Mitigating Mitigation: How Labor Protection Strengthens Climate Policy

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Abstract

Climate change policy has distributive impacts, potentially affecting investors, consumers, and workers. But climate policy does not emerge in a vacuum: it is formed within pre-existing political economy contexts which shape its chances of passage and where its costs ultimately fall. There is longstanding interest in whether countries that protect labor or that have strong labor movements are more or less likely to enact strong mitigation policy. So far the relevant literature has focused on overall pollution levels and national measures of policy, and not on the distribution of policy burdens across different parts of the economy. The results have been conflicting, with evidence for both labor support and labor blocking. This paper helps to resolve this debate by employing sector-level data on mitigation policy stringency. I show that the effect of arrangements which protect labor–like coordinating institutions, strong unions, and stringent employment policies–are conditional on sector-specific factors. I conclude that when protective arrangements are in place, labor is willing to accept higher climate policy burdens.

> "We only have this one earth, not several of them. We should all be aware of that. There is no contradiction between a reduction of CO_2 and secure jobs. They both go together."
>
> Uwe Hück
> *Chairman of the Central Works Council, Porsche*

> "[I]t is difficult for progressive unionists to put climate change on their unions' agenda when workers say, 'I will die quicker from not having a job than from climate change."'
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> Dimitris Stevis, David Uzzell, Nora Räthzel
> *The Labour-Nature Relationship:*
> *Varieties of Labour Environmentalism*

1 Introduction

Climate policy does not exist in a vacuum. It always sits in a wider context of non-climate policy regimes, which have the potential to change where the burden of mitigation policy ultimately falls. This is especially true for policies affecting redistribution, social protection, and state-market coordination, which may intensify or ameliorate the costs of mitigation. The purpose of this paper is to ask how these broader political economy arrangements affect the targeting of climate policy.

Previous literature has already examined how political economy institutions shape countries' environmental performance. But the focus has generally been on levels of pollution across the economy as a whole, and not on the distribution of policy burdens within the economy. Accounts of the role that factors like corporatism, union strength, and welfare policies play in climate politics are incomplete without examining how they affect burden allocations among different economic groups.

In this paper I look at how the protective and coordinating elements in the state-market relationship affect the allocation of climate policy burdens between labor and capital. There are too broad possibilities suggested by the political economy literature.

I briefly summarize them here, before discussing them in more detail below. The first is that there is an antagonistic relationship between protective, coordinating arrangements and climate policy, as such arrangements indicate stronger interest groups better able to block robust climate action. The second is that there is a complementary relationship, in which protection and coordination help insulate groups from the full burden of climate policy, reducing their opposition to mitigation.

I will argue and present evidence that the second relationship dominates, with the result that more institutions of protection and coordination mean more burden is assigned to labor-intense, dirty sectors. The findings are based on three components of labor coordination and protection: institutions, organizations, and policies. To track these concepts, I use data on corporatism, varieties of capitalism, union density, union centralization, employment protection, active labor market programs, and general redistribution. Collectively, these data support the hypothesis that labor bears more of the burden of climate policy when this burden can be softened by other protective arrangements.

This paper will be structured as follows. First, I survey how the wider political economy context has been incorporated into the study of climate politics so far. Second, I modify the expectations of this literature to focus on distributional factors. Third, I describe my empirical strategy and data. Fourth, I discuss the results, with a special focus on three-way interactions between protective arrangements, emissions intensity, and factor intensity. Fourth, I conclude with a discussion of what the findings mean for efforts to promote climate policy is non-coordinated economies, as well as other ways my argument could be tested in future work.

2 Coordination, Protection, and the Climate Policy Literature

The environment is a relatively new subject for state concern, having only come to prominence in the 1960s and 1970s. Climate change is even newer, with concerted interest

among politicians and the public only developing in the 1990s. This newness means that climate politics has always been situated within earlier institutions and policies. In the words of Duit et al. (2016), "the new environmental mandates and programmes were 'layered' on top of pre-existing societal arrangements, creating tensions with more deeply embedded state imperatives." These pre-existing political economy arrangements and their effect on climate policy are my focus below.

Differences in national political economy arrangements have not been fully incorporated into the study of climate politics (Purdon, 2015; Mikler and Harrison, 2012; Steinberg and VanDeveer, 2012). Purdon (2015) identifies "variation in the relationship between the state, markets, and society" as one of the three main "[c]omparative politics themes that continue to have underexplored links to climate change and broader environmental issues". Similarly, in their discussion of environmental political economy and climate change, Mikler and Harrison (2012) note the "surprising dearth of scholarship from a comparative political economy perspective" and claim that "the relevance of the vast comparative capitalism literature has remained largely unchartered waters." These concerns dovetail with the argument of Steinberg and VanDeveer (2012) that environmental politics generally has not drawn enough on the methods and knowledge of comparative politics.

In spite of these criticisms, a cursory review of the extant literature on environmental and climate politics will find no shortage of books and articles incorporating comparative political economy elements. So why are scholars like Meadowcroft, Purdon, Mikler, Harrison, and Steinberg unsatisfied? The problem is that while comparative political economy themes are not unknown in the environmental politics literature, there remain persistent gaps. For my purposes, the most notable such gap is the relative lack of attention to how political economy arrangements affect the distributive calculations involved in making climate policy. A further issue is that most work at the intersection of political economy and the environment focuses on performance or instrument choice, and not on

policy stringency.

In the following section, I will review this literature with these issues in mind. When environmental and climate studies have drawn on comparative political economy, it has usually been woven into one of three strands of work. The first strand focuses on broad differences in political economy institutions, starting with the literature on corporatism and pluralism in the 1990s and early 2000s, and shifting to the varieties of capitalism approach in the 2000s and 2010s. The second strand investigates the role that labor unions play in supporting or opposing climate policy. The third strand examines the role of economic protections and social policies.

2.1 Coordinating Institutions: Are Environmental Interests Being Included?

There is a long tradition of dividing state-market relationships in capitalist countries into two or more camps. Early work on economic institutions and the environment focused on the differences between corporatist and pluralist countries (Schmitter, 1974; Lijphart, 1999), while more recent work has tended to rely on the varieties of capitalism framework (Hall and Soskice, 2001). Though the concepts are distinct, they both tell us something important about whether labor has institutionalized access to state decisions.

Crepaz (1995) defines corporatism as "a system of interest representation in which a small number of strategic actors (usually representatives of capital and labour), organised in peak associations, represent large parts of the population in an encompassing fashion." There are several reasons one might expect corporatist systems to provide stronger environmental protections than pluralist ones. Inclusive peak organizations incentivize advocating for national rather than particularistic interests (Crepaz, 1995; Scruggs, 1999), and pursuit of consensus makes it easier for new kinds of interests to gain access (Jänicke, 1992). Repeated interaction builds trust, making monitoring and information-sharing easier (Stewart, 1992; Bernhagen, 2008). The willingness of corporatist governments to

intervene in the economy means they are more likely to "compensate losers," and firms are readier to accept negotiated solutions to forestall stronger regulation later (Scruggs, 1999).

Despite these advantages, corporatism may not be inherently better for the environment than pluralism (Hukkinen, 1995; Neumayer, 2003). By formally entrenching the power of a few peak organizations, they may make it more difficult for non-traditional interests to gain access (Offe, 1981; Hukkinen, 1995; Hunold and Dryzek, 2002). If they do gain access, guaranteed inclusion may ultimately undermine the environmental movement by removing the need to build membership or public consciousness (Hunold and Dryzek, 2002). Critics of corporatism also argue that it enshrines a "materialist logic of economic growth" that is incompatible with a "postmaterialism that favors ecological concerns" (these views are summarized but not endorsed by Crepaz (1995)).

