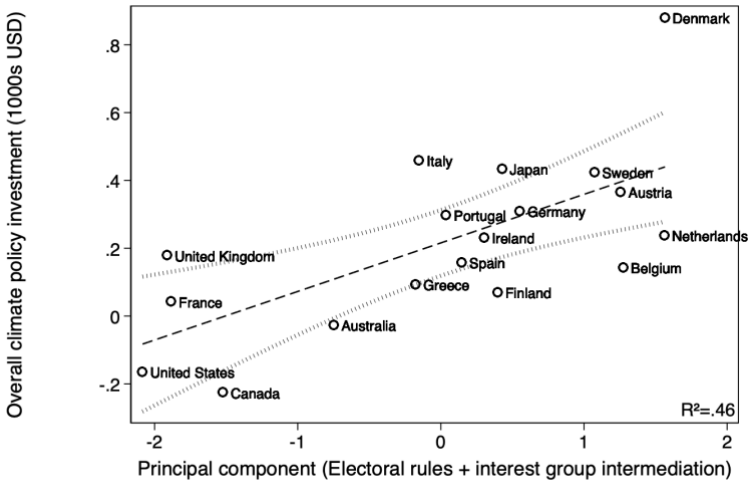
4.5. Institutional complementarities

Lastly, I test how the joint presence of electoral rules and interest group intermediation affect policy. As a first step, I plot electoral rules against concertation to demonstrate that they covary in the expected direction (see online appendix). Next, I extract the first principal component of the two variables. The resulting variable measures countries along a spectrum ranging from the joint presence of PR rules and concertation to the joint presence of majoritarian rules and interest group pluralism. The measure is highly correlated with Lijphart's (2012) measure of consensus democracy (0.85), which is unsurprising since electoral rules and interest group intermediation constitute the institutional basis of his conceptualization.

Plotting the new variable against overall climate policy investment reveals a positive relationship (Figure 8). Consensus democracies with both PR rules and concertation have higher levels

of investment compared to majoritarian ones with first-past-the-post rules and interest group pluralism. Cross-national OLS models with controls confirm the robustness of this result (Table 1 – Model 8).

Figure 8. Institutional complementarities and climate policy investment



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. X-axis is the first principal component of electoral rules and concertation. Fitted line with 95% confidence interval indicated by dotted lines.

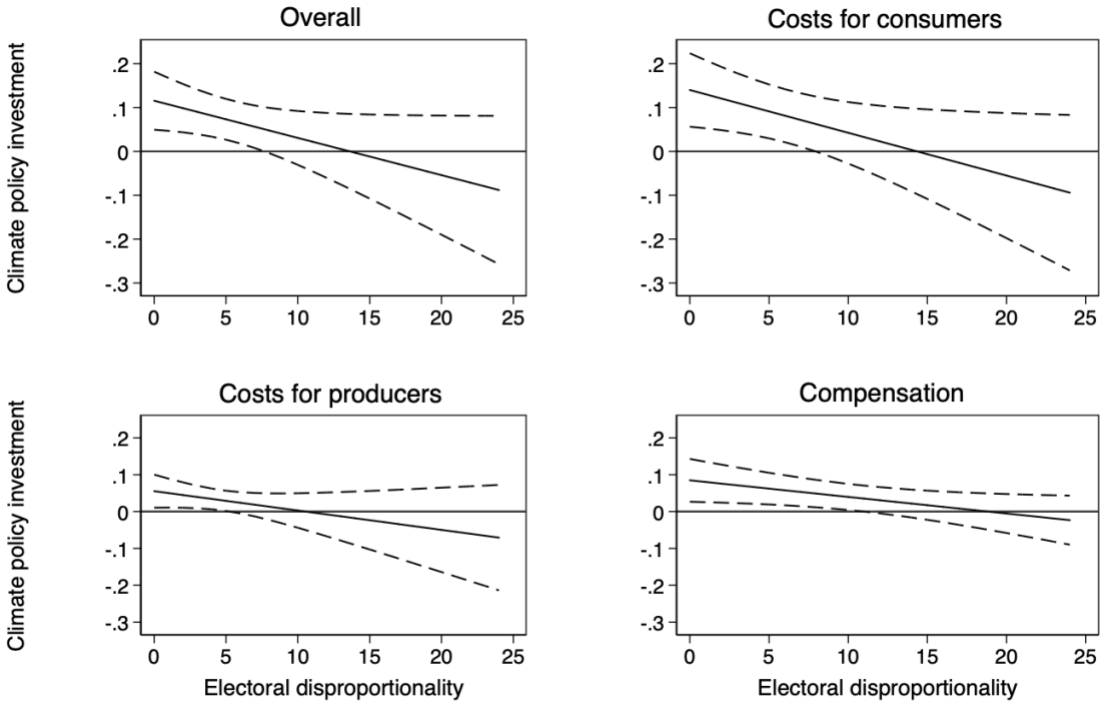
To investigate the relationship further, I again exploit within-country variation in concertation to estimate its influence at different levels of electoral disproportionality using two-way fixed effects models. To do so, I interact the two variables. If there is a complementarity, we should observe a negative coefficient for the interaction term, which would indicate that the positive reinforcing impact of concertation is highest under proportional rules, then diminishes as rules become more disproportional.

Table 2 presents the results. As expected, the coefficients are negative (Table 2 – Models 5-8). Figure 9 presents the marginal effects of the four models. Concertation has the largest and most

statistically significant positive impact on climate policy when electoral rules are proportional, all else equal (Figure 9 – top left). The result is similar when predicting costs for consumers (Figure 9 – top right), producers (Figure 9 – bottom left), and compensation (Figure 9 – bottom right). The results are robust to the inclusion of additional controls (see online appendix).

Overall, the evidence lends support to the key arguments. Electoral rules and interest group intermediation complement one another in important ways. Governments achieve the highest levels of climate policy investment, as well as imposing the highest costs on consumers and producers, when both PR rules and concertation are jointly present.

Figure 9. Institutional complementarities and policy investment: Marginal effects



Notes: Marginal effects of concertation at different levels of electoral disproportionality. Fitted line with 95% confidence interval indicated by dotted lines.

5. Conclusion

This paper offers a theoretical framework rooted in domestic political institutions that explains the wide variation in climate policy across the high-income capitalist democracies. It first reconceptualizes climate policy as a type of long-term policy investment that requires politicians to impose short-term costs on constituents in return for greater long-term benefits. Distributional conflict emerges along two axes: intertemporal and cross-sectional. Governments face the need to invest enough of today's resources to mitigate climate change while at the same time distributing the cost of such investments between producers and consumers in a manner that is political feasible and stable over time. In this way, reconceptualizing climate policy as long-term policy investment clarifies *how* climate change politics are distributional politics.

Institutions matter because they influence the necessary conditions for long-term climate policy investments to occur. They do so by structuring politics along two channels. The first shapes politics between electorally-minded politicians and voters. Here PR rules increase electoral safety by decreasing electoral accountability and electoral competition, which in turn enables governments to impose short-term costs on their constituents. The second channel shapes politics between government and cost-bearing industry. Concertation facilitates bargaining between the government and powerful economic actors over compensation for the losers of policy change, which helps governments overcome opposition from cost-bearing industry. What is more, the joint presence of both institutions generates complementarities that reinforce their independent effects. PR rules decrease risks associated with shifting costs toward voters, which opens up critical room to maneuver when negotiating compensation with cost-bearing groups. Tests using newly available cross-national data on shadow carbon prices for eighteen high-income democracies between 1995 and 2009 provide empirical support for the arguments.