Early studies based on an expert survey by Lijphart and Crepaz (1991) found positive relationships between corporatism and environmental performance (Jänicke, 1992; Jahn, 1998; Scruggs, 1999), including carbon dioxide reductions (Crepaz, 1995). Using a more theoretically-grounded index by Siaroff (1999), however, Neumayer (2003) finds no consistent relationship between corporatism and pollution. Bernhagen (2008) finds some evidence of a relationship between corporatism and greenhouse gas reductions, but it is sensitive to controls for the size of green groups and unions, suggesting the effect of corporatism may be dependent on other factors.

Since the early 2000s, corporatism and pluralism have been largely supplanted by another categorization scheme known as "varieties of capitalism" that distinguishes between liberal market economies (LMEs) and coordinated market economies (CMEs) (Hall and Soskice, 2001). LMEs are characterized by competition in labor markets, bargaining at the firm-level, and a hands-off approach by government. CMEs involve power-sharing in firms between labor and management, collective bargaining across industries, and higher levels of government involvement in the economy. CMEs are expected to treat the envi-

ronment better "principally because of the cooperative pattern of relations between states and business, which enables the state to coordinate policy and transform the interests and practices of business" (Lachapelle et al., 2017).

There is growing evidence that coordinated market economies are indeed doing more about climate change, especially in the area of renewable energy. Coordinated market economies appear to be better at both developing and deploying renewable energy than liberal market economies (Mikler and Harrison, 2012; Ćetković and Buzogány, 2016). But the evidence is not all straightforward. LMEs provide more funding for research and development (Lachapelle and Paterson, 2013), while CMES are surprisingly more likely to implement the kind of "market-based" mitigation policies one would expect to see in LMEs (Lachapelle and Paterson, 2013; MacNeil, 2016). In federal countries like the U.S. (which often stands in for LMEs), national inaction may conceal sub-national ambition (Rabe, 2008). Lachapelle et al. (2017, p. 324) conclude that "the standard analytical traditions in political economy struggle to make sense of the patterns we see."

2.2 Unions: "Swords of Justice" or "Vested Interests"?

The second strand of literature concerns the relationship between labor unions and environmental policy. Unions are "caught" between representing the narrow interests of their members and advocating for a wider community beyond the workplace (Snell and Fairbrother, 2011). The principle of "social unionism" holds that unions have a responsibility to represent the interests of the working class and society at large (Hrynyshyn and Ross, 2011). While the present interests of members can hardly be ignored, the idea of being a "sword of justice" instead of another "vested interest" has long been important to their self-conception and messaging.(Flanders, 1970, p. 15-16). Yet at the dawn of the green movement in the 1960s, many trade unionists were skeptical, seeing the environment either as a luxury for the rich or a source of resources to be exploited (Silverman, 2004, p. 120).

Though this internal conflict is longstanding, climate change presents a new and pressing arena in which it plays out, simultaneously threatening jobs in some industries while also threatening broader social well-being. Unions might oppose mitigation policy if they see it as endangering members' livelihoods. This seems particularly likely for unions whose members are directly involved in fossil fuel extraction and carbon-intense production. As Bernauer and Koubi (2009) note, "[i]n many countries worldwide labor unions have in the past often been vocal opponents, for instance, of closures or modernization of pollution intensive traditional industries." On the other hand, unions might support climate change action if they are committed to a social unionist vision of their role and see mitigation as important for humanity's future. Workers are not exempt from the harmful consequence of climate change. Furthermore, some unions might see material benefits for their members in climate change policy action.

Compared to the literature on political economy institutions and firm strategies on climate change, the relationship between labor and the environment has received "limited attention" (Stevis and Felli, 2015). Räthzel and Uzzell (2011, p. 1215) argues that this reflects a gap in two fields: "[e]nvironmental studies have largely ignored labour issues, while labour studies have paid little attention to climate change issues." The analysis of social unionism in Hyman (2001) makes no mention of environmental concern, and the account of labor environmentalism in Silverman (2004) does not include climate change. The situation has improved somewhat in recent years, as the field of "environmental labour studies" has grown (RaÌĹthzel and Uzzell, 2013).

There is a growing literature documenting unions adopting proactive stances on climate change mitigation and forming alliances with green groups (Räthzel and Uzzell, 2011; Uzzell and Räthzel, 2013; Farnhill, 2016; Hampton, 2018). Many unions advocate for a "just transition" that moves away from fossil fuels while still protecting jobs (Stevis and Felli, 2015; Snell, 2018). Many union officials in both developed and developing countries see their members' interests as compatible with climate change mitigation, though

the degree to which they do see a conflict varies by union and sector (Räthzel and Uzzell, 2011). Bernhagen (2008) finds that countries with higher proportions of workers covered by collective bargaining also have lower greenhouse gas emissions.

But these trends do not indicate that all unions are committed to fighting climate change; Stevis et al. (2018) cautions scholars to study the issue "without assuming that social unions are a priori socially just or care for the way in which nature is used and abused." Unions have been on both sides of the fight over climate change policy in the United States, from the Lieberman-Warner cap-and-trade bill (Knox-Hayes, 2012) to Obama's Clean Power Plan (Mildenberger, 2015). Nor is opposition confined to unions in pluralist countries. While most unions supported Germany's Renewable Energy Law, the Mining, Chemical, and Energy Industrial Union (IG BCE) opposed it (Laird et al., 2009). The Norwegian Confederation of Trade Unions (LO) actually allied with the Confederation of Norwegian Enterprise (NHO) to promote carbon-intensive electricity generation (Mildenberger, 2015, pp. 418-419).

So what do we know after a decade of rising interest in unions and climate policy? There is definite evidence that many unions are comfortable with and active in fighting for climate mitigation policy. But there is also evidence from a range of national contexts that unions have often "stood in for the interests of their affiliated capital" (Mildenberger, 2015). But it remains unclear how unions are shaping policy outcomes across countries, and how much the burden of policy actually ends up falling on labor.

2.3 Social Policy: Tension or Protection?

The third strand of political economy work I weave into my theory concerns the broader social policy environment, particularly policies around employment protection. This is the most recent of the three strands, with the least work conducted to date. The work that has been done has focused on environmental policy generally, rather than climate change specifically. But the arguments are applicable to greenhouse gas mitigation as well.

Environmental policies develop in the context of existing welfare states and social policy decisions, many of them put in place long before climate change became an issue (Meadowcroft, 2005). Climate change, by creating new burdens and challenging existing economic models, has the potential to strain existing social policies. There is a risk of a "double injustice" if people who are already poor end up bearing the brunt of climate change policy burdens in the form of job losses and rising prices. A growing number of scholars have suggested ways that countries could re-design both their environmental and welfare state policies to avoid this injustice (Pye et al., 2008; Fitzpatrick, 2011; Walker, 2012; Gough, 2015). While this work tends to be prescriptive rather than descriptive, it highlights the importance of interactions between the old welfare state and the emerging environmental state. If not resolved, the "tension with more deeply embedded state imperatives" (Duit et al., 2016) risks preventing the creation of strong climate policy.

While environmental policy might put new pressure on social policies, it may also be the case that strong welfare states enable stronger environmental policy. There is not yet much quantitative work on how social policy has affected environmental stringency: reviewing the field, Kerret and Shvartzvald (2012, p. 12329) find that "study of social policy effects is absent in the research literature." Fitzpatrick (2011) has called for scholars "to turn environmentalism and social policy from distant acquaintances into firm friends." Kerret and Shvartzvald conduct their own study using aggregate indices of social policy (Krishnakumar and Tellez Minnig, 2009) and environmental performance (Emerson et al., 2010). They find that countries with stronger social policy perform better on several subsets of the performance data.

Bernauer and Böhmelt (2013) review the study, suggesting three potential reasons for this apparent regularity. First, there might be a socio-tropic spillover effect in which welfare states make societies "kindler and gentler" over time, socializing citizens into being more other-regarding. Second, higher provision of public goods creates more human capital, liberating citizens to be more concerned with post-materialist problems like environ-

mental quality. Third, the relationship may simply be a correlation, if countries that are richer or more democratic tend to provide both economic and environmental protection to their citizens, for example. In their re-analysis of the data from Kerret and Shvartzvald (2012), Bernauer and Böhmelt settle on the last explanation as the most convincing, finding "only weak and inconsistent support" for a link between social and environmental policy. They also criticize the use of aggregate indices of many kinds of pollution, arguing that "more disaggregated analyses are in need as beneficial effects could well exist in some environmental domains, but not in others."

3 A Theory of Mitigation Offsetting

The three strands of work discussed above demonstrate a growing attention to the intersection of political economy and environmental policy. Yet despite this attention, it is hard to identify clear conclusions. Expectations that coordination, unionization, and social protection will enable stronger environmental and climate change policy receive inconsistent support, with positive findings mixed with a number of counter-examples and negative findings. In the face of these ambiguous results, scholars should be prepared to recognize that perhaps the true effect of political economy arrangements is simply weak or ambivalent. But another possibility is that analysis of these arrangements needs to be further developed to identify their full impact.

While they deal with distributive institutions, most of the quantitative studies cited here do not really provide distributive accounts of their effect on mitigation policy. Consistent with the climate policy literature more broadly, the focus is on explaining how much pollution is emitted or how much action is taken, and not on where the burdens of such actions fall.

In the study of coordinating institutions, distributive concerns are explicit in the idea that "losers" from policy are more willing to be burdened when they know they will be protected. But if losers are not distributed evenly across the economy, disaggregated data

are needed in order to tell whether corporatism and coordinated market economies are having their predicted effect.

In the study of labor unions, there is repeated evidence that unions can be both supporters and opponents of climate action within the same country. A carbon tax clearly has different distributive implications for industrial and service unions. But since the dependent variables are economy-wide, we cannot see whether some sectors are ending up with more or less regulation. On the explanatory side, measures of union strength in these studies are always national rather than sectoral, preventing us from seeing whether better-represented sectors receive higher or lower burdens.

In the study of social policy, existing theories about welfare states and environmental states are clearly distributional. But the theory is predominantly future-oriented, concerned with avoiding double injustice and providing a framework for doing so. There is less attention paid to how existing welfare states have already shaped climate change action, the limited quantitative work having focused on environmental performance generally.

I focus on the balance of power between capital and labor, weaving together themes from all three strands of the political economy literature. I proceed from the broad assumption that capital generally has a 'privileged' position and is rarely denied a voice in policymaking (Lindblom, 1977; Przeworski and Wallerstein, 1988; Ferguson, 1995). Business is rarely, if ever, denied a voice in policymaking. Whether a country is corporatist and a coordinated market economy or pluralist and a liberal market economy, capital owners generally have access to the policymaking process through formal or informal channels of influence (at least in the countries covered by this dissertation). In earlier work, I found evidence that this assumption holds true in climate politics as well, given that capital-intense sectors more likely to be protected from the costs of climate policy.

To what extent is labor also protected? Although coordinating institutions, union strength, and social policy are all distinct phenomena, they all indicate something about

how much labor can expect to be shielded from the costs of policy change. If labor is formally included in policymaking, has strong organizational representation, or is already safeguarded through existing laws, it suggests that workers' interests are more likely to be protected.

None of these factors tells the whole story on its own, and no single indicator of labor protection is perfect. Corporatism may not always include labor groups in its consultations: for example, Japan is thought by some to be a case of "corporatism without labor" (Pempel and Tsunekawa, 1979). Low levels of union membership do not mean that unions are necessarily weak: France has low unionization rates but unions have legally-protected roles in management and almost all French workers are covered by collective bargaining (Schulze-Marmeling et al., 2017). Strong welfare policies could indicate that labor was powerful in the past, without guaranteeing that it remains powerful today. But while no single measure is perfect, combining data from all three areas helps patch potential gaps between them, and gives us a general sense of whether labor has access to and influence over policymakers.

The question for my analysis is how the protection of labor affects the prospects for climate protection. In other words, when labor is empowered, how does it use its power? I identify two competing hypotheses that integrate arguments from across the three strands of literature. First, protection may mean lower regulation, because workers have more power to block mitigation policy. Second, coordination may mean higher regulation, because workers' costs from mitigation policy will be offset.

Both hypotheses will be specified in terms of interactions between emissions intensity, labor intensity, and indicators of labor protection. I do this to capture how labor protection changes (or fails to change) the burden on emissions-intense, labor-intense sectors. I expect conflict to be most salient in emissions-intense sectors, since that is where increases in the cost of emitting greenhouse gasses will have the greatest effect on jobs, all else being equal. I expect the effects to be concentrated in sectors where labor is a major input

and there are more jobs at stake.

This interactive approach is crucial for isolating the distributive effect of labor protection. In existing studies, hypotheses about political economy factors are constrained by the fact that while they posit distributive effects, only aggregate changes in policy stringency are visible. This approach seems unsatisfactory when the variables of interest should be expected to affect some sectors more strongly than others. For example, in the case of unions, why expect labor to fight equally in labor-heavy and labor-light sectors? If policymakers were constrained to set one level of stringency for all sectors, this would be an appropriate assumption. But earlier work has already shown that neither emissions intensity, labor intensity, nor policy stringency is homogeneous across sectors.[1] By leveraging this heterogeneity, I can make a more sensitive test of political economy effects than the literature has managed so far.

3.1 Protection Blocks Stringency

My first hypothesis is that increased labor protection will block climate mitigation stringency in dirty, labor-intense sectors. If environmental policy forces industrial restructuring, and labor is threatened by industrial restructuring, then more powerful labor interests should join with business and capital in a producer coalition against mitigation. Emissions-intense, labor-intense sectors will be on the front lines of this conflict, and will receive lower levels of climate policy:

Hypothesis 1 (Labor Protection Blocks Mitigation) *When labor is better protected by political economy arrangements, sectors which are labor-intense and emissions-intense will receive lower climate policy burdens.*

If a country has a corporatist or coordinated market economy system and labor is formally included in policy consultation, then labor can use this privileged access to head off proposals which would affect members' interests. If a country has strong unions, they

[1] This claim is based on a working paper by the author, which is available upon request.

can use their resources to lobby the government or mobilize their members against policies which affect jobs in dirty sectors, as the "vested interest" concept of unions trumps the "sword of justice" vision. Strong welfare policies could be a proxy for a strong labor movement, indicating that labor has enough influence to obtain favorable treatment from government. Alternatively, strong welfare policies could be seen as putting the government "on the hook" for job losses in affected sectors, straining budgets and making it more costly to policymakers to induce such losses through regulation.