This article pinpoints discrete causal mechanisms – electoral safety and compensation – that link institutions to climate policy investment and provides a theoretical account of their micro-foundations. Doing so contributes to the nascent literature on the comparative political economy of climate change, especially regarding the role of institutions (Andersen, 2019; Lipscy, 2018; Meckling & Nahm, 2018; Mildenberger, 2020). Moreover, the article offers broad theory about how packages of institutions systematically structure climate policy investment across countries, which helps to situate existing research, especially regarding the role of electoral politics, partisanship, business, and trust (Aklin & Urpelainen, 2013; Finnegan, 2018; Mildenberger, 2020; Rafaty, 2018; Tvinnereim, 2013), by mapping the institutional environment within which these processes play out.

The arguments also imply two-ideal type varieties of climate politics across the high-income democracies. The first is produced by consensus-based democratic institutions (PR and concertation). In addition to shifting the costs of climate policy toward consumers and away from producers, we should expect that politicians face greater incentives for cross-party consensus and that policy enjoys greater support from cost-bearing industry and lower public conflict. Furthermore, policy change is likely to be incremental rather than radical and offer compensation to losers. Given diffuse veto points, wholesale policy reversal should be rare. Archetypes of this model include the Nordic countries, as well as Austria, Germany, and Switzerland.

The second model is produced by competitive and adversarial institutions (first-past-the-post and interest group pluralism). Here we should expect costs to be either more evenly distributed between consumers and producers or directed more heavily toward producers. Moreover, we should expect little cross-party consensus or support from cost-bearing producers. We should also expect higher public conflict as cost-bearing industry attempts to influence policy change through directly influencing voter preferences. However, given the winner-take-all nature of elections there is likely greater capacity for radical policy change (Mildenberger 2020). Though the threat of policy reversal is

also higher, as opposition parties are empowered to change course dramatically after winning elections, creating boom and bust cycles for climate policy. Archetypes of this model include Australia, Canada, the UK, and the US.

To be sure, additional research is needed to investigate these mechanisms. Future work could, for example, examine the link between electoral rules and climate policy credibility, electoral rules and party positions on climate change, corporatism and public climate change skepticism, and both institutions and policy reversal. In addition, research is needed that examines the effect of other complementarity institutions, especially legislative committees, corporate governance structures, and welfare states. Lastly, additional measures of climate policy investment, especially time series data that reach back into the 1980s, are needed to analyze the effect of institutions over longer time periods.

The results also contribute to the emerging literature on the politics of long-term policymaking. Countries are able to achieve higher levels of climate policy investment when politicians have a low risk of losing office and can overcome opposition from cost-bearing organized groups – two key necessary conditions hypothesized by Jacobs (2011; 2016).

Moreover, the paper is the first to extend this literature to the critical case of climate change – a long-term problem whose future costs and benefits cannot be redistributed. Under these conditions, I find that the opportunities for and constraints on short-term cross-sectional distribution are crucial. Those countries that distribute short-term costs toward voters and away from industry (i.e., simultaneous cross-sectional and intertemporal redistribution) are also those that have higher overall levels of climate policy investment. In contrast, those that impose similar short-term costs on both groups (i.e., pursue vertical investment) have lower levels of overall investment. This suggests a relationship between types of policy investment (simultaneous cross-sectional and intertemporal versus vertical) and overall levels of investment. Further research is needed to explore these dynamics.

Lastly, the analysis points to causal mechanisms that predict that consensus democracies are better able address a wider range of long-term policy challenges apart from climate change. Previous CPE scholars have suggested this hypothesis (e.g., Birchfield and Crepaz 1998; Lindvall 2017; Martin 2015; Steinmo 1989). This paper links institutions present in these political economies to one type of long-term policy investment. Additional research is needed to further test the relationship across other policy areas.

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Online appendix

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A1. Summary statistics

Table A1. Summary statistics

Variable	Source	Obs	Mean	Std. Dev.	Min	Max
Overall climate policy investment (2005 USD per toe)	Althammer & Hille (2016)	270	0.217	0.267	-0.290	1.089
Costs for consumers (2005 USD per toe)	Althammer & Hille (2016)	270	0.286	0.342	-0.356	1.405
Costs for producers (2005 USD per toe)	Althammer & Hille (2016)	270	0.060	0.141	-0.206	0.696
Compensation (2005 USD per toe)	Althammer & Hille (2016)	270	0.226	0.287	-0.276	1.286
Electoral disproportionality	Lijphart (2012)	18	6.996	5.501	1.080	19.56
Electoral disproportionality	Armingeon et al. (2016)	269	7.021	5.911	0.350	24.61
Routine involvement of employers and labor unions in policymaking	Visser (2015)	269	1	0.801	0	2
Routine involvement of employers and labor unions in policymaking	Author's recoding based on Visser (2015)	269	1.112	0.793	0	2
EU membership	Armingeon et al. (2016)	270	0.778	0.417	0	1
Institutional constraints	Armingeon et al. (2016)	269	3.781	2.208	1	10
Green preferences of governments	Jahn (2016)	269	-2.779	7.072	23.152	-16.794
Fossil fuel production per capita (toe per capita)	IEA (2018)	269	2.324	3.383	0	12.885
Real GDP growth rate	Armingeon et al. (2016)	269	2.385	2.594	-8.270	11.27
Left-right position of government	Jahn (2016)	269	2.293	5.220	-12.788	21.497
Unemployment rate	Armingeon et al. (2016)	269	7.438	2.849	3.100	20.700
Real GDP per capita ($10,000s)	OECD (2018)	269	3.091	0.533	1.810	4.535
Industry value added (as % of GDP)	World Bank (2019)	255	27.587	4.215	17.126	39.654
Carbon intensity of total primary energy supply (TPES)	IEA (2018)	269	54.655	13.064	20.680	80.600

Political constraints (POLCON III)	Henisz (2002)	269	0.490	0.094	0.225	0.718
Perception of corruption	Standaert (2015)	270	25.060	10.774	7.460	52.494

A2. Coding for economic sectors

Table A2. List of sectors and coding

Sector	ISIC Rev 3.1 Classification	Coding
Agriculture, Hunting, Forestry and Fishing	A to B	Consumer[1]
Mining and Quarrying	C	Producer
Food, Beverages and Tobacco	D: 15 to 16	Producer
Textiles and Textile Products	D: 17 to 18	Producer
Leather, Leather and Footwear	D: 19	Producer
Wood and Products of Wood and Cork	D: 20	Producer
Pulp, Paper, Paper , Printing and Publishing	D: 21 to 22	Producer
Coke, Refined Petroleum and Nuclear Fuel	D: 23	Producer
Chemicals and Chemical Products	D: 24	Producer
Rubber and Plastics	D: 25	Producer
Other Non-Metallic Mineral	D: 26	Producer
Basic Metals and Fabricated Metal	D: 27 to 28	Producer
Machinery, Nec	D: 29	Producer
Electrical and Optical Equipment	D: 30 to 33	Producer
Transport Equipment	D: 34 to 35	Producer
Manufacturing, Nec; Recycling	D: 36 to 37	Producer
Electricity, Gas and Water Supply	E	Producer
Construction	F	Consumer
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	G: 50	Consumer
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	G: 51	Consumer
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	G: 52	Consumer
Hotels and Restaurants	H	Consumer
Inland Transport	I: 60	Consumer
Water Transport	I: 61	Consumer
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	I: 63	Consumer
Post and Telecommunications	I: 64	Consumer
Financial Intermediation	J	Consumer
Real Estate Activities	K: 70	Consumer
Renting of M&Eq and Other Business Activities	K: 71 to 74	Consumer

[1] Agriculture, Hunting, Forestry and Fishing is coded as "consumer" because Althammer and Hille (2016, 636) use household energy prices to calculate the shadow price for the sector.