3.2 Protection Enables Stringency

My second hypothesis lays out the opposite position, arguing that when labor's interests are better protected it will be willing to accept higher levels of climate policy stringency. The central idea here is that coordinating institutions, strong unions, and strong social policies collectively serve as a form of insurance for labor. When labor knows it has a seat at the table, when it has sufficient resources to shape policy, and when it has pre-existing protective guarantees, the prospect of stringent climate regulation becomes less threatening. In these cases, labor can reasonably trust that any burden the government imposes will be offset in other ways, leading them to accept to stronger regulation:

Hypothesis 2 (Labor Protection Offsets Mitigation Costs) *When labor is better protected by political economy arrangements, sectors which are labor-intense and emissions-intense will receive higher climate policy burdens.*

The potential for offsetting does not mean that labor will never oppose climate mitigation policy in countries where it is protected. But on the margin this opposition may be less intense, since there is comparatively less at stake for labor than in countries where such protection is far from assured. In countries with coordinating institutions, labor is more likely to have a direct role in the policymaking process, shaping mitigation strategies so that they are less threatening. Even if labor representatives are initially opposed to climate policy, there will be more room within coordinating institutions to fashion a

bargain that protects both labor's interests and environmental goals. The end result will be stronger mitigation policy.

Strong labor unions from emissions-intense sectors may still oppose climate policy. But a strong union from a dirty industry can be more confident that even if climate policy passes, it will be able to secure side-payments or protective regulation. Strong unions with large membership also have a broader perspective: losses in one member's industry may be compensated for by gains in other members' industries.

Finally, policies protect employee welfare and ensure redistribution help dilute the negative impact of climate mitigation. If rules make it difficult to fire employees or provide generous benefits to the unemployed, job losses become either less likely or less frightening. Redistribution more generally lowers the risks attached to drops in income. Countries with "kindler, gentler" policy environments effectively promise to "file the sharp edges" off of climate policy-induced costs.

4 Data and Methods

The key limitation of previous quantitative, cross-national studies of the relationship between political economy contexts and climate change action is that they have relied almost entirely on measuring outcomes at the national level. The problem with doing so is that it leaves unclear where the burden of climate policy is falling. In order to capture how protective arrangements are operating, it is important to know how much of their burden is falling on labor.

Althammer and Hille (2016) develop a sector-level measure of regulatory stringency based on a "shadow price" approach. This method uses fossil fuel consumption and greenhouse gas emissions data for individual economic sectors and combines them with national and global prices for fossil fuel inputs. They use this information to calculate whether a sector is emitting more or less than it would be expected to do based on prevailing prices and assumptions about technology. The "wedge" between predicted and

actual reliance on emissions serves as an estimate of regulatory stringency.

The chief drawback of this method is that it relies on econometric estimates rather than direct inventories of specific regulations. But the benefit of using shadow prices is that they render comparable all manner of climate change mitigation regulations. Without such a method, it would be difficult to compare the stringency of heterogeneous policies like a renewable portfolio standard, a carbon tax, and an efficiency subsidy. These data are available in three year increments from 1995 to 2007. This is a good period for studying climate policy, because it covers the time when climate change first became a salient issue in many countries, while avoiding the disruption incurred by the financial crisis.

Other data on economic sectors come from the World Input Output Database (Timmer et al., 2015). From this source I obtain information on CO_2 emissions intensity and labor intensity. Both measures are calculated as proportions of output and standardized, and the emissions measure is also logged. WIOD is also the source of the data for Althammer and Hille (2016), so the measures and sectoral definitions are compatible. As controls, I also use the logged gross domestic product per capita from (Feenstra et al., 2015) and fossil fuel income per capita from Coppedge et al. (2017), both of which are standardized. Because the European Union imposes its own environmental regulations, I also control for European Union membership. All models also include a time-trend to reflect the fact that climate policy was generally rising in strength over this period.

To test the effects of the state-market relationship, I use measures of corporatism (Siaroff, 1999) and varieties of capitalism (Hall and Gingerich, 2009). To test the effects of labor organization, I use measures of union density at the national and sectoral levels, as well as union centralization (Visser, 2016). And to test the effects of the policy environment, I use employment protection legislation (OECD, 2017), active labor market programs (OECD, 2016), and overall redistribution (Solt, 2016). I will describe the measures in more detail as I outline the regressions below.

The units of analysis belong to two overlapping groups: each is nested within a par-

ticular sector and a particular country. In order to account for this structure, I use a multilevel mixed effects linear regression with crossed effects. I also performed the regressions using a linear regression with two-way clustered standard errors, with substantively similar results (Cameron et al., 2006).

5 Results

As the discussion earlier in this paper revealed, there is good reason to believe that the wider political economy context shapes the impact of mitigation policy on labor. If coordinating institutions, powerful unions, and strong employment protections are evidence of higher levels of influence for workers, then one should expect to see lower mitigation stringency for labor-intense sectors when those factors are present. This can be thought of as a "first-order" effect of labor strength: stronger labor means lower stringency. At the same time, if labor is sufficiently influential, or at least sufficiently sure of its protected status, then it may have less to fear from the imposition of stringent regulation. This would be a "second-order" effect of labor strength: if labor is strong enough, it can afford to take the long view on mitigation regulation. Both could conceivably operate at the same time, which could help explain the conflicting results sometimes observed in the literature.

The statistical models whose results are reported below are intended to test whether the second-order effect exists, and if so, whether it dominates the first-order effect. That is, I want to know whether carbon-intense, labor-intense sectors face higher or lower regulation in countries with strong institutions of coordination and protection. The answer, consistent across all of my regressions, is yes: coordination is associated with more regulation for labor-intense, dirty sectors.[2]

Throughout the results I include several marginal effects plots. These illustrate the impact of labor intensity on mitigation policy stringency at various levels of carbon intensity

[2]Performing the analyses with capital intensity instead of labor intensity gave symmetrical results, which are omitted for reasons of space.

and two levels of the independent variable of interest. The marginal effects for these plots are calculated while holding all the other variables at their means.

5.1 State-Market Relationships

I begin by presenting the results of testing the effects of political economy institutions: the level of corporatism and the variety of capitalism present in a country. The results for the interacted models are presented in Table 1.[3] Corporatism is measured using an index by Siaroff (1999) that tracks eight indicators of "social partnership," "industry-level co-ordination," and "overall national policy-making patterns." Higher values represent more corporatist arrangements. The varieties of capitalism measure is based on a measure of "strategic co-ordination in labor relations" from Hall and Gingerich (2009).

Neither corporatism nor having a coordinated market economy has a statistically significant effect on its own. This suggests that the national state-market relationship is not consistently associated with either an increase or decrease in policy stringency across all sectors. When interacted with the carbon intensity and labor intensity of a sector, however, both variables have a large and statistically significant positive effect on the shadow price of emitting carbon dioxide.

At low levels of emissions intensity, labor intensity has a similar association with mitigation stringency regardless of the state-market relationship. But as emissions intensity increases, the impact of labor intensity diverges. Carbon-intense, labor-intense sectors in corporatist countries or CMEs face significantly higher shadow prices. These relationships are graphed in Figure 1 and Figure 2

[3]The non-interacted models for all the independent variables are presented in the Appendix.