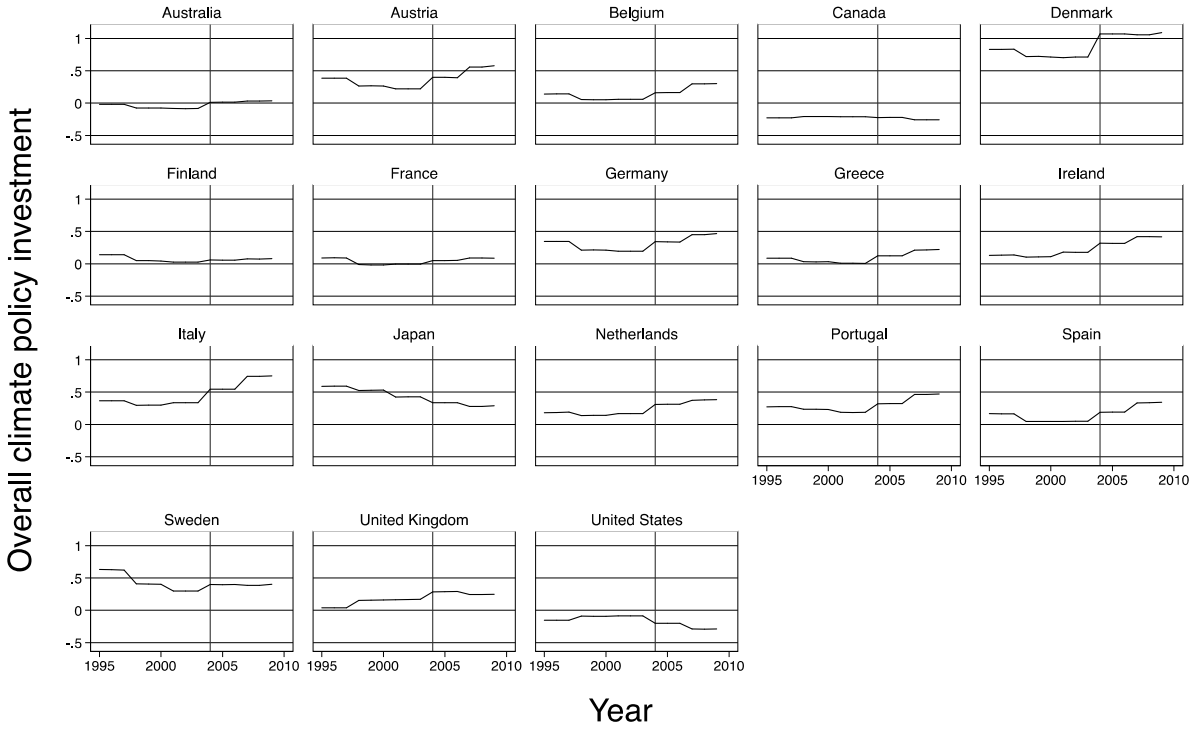
Public Admin and Defence; Compulsory Social Security	L	Consumer
Education	M	Consumer
Health and Social Work	N	Consumer
Other Community, Social and Personal Services	O	Consumer

A3. Validating climate policy stringency measure

To validate the wedge coefficient λ_E measure, I test whether stringency increases in countries of European Union (EU) after the implementation of the EU Emissions Trading System (EU ETS) in 2005.

Figure A1 plots overall climate policy investment across the sample of countries. Because Althammer and Hille (2016) estimate shadow prices for five time periods: 1995-1997, 1998-2000, 2001-2003, 2004-2006, and 2007-2009, we should observe stringency increasing from 2004 onwards in EU countries as a result of the EU ETS (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, and the UK). Indeed, this trend is observed. Furthermore, we observe no similar increase in non-EU countries (Australia, Canada, Japan, and the US).

Figure A1. Validating measure of climate policy stringency



A4. Testing mechanisms: Electoral competition and electoral accountability

Here I test whether the theorized mechanisms of electoral competition and electoral accountability link electoral rules to climate policy. As a first step, I establish that electoral rules are a key predictor of both of these outcomes.

To generate a measure of electoral competition, I utilize loss probability data from Kayser and Lindstädt (2015). Their measure captures the "expected probability that the plurality party in parliament loses its seats plurality in the next election" from the perspective of that party (Kayser and Lindstädt 2015, 243).

Electoral competition is highest at middle values of loss probability. It is around these values that plurality parties should be most responsive to the electorate in an effort to maximize votes and secure electoral success. To measure electoral competition, I therefore use Formula 1 to calculate the absolute distance of each plurality party's loss probability from 0.5, or theoretically perfect competition, and then rescale the variable to a range of 0 to 1, where 1 is equal to perfect competition:

$$\left(\frac{1-|loss\ probability_{i,t} - 0.5|}{0.5}\right) - 1 \quad (1)$$

To measure electoral accountability, I use data from Lijphart (2012) on the average percentage of minimal winning one-party cabinets between 1980 and 2010. The assumption is that electoral accountability is higher under single-party governments because, compared to multi-party governments, voters will find it easier to assign responsibility for policies they dislike and punish the government by removing it from office.

To test whether electoral rules predict both competition and single-party government, I estimate two OLS models (Table A4). In both cases, electoral disproportionality is a statistically significant predictor of both outcomes and the coefficients have the expected signs.