Table 1: State-Market Relationships

	(1) Corporatism	(2) Varieties of Capitalism
Labor Share of Value-Added	31.47***	2.13
	(7.64)	(13.15)
CO_2 Intensity	-64.30***	-31.11*
	(9.85)	(16.47)
CO_2 Intensity × Labor Intensity	1.77	-23.70*
	(6.49)	(12.31)
Corporatism	17.48	
	(46.94)	
Corporatism × Labor Intensity	22.29***	
	(5.17)	
Corporatism × CO_2 Intensity	-27.81***	
	(4.97)	
Corporatism × CO_2 Intensity × Labor Intensity	16.67***	
	(4.30)	
Labor Relations Coordination		201.74
		(165.55)
Labor Coordination × Labor Intensity		53.93***
		(18.85)
Labor Coordination × CO_2 Intensity		-92.97***
		(21.32)
Labor Coordination × CO_2 Intensity × Labor Intensity		46.04**
		(18.12)
National CO_2 Intensity	-187.83***	-175.04***
	(32.97)	(35.58)
Fossil Fuel Income per Capita	-40.63***	-36.19***
	(11.80)	(12.23)
GDP per Capita	18.80	42.63
	(64.45)	(66.16)
European Union Member	59.69	35.30
	(117.98)	(115.96)
Year	3.55	2.67
	(3.05)	(3.15)
Constant	-6.03	-111.91
	(120.68)	(129.10)
N	2,359	2,227

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

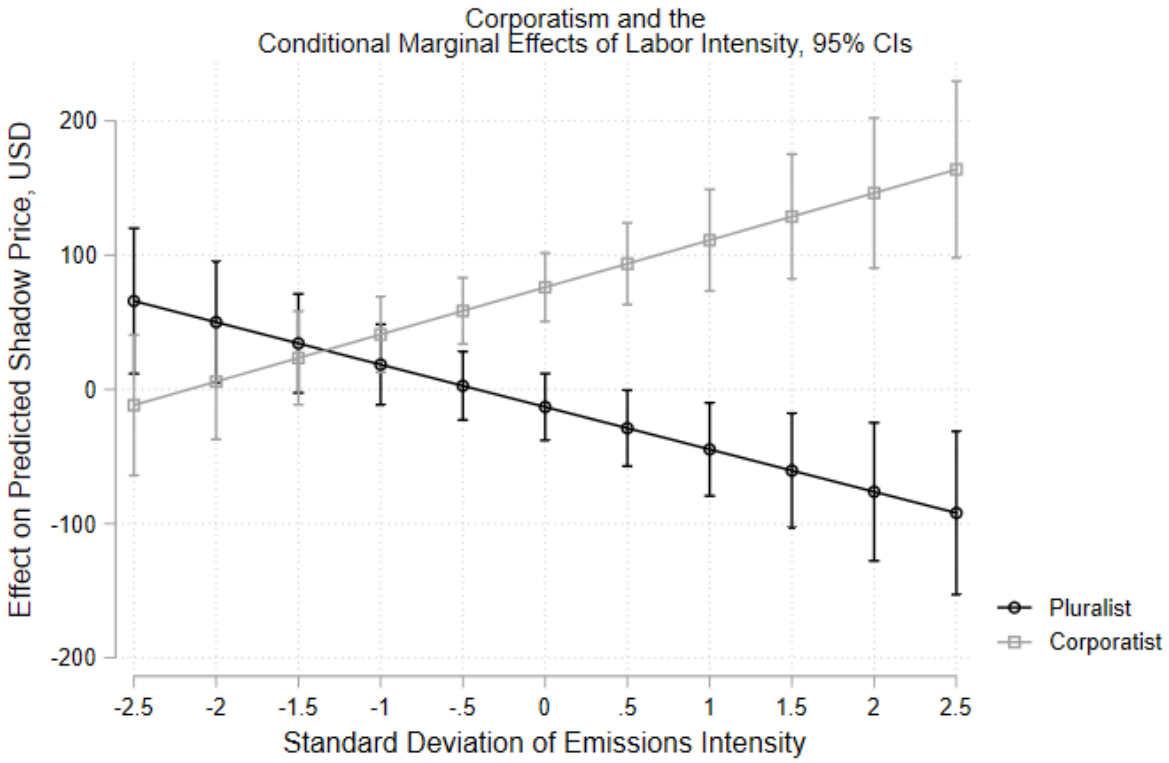

Figure 1: Effects of Corporatism on the Marginal Effect of Labor Intensity

Turning to the varieties of capitalism measure, I find results consistent with those for corporatism. As with the corporatism results, the effect of labor intensity in clean sectors appears similar in both liberal and coordinated market economies. But while labor intensity in dirty sectors appears to have a negative or potentially non-existent effect in liberal market economies, in coordinated market economies the effect is strongly positive. This relationship is graphed in Figure 2

In the first model, without interactions, the measure of coordination in labor relations exhibits both a substantively and statistically significant positive relationship with mitigation stringency. This relationship persists in the second model, though its magnitude can only properly be interpreted in light of the interaction terms, as graphed in Figure 2.

As with the corporatism results, the effect of labor intensity in clean sectors appears similar in both liberal and coordinated market economies. But while labor intensity in

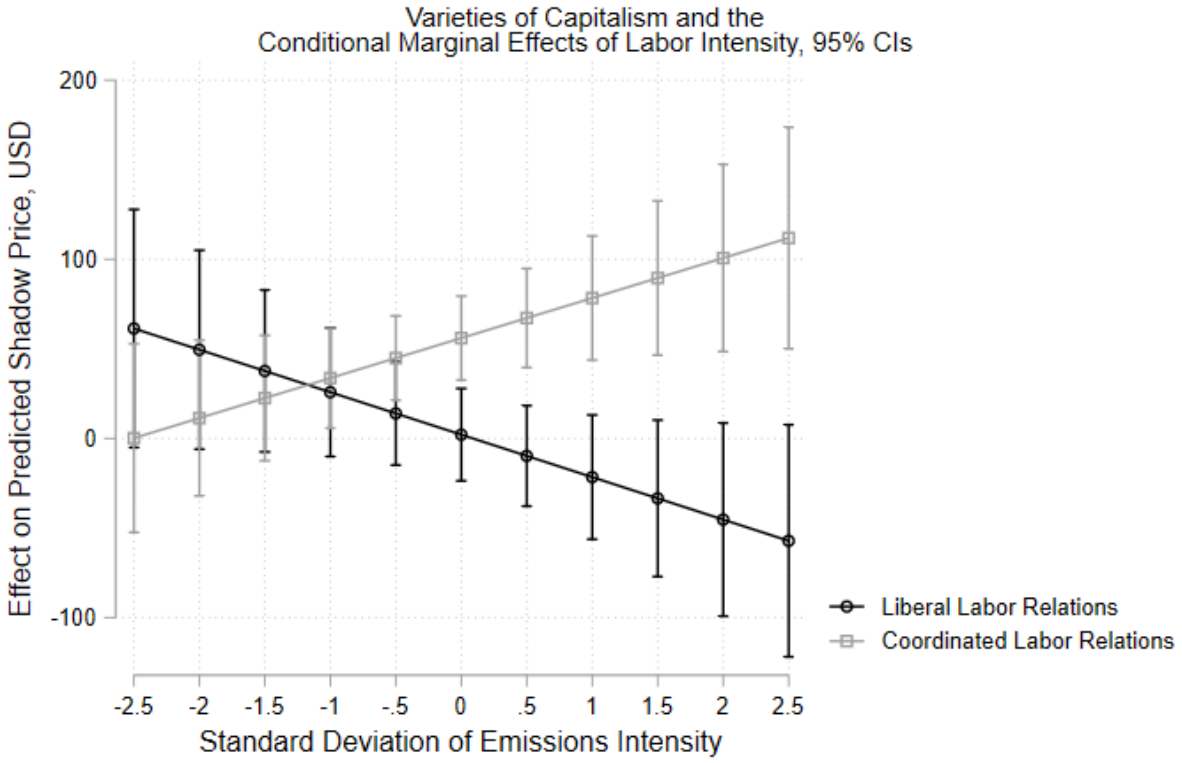

Figure 2: Effects of the Variety of Capitalism on the Marginal Effect of Labor Intensity