Table A4. Electoral rules, electoral competition, and single-party governments

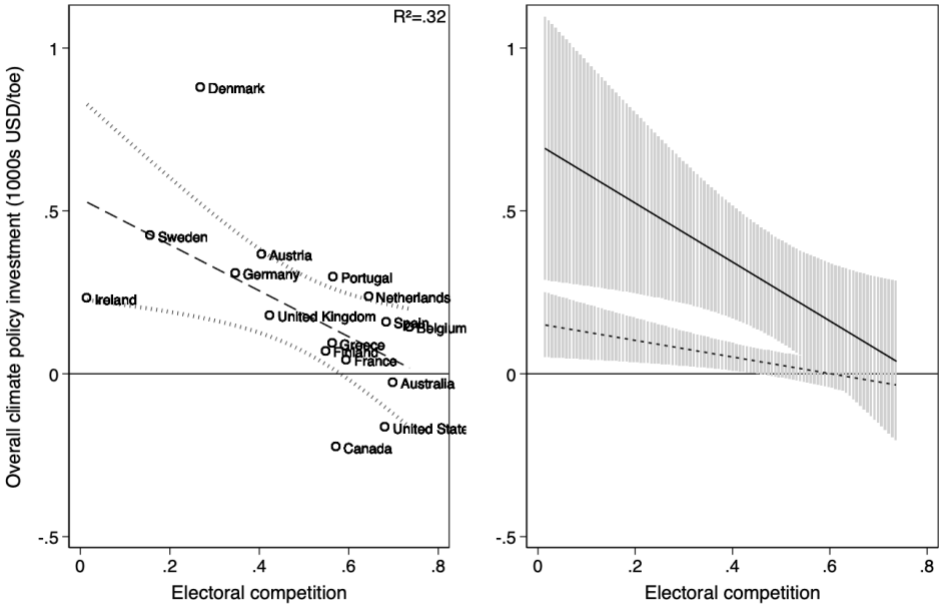
	(1) Electoral competition	(2) % of minimal winning one-party cabinets
Electoral disproportionality	0.0120***	3.074**
	(0.00332)	(1.266)
Constant	0.388***	28.53***
	(0.0290)	(9.318)
R^2	0.0376	0.284
N	359	18

Notes: Electoral disproportionality is average from 1981-2010. Electoral competition is yearly observations from 1988 to 2013. Percentage of minimal winning one-party cabinets is average from 1981 to 2010. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Electoral competition and climate policy investment

I turn first to testing the relationship between electoral competition and climate policy investment. Figure A2 plots the relationship between electoral competition and overall policy stringency (left side), as well as competition and the imposition of costs on consumers versus producers (right side). In line with expectations, countries with lower levels of competition have higher policy stringency and impose higher costs on consumers. Cross-national OLS models broadly confirm the relationships illustrated by the scatter plots (Table A5).

Figure A2. Electoral competition and climate policy investment



Notes: Climate policy investment is averaged from 1995-2009. Electoral competition is averaged from 1988-2013 and weighted by sector output. Right panel: Solid line is costs imposed on consumers; dashed line is costs imposed on producers. Fitted lines with 95% confidence intervals indicated by dotted lines (left panel) and shaded areas (right panel).

Table A5. Electoral competition and climate policy investment

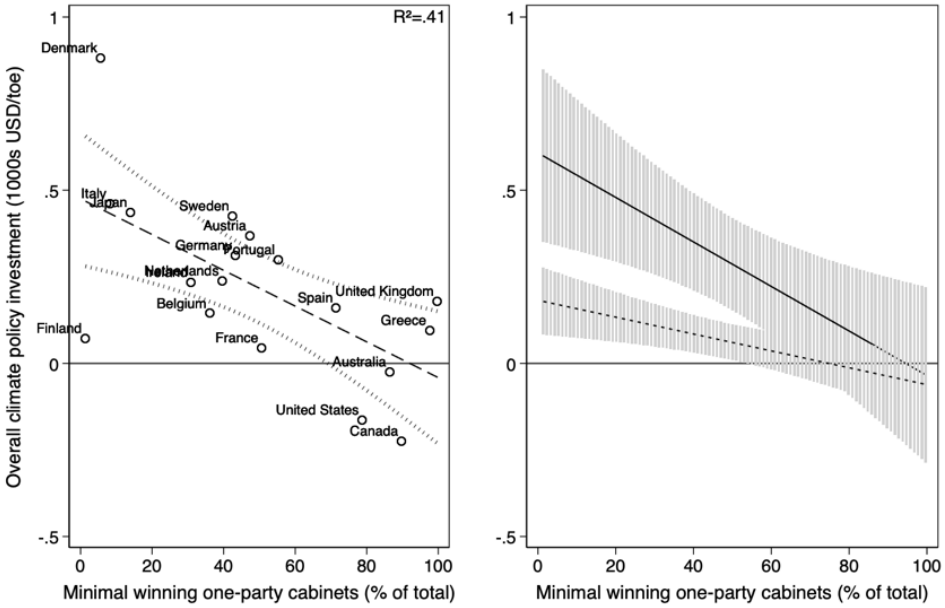
	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers
Electoral competition	-0.609**	-0.808**	-0.157
	(0.257)	(0.326)	(0.0916)
EU Membership	0.399	0.543	0.0321
	(0.245)	(0.333)	(0.108)
Institutional constraints	-0.0136	-0.0136	-0.00761
	(0.0254)	(0.0338)	(0.0115)
Green policy preferences	-0.00160	-0.00507	0.00512
	(0.00808)	(0.0106)	(0.00284)
Real GDP growth	-0.0861*	-0.129**	0.0159
	(0.0397)	(0.0505)	(0.0144)
Fossil fuel production	0.0265	0.0378	-0.00897
	(0.0236)	(0.0308)	(0.0111)
Constant	0.368	0.492	0.103
	(0.374)	(0.492)	(0.174)
R^2	0.721	0.721	0.700
N	16	16	16

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Electoral accountability and climate policy investment

I next test the relationship between electoral accountability and climate policy investment. Figure A3 plots the relationship between the average percentage of minimal winning single-party cabinets in each country against overall policy stringency, as well as single-party government and the imposition of costs on consumers versus producers (right side). In line with expectations, countries with fewer single-party governments have higher policy stringency and impose higher costs on consumers. Cross-national OLS models broadly confirm the relationships illustrated by the scatter plots (Table A6).

Figure A3. Electoral accountability and climate policy investment



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Minimal winning one-party cabinets is averaged from 1980-2010. Right panel: solid line is costs imposed on consumers; dashed line is costs imposed on producers. Fitted lines with 95% confidence intervals indicated by dotted lines (left panel) and shaded areas (right panel).

Table A6. Single-party governments and climate policy investment

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers
% min. win. one-party cabinets	-0.00389*	-0.00502*	-0.00136
	(0.00192)	(0.00243)	(0.00100)
EU Membership	0.209	0.335*	-0.109*
	(0.125)	(0.162)	(0.0596)
Institutional constraints	-0.0290	-0.0306	-0.0185*
	(0.0194)	(0.0266)	(0.00983)
Green policy preferences	-0.0116*	-0.0175*	0.000798
	(0.00610)	(0.00817)	(0.00281)
Real GDP growth	-0.0705	-0.0969*	-0.00686
	(0.0407)	(0.0473)	(0.0325)
Fossil fuel production	0.0150	0.0265	-0.0202**
	(0.0194)	(0.0249)	(0.00704)
Constant	0.460**	0.514**	0.348***
	(0.163)	(0.208)	(0.0814)
R^2	0.707	0.698	0.565
N	18	18	18

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A5. Concertation and climate policy investment: Robustness

Below are additional tests of the relationship between concertation and climate change policy investment.

- **Concertation coding:** The main results use a modified version of Visser's (2015) measure of concertation (described in main text). Here I re-run both the cross-national (Table A7) and fixed effects (Table A8) models using Visser's original measure. They are not substantially different from the main results.
- **Fixed effects models with additional controls:** Table A9 re-estimates the fixed effects models from Table 2 of the main text with an additional set of controls. I include the left-right ideological position of the government from Jahn (2016) to further control for the effect of partisan preferences. The unemployment rate and real GDP per capita are added to further control for the state of the national economy, as well as income effects. To control for structural economic changes over time I include value added of industry as a percentage of GDP. I also include the carbon intensity of countries' total primary energy supply (TPES). Countries with less carbon-intensive energy may find it more feasible to adopt stringent climate policy. Henisz's (2002) measure of political constraints is included to control for veto points. Lastly, to control for political trust, I include the Baysian Corruption Index from Standaert (2015) to measure citizens' perception of government corruption. Previous cross-national studies suggest a link between trust and climate policy (Povitkina, 2018; Rafaty, 2018). The results do not substantively change once these additional are added.
- **Alternative specification:** To ensure that the results are not dependent on model specification, I estimate a series of "between-within", or hybrid, models (Table A10). The advantage of between-within models is that they simultaneously estimate both between- and within-country effects. Following Bell and Jones (2015), I estimate models of the form:

$$y_{it} = \beta_0 + \beta_1(x_{it} - \bar{x}_i) + \beta_2\bar{x}_i + \beta_3 z_i + (u_i + e_{it}) \quad (2)$$

where y_{it} is a measure of climate policy investment, x_{it} is a series of time-varying variables measured at the country-year level, and z_i is a series of time-invariant variables measured at

the country level. β_1 is the within-unit effect (relying on variation within countries over time) and β_2 is the between-unit effect (relying on variation across countries) for each time-variant variable x_{it}. β_3 is the between-country effect of each time-invariant variable z_i. The "random" part of the model is in brackets and consists of u_i, the higher-level error term for each country *i*, and e_{it}, the occasion-level error term for each country *i* in year *t*. I estimate the model within the random effects framework.[2]

- **Alternative operationalization of dependent variable:** The main cross-national results use average climate policy investment from 1995 to 2009 as the dependent variable. To ensure that the results are not contingent on this particular operationalization, I re-rerun the models from Table 1 of the main text using climate policy investment values from 1995 (the first year of the time series) and 2009 (the last year of the series). Tables A11 and A12 present the results. The coefficients are similar in magnitude for both years, as well as similar to the main results, suggesting that the influence of institutions is relatively stable over time.

[2] Random effects models are often criticized for not meeting their key identifying assumption that the residuals are independent of the covariates. Hybrid models overcome this issue (Bell & Jones 2015). Because they fully account for both within and between effects, no additional variance is absorbed by the error terms u_i and e_{it}, so they cannot be correlated with the covariates.

Table A7. Visser concertation coding and climate policy investment: Cross-national OLS models

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers	(4) Compensation
Concertation	0.182**	0.269**	-0.00317	0.272**
	(0.0812)	(0.105)	(0.0400)	(0.101)
EU Membership	-0.0310	-0.00629	-0.129	0.123
	(0.110)	(0.146)	(0.0760)	(0.145)
Institutional constraints	-0.0360	-0.0371	-0.0261**	-0.0110
	(0.0218)	(0.0277)	(0.0117)	(0.0243)
Green policy preferences	-0.0129*	-0.0206**	0.00301	-0.0237***
	(0.00673)	(0.00865)	(0.00341)	(0.00721)
Real GDP growth	-0.0900	-0.123	-0.0113	-0.112**
	(0.0604)	(0.0704)	(0.0392)	(0.0428)
Fossil fuel production	-0.00889	-0.00523	-0.0265***	0.0213
	(0.0179)	(0.0225)	(0.00766)	(0.0194)
Constant	0.404**	0.426*	0.359***	0.0665
	(0.172)	(0.212)	(0.100)	(0.161)
R^2	0.689	0.722	0.489	0.724
N	18	18	18	18

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8. Visser concertation coding and climate policy investment: Fixed effects models

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers	(4) Compensation
Concertation	0.0603**	0.0767**	0.0202	0.0565**
	(0.0217)	(0.0290)	(0.0122)	(0.0205)
Green policy preferences	-0.00276	-0.00267	-0.00236	-0.000308
	(0.00202)	(0.00229)	(0.00174)	(0.00173)
Fossil fuel production	0.00253	0.00512	-0.00546	0.0106
	(0.0163)	(0.0174)	(0.00905)	(0.0145)
Real GDP growth	-0.00466	-0.00750	0.000472	-0.00797
	(0.00530)	(0.00845)	(0.00297)	(0.00881)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2 – within	0.405	0.407	0.300	0.312
R^2 – between	0.402	0.410	0.238	0.248
R^2 – overall	0.266	0.265	0.224	0.194
Countries	18	18	18	18
N	269	269	269	269

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9. Concertation and climate policy investment: Fixed effects models with additional controls

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers	(4) Compensation
Concertation	0.0505**	0.0693**	0.00151	0.0678***
	(0.0208)	(0.0287)	(0.00932)	(0.0232)
Green policy preferences	-0.00527**	-0.00619**	-0.00289*	-0.00330
	(0.00226)	(0.00253)	(0.00157)	(0.00194)
Fossil fuel production	0.0125	0.0199	-0.00311	0.0230
	(0.0161)	(0.0189)	(0.0138)	(0.0186)
Real GDP growth	-0.00254	-0.00315	-0.00165	-0.00149
	(0.00636)	(0.00797)	(0.00386)	(0.00598)
Left-right position of gov	-0.00350	-0.00436	-0.00192	-0.00244
	(0.00267)	(0.00298)	(0.00204)	(0.00191)
Unemployment rate	-0.00278	0.00117	-0.00775	0.00892
	(0.00884)	(0.00983)	(0.00710)	(0.00533)
GDP per capita	0.0543	0.111	-0.0241	0.135
	(0.131)	(0.155)	(0.0993)	(0.109)
Industry value added	-0.0138	-0.0189	-0.00201	-0.0169
	(0.0121)	(0.0147)	(0.00690)	(0.0111)
Carbon intensity	-0.00739	-0.00625	-0.00780*	0.00155
	(0.00563)	(0.00653)	(0.00418)	(0.00502)
Political constraints	-0.0695	-0.0852	-0.0749	-0.0103
	(0.148)	(0.166)	(0.103)	(0.0973)
Perceptions of corruption	0.0261**	0.0256*	0.0305**	-0.00487
	(0.0121)	(0.0131)	(0.0105)	(0.00571)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2 – within	0.509	0.497	0.512	0.415
R^2 – between	0.054	0.101	0.121	0.044
R^2 – overall	0.018	0.040	0.128	0.112
Countries	18	18	18	18
N	255	255	255	255

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A10. Concertation and climate policy investment: Hybrid models