dirty sectors appears to have a negative or potentially non-existent effect in liberal market economies, in coordinated market economies the effect is strongly positive. For a sector with carbon intensity two standard deviations above the mean, in a country with a coordinated labor relations two standard deviations above the mean, a one-standard deviation increase in labor intensity is associated with a $204 increase in shadow prices (.64 standard deviations). In a country with liberal labor relations, a similar sector would receive a $129 decrease in shadow prices (-0.40 standard deviations). If I substitute the corporate governance measure instead of the labor relations measure of coordination, the results are largely similar (and thus not reported).

Taken together, the results of Table A3 and Table A4 offer strong support to the coordination offsetting hypothesis (Hypothesis 2).Countries that have strong ties between the state, business, and labor are more likely to impose stringent mitigation policies on labor-intense, emissions-intense sectors. Conversely, countries with pluralist institutions and liberal market economies are more likely to avoid placing regulatory burdens on labor-intense, emissions intense sectors in this way.

5.2 Labor Organization

To study the effects of labor organization, I employ three variables: union density, sector-level union density, and the level of union centralization. Union density represents the proportion of workers who are union members. Union centralization represents the extent to which peak unions have power over local affiliates. These data come from the Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS) database (Visser, 2016). The results are presented in Table 2.

Table 2: Labor Organization

	(1) Density	(2) Sector Density	(3) Centralization
Labor Share of Value-Added	31.72***	41.97***	33.95***
	(7.70)	(14.03)	(7.66)
CO_2 Intensity	-58.33***	-144.35***	-56.79***
	(9.97)	(18.94)	(9.93)
CO_2 Intensity × Labor Intensity	-0.78	24.05*	-2.45
	(6.50)	(12.42)	(6.69)
Density	-9.33		
	(39.16)		
Density × Labor Intensity	16.77***		
	(5.13)		
Density × CO_2 Intensity	-24.31***		
	(4.99)		
Density × CO_2 Intensity × Labor Intensity	6.85		
	(4.48)		
Sectoral Density		3.48	
		(15.27)	
Sectoral Density × Labor Intensity		-0.07	
		(9.54)	
Sectoral Density × CO_2 Intensity		-18.20	
		(13.36)	
Sectoral Density × CO_2 Intensity × Labor Intensity		39.89***	
		(10.24)	
Centralization			-237.17***
			(33.73)
Centralization × Labor Intensity			18.99***
			(5.42)
Centralization × CO_2 Intensity			-15.33***
			(5.24)
Centralization × CO_2 Intensity × Labor Intensity			11.17**
			(4.44)
National CO_2 Intensity	-189.51***	-145.15**	-190.08***
	(33.26)	(62.85)	(33.79)
Fossil Fuel Income per Capita	-42.73***	-58.72***	-61.03***
	(11.89)	(19.45)	(12.23)
GDP per Capita	23.42	76.75	-11.26
	(64.77)	(80.83)	(65.86)
European Union Member	77.44	97.58	233.65
	(116.37)	(66.92)	(182.05)
Year	3.36	5.01	4.65
	(3.17)	(4.80)	(3.09)
Constant	-22.86	9.82	-106.40
	(116.69)	(83.95)	(170.34)
N	2,359	690	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

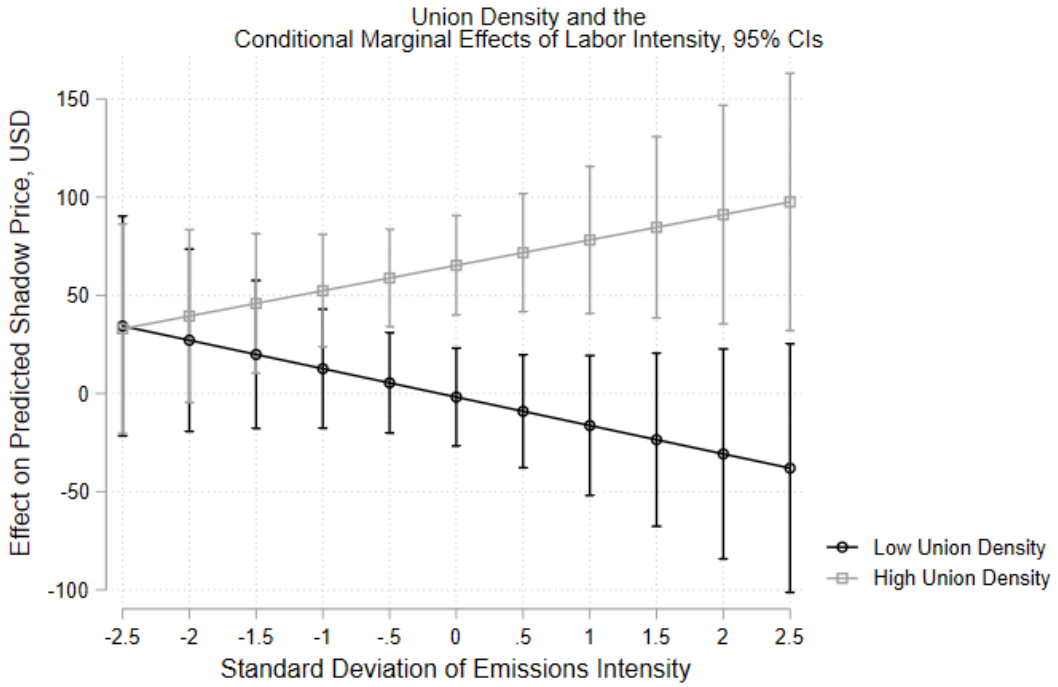

Figure 3: Effects of National Union Density on the Marginal Effect of Labor Intensity

National union density, included in the first model, has no statistically significant relationship with mitigation stringency in either its main effect or in the three-way interaction. This lack of significance is also visible in the marginal effects plot in Figure 3, where the two lines appear to diverge quite strongly, but with many of the confidence intervals overlapping.

Sector-level union density data is available only for a limited number of sectors, so the results must be interpreted with some caution. But keeping this in mind, the results appear consistent with Hypothesis 2. There is a substantively large and statistically significant interaction between sector-level union density and carbon- and labor-intensity. Emissive, labor-intense sectors receive stronger mitigation policy when they also have a high proportion of their workers in unions. The marginal effects plot is available in Figure 5

Union centralization is another national level variable. This is an index which tracks the degree to which a confederal union organization has power over its affiliated unions.