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers	(4) Compensation	(5) Overall climate policy investment	(6) Costs for consumers	(7) Costs for producers	(8) Compensation
Between-country effects								
Concertation	0.173***	0.249***	0.00706	0.242***	0.204*	0.320***	-0.0681	0.388***
	(0.0662)	(0.0826)	(0.0362)	(0.0721)	(0.105)	(0.119)	(0.0653)	(0.0656)
EU Membership	0.191*	0.318**	-0.129***	0.447***	0.395***	0.490***	0.113	0.377***
	(0.115)	(0.148)	(0.0473)	(0.129)	(0.147)	(0.173)	(0.0797)	(0.106)
Institutional constraints	-0.0225	-0.0181	-0.0248**	0.00672	0.00556	0.0106	-0.0123	0.0229**
	(0.0193)	(0.0249)	(0.0113)	(0.0228)	(0.0196)	(0.0223)	(0.0142)	(0.0109)
Green policy preferences	-0.0112*	-0.0179**	0.00263	-0.0206***	-0.00126	-0.00346	0.00189	-0.00535
	(0.00578)	(0.00762)	(0.00263)	(0.00658)	(0.00829)	(0.00963)	(0.00394)	(0.00615)
Fossil fuel production	0.0110	0.0232	-0.0254***	0.0487**	0.00102	0.00763	-0.0133	0.0209*
	(0.0194)	(0.0244)	(0.00720)	(0.0214)	(0.0173)	(0.0198)	(0.0109)	(0.0108)
Real GDP growth	-0.0798*	-0.107**	-0.0139	-0.0932***	-0.0874***	-0.110***	-0.0410**	-0.0693***
	(0.0417)	(0.0456)	(0.0347)	(0.0258)	(0.0264)	(0.0313)	(0.0165)	(0.0227)
Left-right position of gov					0.0304**	0.0340**	0.0118	0.0223**
					(0.0130)	(0.0150)	(0.00795)	(0.0106)
Unemployment rate					-0.0344**	-0.0369*	-0.0224*	-0.0145
					(0.0174)	(0.0198)	(0.0116)	(0.0117)
GDP per capita					0.0412	0.0529	0.0442	0.00870
					(0.0891)	(0.106)	(0.0485)	(0.0633)
Industry value added					0.0197	0.0180	0.0269***	-0.00897
					(0.0127)	(0.0147)	(0.00639)	(0.00854)
Carbon intensity					0.00492*	0.00467	0.00369*	0.000978
					(0.00297)	(0.00343)	(0.00214)	(0.00186)
Political constraints					-1.096	-1.716*	0.393	-2.109***
					(0.823)	(0.945)	(0.475)	(0.561)
Perceptions of corruption					0.00192	-0.000811	0.00914***	-0.00995**
					(0.00600)	(0.00695)	(0.00332)	(0.00434)
Within-country effects								
Concertation	0.0607***	0.0771***	0.0218*	0.0565***	0.0757**	0.0924**	0.0327*	0.0597*
	(0.0223)	(0.0296)	(0.0126)	(0.0209)	(0.0306)	(0.0391)	(0.0178)	(0.0317)

Green policy preferences	-0.00249	-0.00244	-0.00213	-0.000345	-0.00574**	-0.00662***	-0.00323**	-0.00340*
	(0.00200)	(0.00230)	(0.00166)	(0.00171)	(0.00231)	(0.00256)	(0.00161)	(0.00198)
Fossil fuel production	0.00928	0.0115	-0.00425	0.0157	0.0212	0.0286	0.00160	0.0270*
	(0.0183)	(0.0188)	(0.00886)	(0.0138)	(0.0150)	(0.0174)	(0.0131)	(0.0159)
Real GDP growth	-0.00537	-0.00820	0.000230	-0.00841	-0.00350	-0.00429	-0.00163	-0.00266
	(0.00532)	(0.00852)	(0.00310)	(0.00891)	(0.00662)	(0.00827)	(0.00422)	(0.00645)
Left-right position of gov					-0.00377	-0.00463	-0.00210	-0.00252
					(0.00283)	(0.00313)	(0.00218)	(0.00185)
Unemployment rate					-0.00159	0.00222	-0.00620	0.00842
					(0.00843)	(0.00919)	(0.00727)	(0.00528)
GDP per capita					0.0305	0.0875	-0.0347	0.122
					(0.128)	(0.152)	(0.0996)	(0.119)
Industry value added					-0.0152	-0.0207	-0.00397	-0.0167
					(0.0113)	(0.0137)	(0.00678)	(0.0108)
Carbon intensity					-0.00817*	-0.00763	-0.00745**	-0.000182
					(0.00419)	(0.00479)	(0.00378)	(0.00398)
Political constraints					-0.0266	-0.0430	-0.0448	0.00180
					(0.147)	(0.163)	(0.108)	(0.106)
Perceptions of corruption					0.0288**	0.0303**	0.0314***	-0.00104
					(0.0133)	(0.0146)	(0.0111)	(0.00678)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 – within	0.407	0.409	0.299	0.315	0.510	0.500	0.482	0.418
R^2 – between	0.721	0.749	0.493	0.726	0.900	0.919	0.860	0.952
R^2 – overall	0.678	0.709	0.455	0.698	0.820	0.846	0.761	0.900
Countries	18	18	18	18	18	18	18	18
N	268	268	268	268	254	254	254	254

Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. EU membership and institutional constraints are excluded from the within-country part of the model because they do not vary over time.

Table A11. Institutions and climate policy investment in 1995: Cross-national OLS models

	(1) Overall	(2) Costs for consumers	(3) Costs for producers	(4) Overall	(5) Costs for consumers	(6) Costs for producers	(7) Compensation	(8) Overall	(9) Costs for consumers	(10) Costs for producers	(11) Compensation
Electoral disproportionality	-0.0224**	-0.0327***	-0.00203								
	(0.00730)	(0.00966)	(0.00335)								
Concertation				0.212**	0.291**	0.0444	0.247**				
				(0.0785)	(0.0994)	(0.0328)	(0.0814)				
First principal component								0.127**	0.179***	0.0189	0.160***
								(0.0439)	(0.0559)	(0.0178)	(0.0457)
EU membership	-0.0444	0.0356	-0.245**	0.0541	0.175	-0.231**	0.406**	-0.00670	0.0912	-0.243**	0.334**
	(0.119)	(0.147)	(0.0796)	(0.145)	(0.191)	(0.0747)	(0.182)	(0.120)	(0.153)	(0.0783)	(0.145)
Institutional constraints	-0.0322	-0.0321	-0.0275*	-0.0223	-0.0205	-0.0226*	0.00208	-0.0248	-0.0229	-0.0250*	0.00214
	(0.0234)	(0.0303)	(0.0143)	(0.0229)	(0.0310)	(0.0123)	(0.0296)	(0.0213)	(0.0284)	(0.0132)	(0.0273)
Green policy preferences	-0.0130*	-0.0198**	0.00102	-0.0139*	-0.0206*	0.000138	-0.0207**	-0.0144**	-0.0215**	0.000470	-0.0220**
	(0.00587)	(0.00785)	(0.00268)	(0.00686)	(0.00946)	(0.00245)	(0.00885)	(0.00615)	(0.00848)	(0.00259)	(0.00800)
Real GDP growth	-0.110*	-0.158**	-0.00674	-0.0782*	-0.113**	-0.00142	-0.112***	-0.101**	-0.145**	-0.00612	-0.139***
	(0.0525)	(0.0633)	(0.0291)	(0.0360)	(0.0415)	(0.0258)	(0.0260)	(0.0426)	(0.0496)	(0.0273)	(0.0314)
Fossil fuel production	-0.0153	-0.00808	-0.0355***	-0.00319	0.00838	-0.0325***	0.0409	-0.00628	0.00456	-0.0339***	0.0385
	(0.0191)	(0.0236)	(0.00899)	(0.0233)	(0.0296)	(0.00862)	(0.0251)	(0.0209)	(0.0261)	(0.00887)	(0.0213)
Constant	0.802***	0.975***	0.455***	0.191	0.126	0.340**	-0.214	0.528***	0.583**	0.420***	0.163
	(0.186)	(0.233)	(0.115)	(0.268)	(0.347)	(0.126)	(0.295)	(0.166)	(0.215)	(0.112)	(0.202)
R^2	0.714	0.725	0.721	0.780	0.777	0.757	0.728	0.785	0.795	0.737	0.771
N	17	17	17	17	17	17	17	17	17	17	17

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

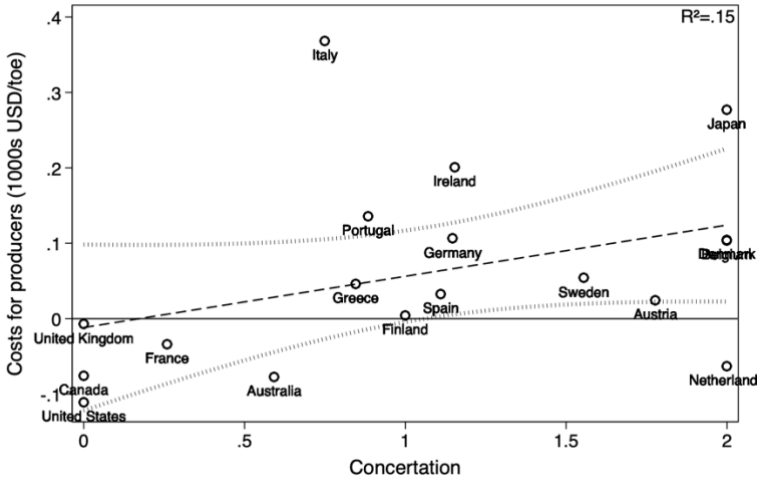
Table A12. Institutions and climate policy investment in 2009: Cross-national OLS models

	(1) Overall	(2) Costs for consumers	(3) Costs for producers	(4) Overall	(5) Costs for consumers	(6) Costs for producers	(7) Compensation	(8) Overall	(9) Costs for consumers	(10) Costs for producers	(11) Compensation
Electoral disproportionality	-0.0252***	-0.0342***	-0.00723								
	(0.00639)	(0.00819)	(0.00404)								
Concertation				0.204*	0.292**	-0.0000478	0.292**				
				(0.101)	(0.120)	(0.0718)	(0.101)				
First principal component								0.131**	0.181**	0.0168	0.165**
								(0.0490)	(0.0613)	(0.0282)	(0.0591)
EU membership	0.357**	0.457**	0.0523	0.474**	0.619**	0.0696	0.550***	0.408**	0.525**	0.0684	0.457**
	(0.148)	(0.191)	(0.0726)	(0.167)	(0.209)	(0.0733)	(0.175)	(0.141)	(0.176)	(0.0796)	(0.158)
Institutional constraints	-0.0204	-0.0145	-0.0170	-0.0151	-0.00497	-0.0248	0.0198	-0.0153	-0.00652	-0.0206	0.0141
	(0.0271)	(0.0347)	(0.0127)	(0.0270)	(0.0329)	(0.0186)	(0.0279)	(0.0241)	(0.0305)	(0.0139)	(0.0278)
Green policy preferences	-0.0117	-0.0188*	0.00326	-0.0120	-0.0196*	0.00510	-0.0247**	-0.0128	-0.0205*	0.00414	-0.0246***
	(0.00761)	(0.00946)	(0.00405)	(0.00811)	(0.0102)	(0.00433)	(0.00828)	(0.00768)	(0.00961)	(0.00404)	(0.00730)
Real GDP growth	-0.0969	-0.115	-0.0315	-0.0757	-0.0860	-0.0285	-0.0575	-0.0928	-0.110	-0.0293	-0.0809
	(0.0736)	(0.0868)	(0.0537)	(0.0689)	(0.0773)	(0.0567)	(0.0421)	(0.0688)	(0.0789)	(0.0533)	(0.0514)
Fossil fuel production	0.0133	0.0193	-0.0164	0.0246	0.0357	-0.0174	0.0532	0.0224	0.0321	-0.0158	0.0479
	(0.0246)	(0.0307)	(0.0109)	(0.0281)	(0.0347)	(0.0122)	(0.0299)	(0.0262)	(0.0321)	(0.0114)	(0.0268)
Constant	0.456*	0.504	0.319**	-0.125	-0.317	0.285	-0.602*	0.176	0.120	0.265*	-0.145
	(0.228)	(0.293)	(0.129)	(0.349)	(0.408)	(0.262)	(0.302)	(0.212)	(0.259)	(0.142)	(0.210)
R^2	0.688	0.696	0.447	0.708	0.738	0.418	0.721	0.721	0.745	0.426	0.677
N	18	18	18	18	18	18	18	18	18	18	18

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A6. Concertation and costs for producers

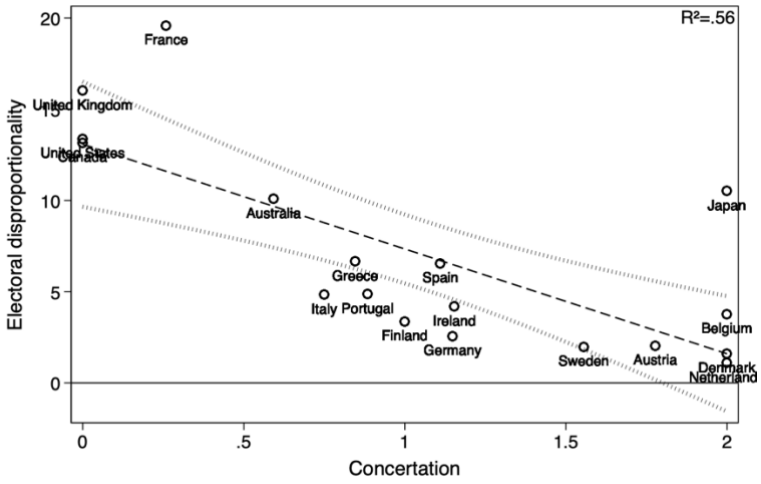
Figure A4. Concertation and costs for producers



Notes: Costs for producers is averaged from 1995-2009 and weighted by sector output. Concertation is averaged from 1988-2013. Fitted line with 95% confidence interval indicated by dotted lines.

A7. Institutional complementarities: Electoral rules and interest group intermediation

Figure A5. Electoral rules and interest group intermediation



Notes: Concertation is averaged from 1988-2013 and weighted by sector output. Electoral disproportionality is averaged from 1980-2010. Fitted line with 95% confidence interval indicated by dotted lines.

A8. Institutional complementarities and climate policy investment: Robustness

Below I re-estimate the main results from Table 2 with additional controls. The findings do not substantively change.