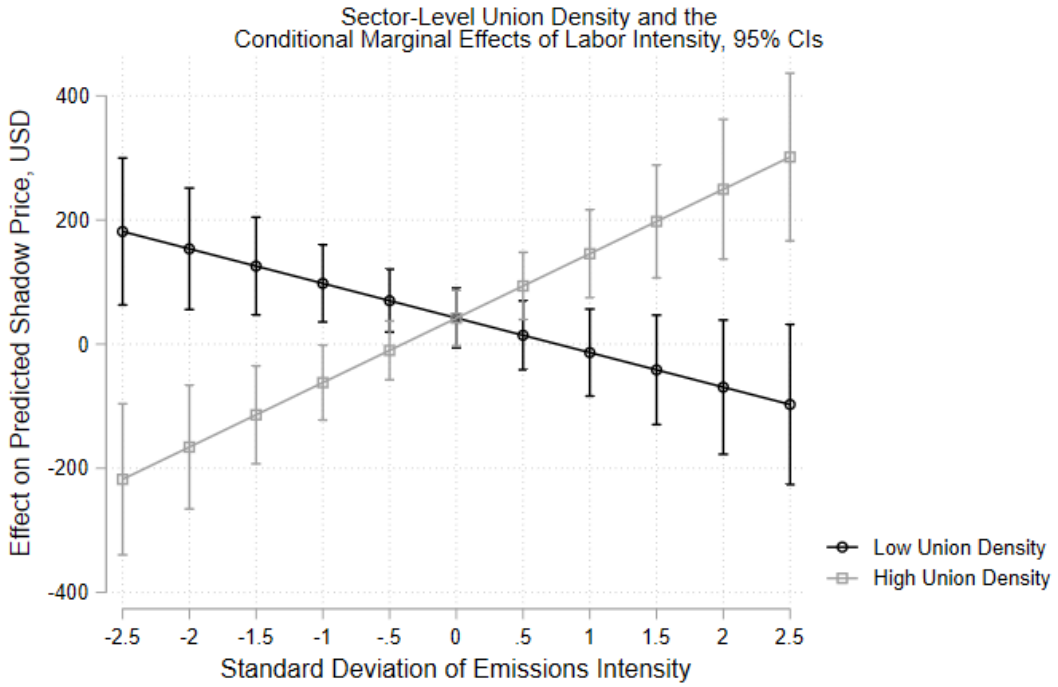

Figure 4: Effects of Sector-Level Union Density on the Marginal Effect of Labor Intensity

It has four components: whether the center has control over the appointment of leaders, is involved in affiliates' wage agreements, provides a strike fund, and has power over affiliate strike decisions. Higher values represent more centralization. Centralized unions are likely to be more powerful since they are larger and better coordinated, but also have more "encompassing" interests since they cover a wider range of industries.

Centralization has an extremely large and statistically significant negative main effect, with a smaller but still statistically significant three-way interaction term. This suggests that centralized unions block mitigation policy in general, but that they are willing to accept stronger policy burdens for emissions-intense, labor-intense sectors (as in Hypothesis 2). The marginal effects plot is available in Figure 5.

5.3 Policies

For the final set of regressions, I focus on the kinds of rules and policies that are implied—but not measured—by the foregoing institutional and organization-based variables. I

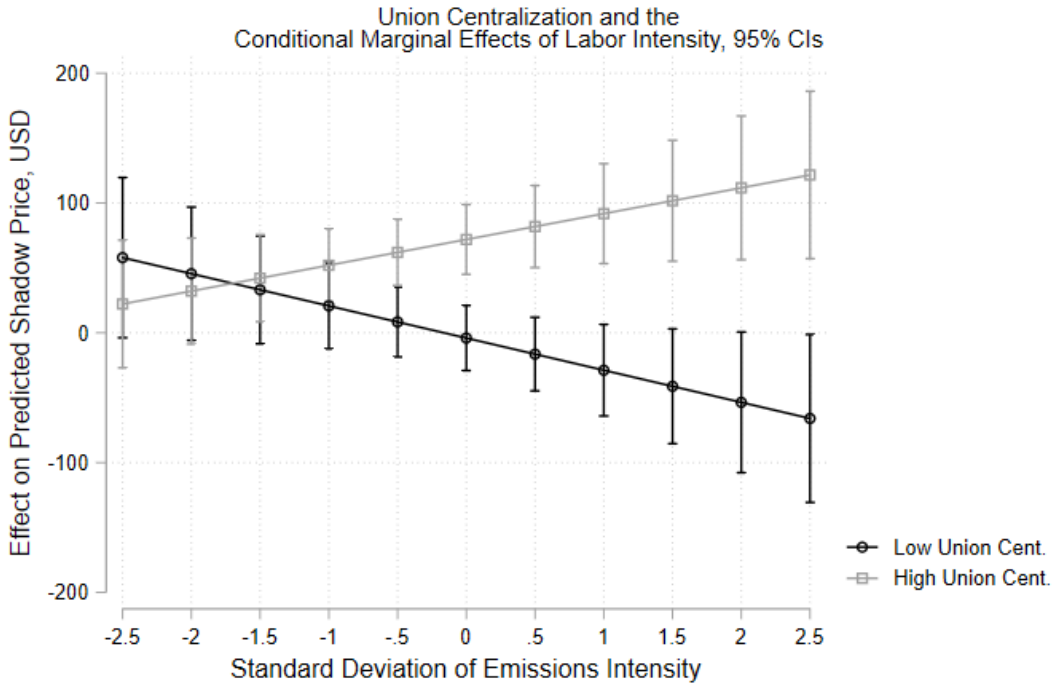

Figure 5: Effects of Union Centralization on the Marginal Effect of Labor Intensity

examine policies in three areas: the level of employment protection, the extensiveness of active labor market programs, and the amount of redistribution. Together they are meant to represent the extent to which workers are shielded from the costs of regulation.

The first policy variable is an index of employment protection legislation, drawn from the OECD's Employment and Labour Force Statistics database (OECD, 2017). The OECD tracks regulations that govern how employees can be dismissed, such as notice periods, severance pay, grounds for dismissal, appeals processes. It also includes information about restrictions on hiring temporary employees, including restrictions on hours, contract lengths, and monitoring requirements. I take the average of these variables.[4]

The second policy variable is the size of active labor market programs (ALMP), drawn from the OECD's Social Expenditure Database (OECD, 2016). It measures the percentage of Gross Domestic Product spent by the government on helping jobless people re-

[4]While the index in theory varies from 0 to 6, in the data the range is 0.21 to 3.85. In other words, no country's policy is near the maximum strictness possible in all areas. The detailed methodology for the construction of the EPL index is available at http://www.oecd.org/els/emp/EPL-Methodology.pdf.

enter work, through mechanisms like training programs, subsidized apprenticeships, job-search assistance, and employment incentives. Countries with more generous active labor market programs make it to find a job, shifting the transition costs imposed by stringent mitigation policy from workers to the government.

The final policy-related variable is the overall level of economic redistribution in a country. The other variables specifically measure interventions in the labor market. But more redistribution also reduces the risk workers face from regulation, acting like another kind of insurance for income losses (Moene and Wallerstein, 2001). I use the measure of relative redistribution from the Standardized World Income Inequality Database (SWIID) by Solt (2016). This is calculated as the market (pre-tax-and-transfer) level of inequality, minus the net (post-tax-and-transfer) level of inequality, divided by the market level of inequality. Inequality is measured with Gini coefficients. Higher values represent proportionally larger levels of redistribution.