Table A13. Institutional complementarities and climate policy investment: FE models with additional controls

	(1) Overall climate policy investment	(2) Costs for consumers	(3) Costs for producers	(4) Compensation
Concertation	0.0938***	0.122**	0.0233	0.0983***
	(0.0314)	(0.0422)	(0.0158)	(0.0336)
Electoral disproportionality	0.000818	0.00164	-0.00160**	0.00324
	(0.00201)	(0.00250)	(0.000726)	(0.00230)
Concertation * Electoral dis.	-0.00647*	-0.00787*	-0.00311	-0.00476**
	(0.00344)	(0.00380)	(0.00277)	(0.00193)
Green policy preferences	-0.00417**	-0.00493**	-0.00216*	-0.00277
	(0.00196)	(0.00227)	(0.00118)	(0.00201)
Fossil fuel production	0.0118	0.0191	-0.00379	0.0229
	(0.0144)	(0.0169)	(0.0134)	(0.0177)
Real GDP growth	-0.00323	-0.00398	-0.00198	-0.00201
	(0.00619)	(0.00774)	(0.00388)	(0.00579)
Left-right position of gov	-0.00212	-0.00275	-0.00106	-0.00169
	(0.00265)	(0.00304)	(0.00186)	(0.00207)
Unemployment rate	-0.00214	0.00200	-0.00757	0.00957*
	(0.00895)	(0.00992)	(0.00721)	(0.00527)
GDP per capita	0.0562	0.114	-0.0238	0.138
	(0.122)	(0.144)	(0.0949)	(0.104)
Industry value added	-0.0121	-0.0169	-0.00121	-0.0157
	(0.0116)	(0.0140)	(0.00674)	(0.0106)
Carbon intensity	-0.00764	-0.00653	-0.00802*	0.00149
	(0.00536)	(0.00617)	(0.00417)	(0.00479)
Political constraints	-0.126	-0.150	-0.116*	-0.0339
	(0.106)	(0.132)	(0.0635)	(0.103)
Perceptions of corruption	0.0212*	0.0200	0.0269**	-0.00691
	(0.0110)	(0.0118)	(0.00989)	(0.00475)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2 – within	0.531	0.520	0.532	0.427
R^2 – between	0.037	0.072	0.126	0.083
R^2 – overall	0.003	0.010	0.138	0.165
Countries	18	18	18	18
N	255	255	255	255

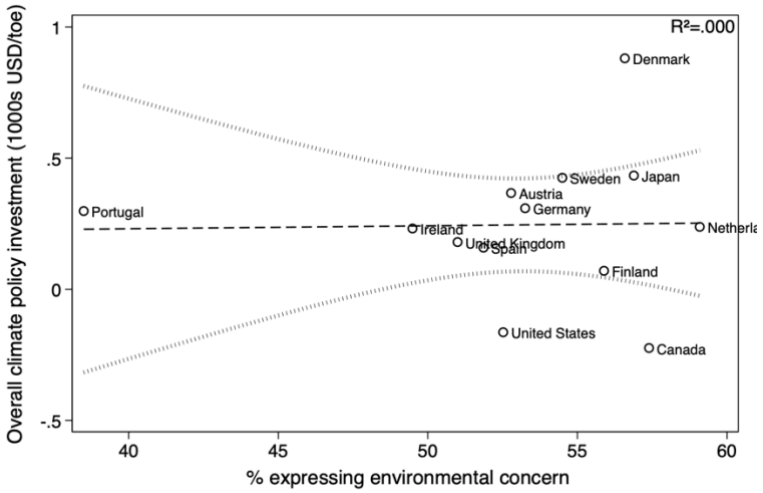
Notes: Robust standard errors in parentheses clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A9. Public opinion and climate policy investment

The series of plots below compare three different measures of public opinion with overall climate policy investment. The measure "Environmental concern" is a score calculated by Franzen and Vogl (2013) based on responses to environmental-related question in three waves of International Social Survey Programme (ISSP) surveys: 1993, 2000, and 2010. The measure "Willing to pay higher taxes to protect the environment" is taken from ISSP data for the question "…how willing would you be to pay much higher taxes in order to protect the environment?" (ISSP Research Group 2019). It is the sum of those that responded either "very willing" or "fairly willing". It is averaged across three waves: 1993, 2000, and 2010. The measure "Climate change is a personal threat" is taken from a 2007-08 Gallup survey data (Gallup 2009).

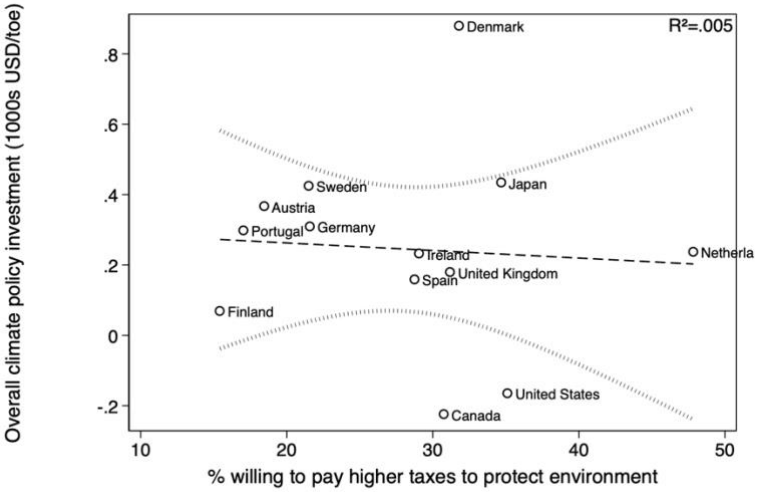
The figures provide little evidence of a cross-national relationship between public opinion and climate change policy. Indeed, in Figure A8 the relationship runs counter to expectations.

Figure A6. Environmental concern and overall climate policy investment



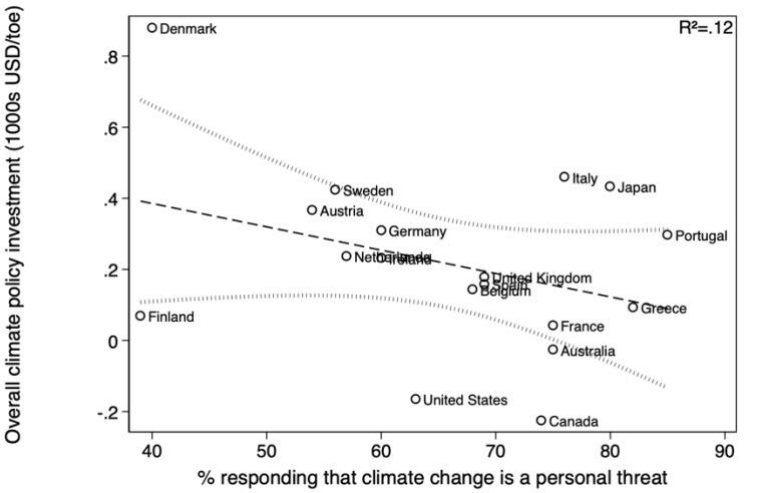
Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Percentage expressing environmental concern taken from Franzen and Vogl (2013). Fitted line with 95% confidence interval indicated by dotted lines.

Figure A7. Willingness to pay and overall climate policy investment



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Percentage willing to pay higher taxes to protect environment taken International Social Survey Programme (ISSP) surveys. Fitted line with 95% confidence interval indicated by dotted lines.

Figure A8. Personal threat and overall climate policy investment



Notes: Climate policy investment is averaged from 1995-2009 and weighted by sector output. Percentage responding that climate is a personal threat taken from 2007-08 Gallup (Gallup 2009). Fitted line with 95% confidence interval indicated by dotted lines.

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