The results for all three variables are displayed in Table 3. All three variables are standardized. For employment protection legislation and relative redistribution, the results appear consistent with Hypothesis 2. In countries where employees are difficult to fire and where lower-income people receive more generous transfers, sectors that are both carbon-intense and labor-intense appear to receive more stringent regulation. This interaction is statistically significant (at the p=0.01 level for EPL and p=0.05 level for redistribution). The sign for active labor market programs is positive, in line with Hypothesis 2, but the relationship does not attain statistical significance.

As with the earlier models, the relationships are better illustrated through marginal effects plots. The effect of employment protection is shown in Figure 6, active labor market protections in Figure 7, and redistribution in Figure 8.

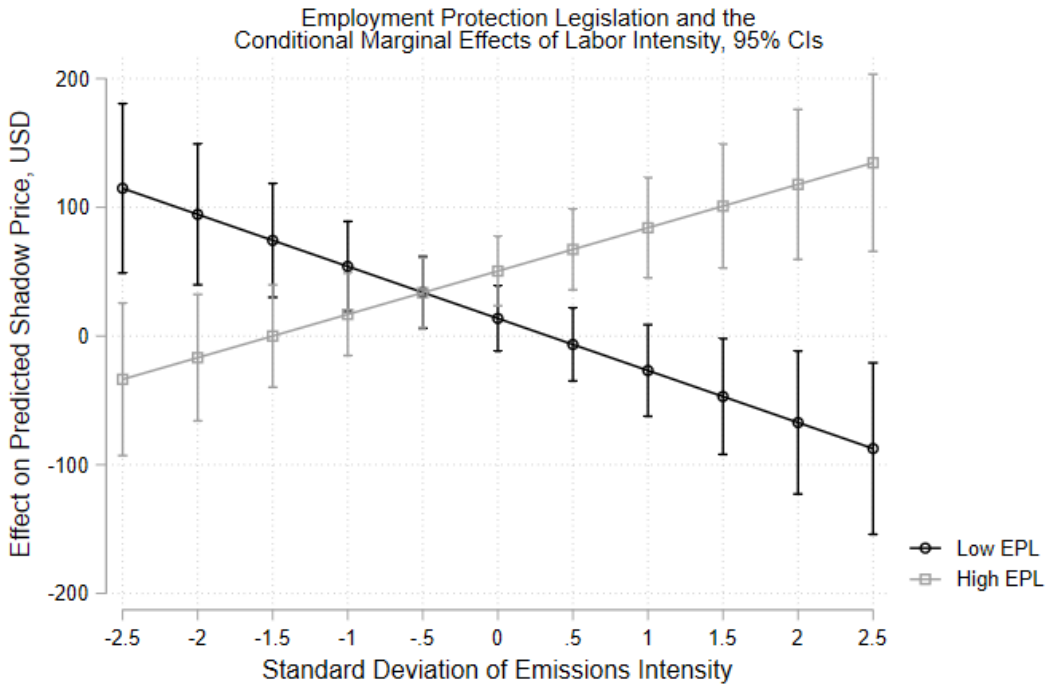

Figure 6: Effects of Employment Protection on the Marginal Effect of Labor Intensity

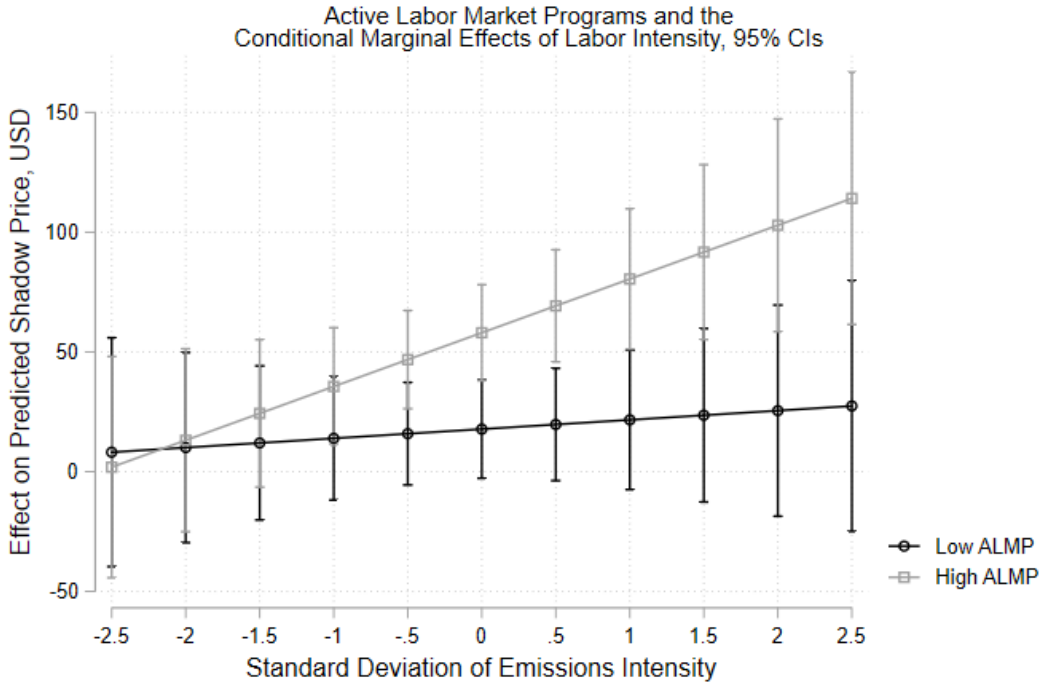

Figure 7: Effects of Active Labor Market Programs on the Marginal Effect of Labor Intensity

Table 3: Policies

	(1) EPL	(2) ALMP	(3) Redistribution
Labor Share of Value-Added	32.04***	37.89***	32.62***
	(7.71)	(6.13)	(7.72)
CO_2 Intensity	-74.74***	-68.58***	-65.43***
	(10.11)	(7.51)	(9.97)
CO_2 Intensity × Labor Intensity	-3.40	13.15***	1.42
	(6.60)	(5.08)	(6.53)
Employment Protection Legislation	-133.99***		
	(23.57)		
EPL × Labor Intensity	9.20*		
	(5.46)		
EPL × CO_2 Intensity	23.51***		
	(5.85)		
EPL × CO_2 Intensity × Labor Intensity	18.52***		
	(5.13)		
Active Labor Market Programs		9.54	
		(16.92)	
ALMP × Labor Intensity		10.06**	
		(4.17)	
ALMP × CO_2 Intensity		-55.73***	
		(4.67)	
ALMP × CO_2 Intensity × Labor Intensity		4.65	
		(3.89)	
Relative Redistribution			14.14
			(11.72)
Redistribution × Labor Intensity			18.20***
			(4.91)
Redistribution × CO_2 Intensity			-18.08***
			(4.92)
Redistribution × CO_2 Intensity × Labor Intensity			11.13**
			(4.58)
National CO_2 Intensity	-188.22***	-164.40***	-180.29***
	(33.44)	(27.85)	(33.27)
Fossil Fuel Income per Capita	-36.89***	-52.98***	-40.72***
	(12.11)	(11.01)	(11.97)
GDP per Capita	73.15	-90.37**	24.64
	(65.22)	(40.83)	(64.38)
European Union Member	269.66**	56.84**	64.70
	(130.28)	(24.88)	(112.02)
Year	-2.13	7.96***	3.42
	(3.21)	(2.27)	(3.04)
Constant	-211.25	71.12*	-9.37
	(129.84)	(41.77)	(114.80)
N	2,359	3,298	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

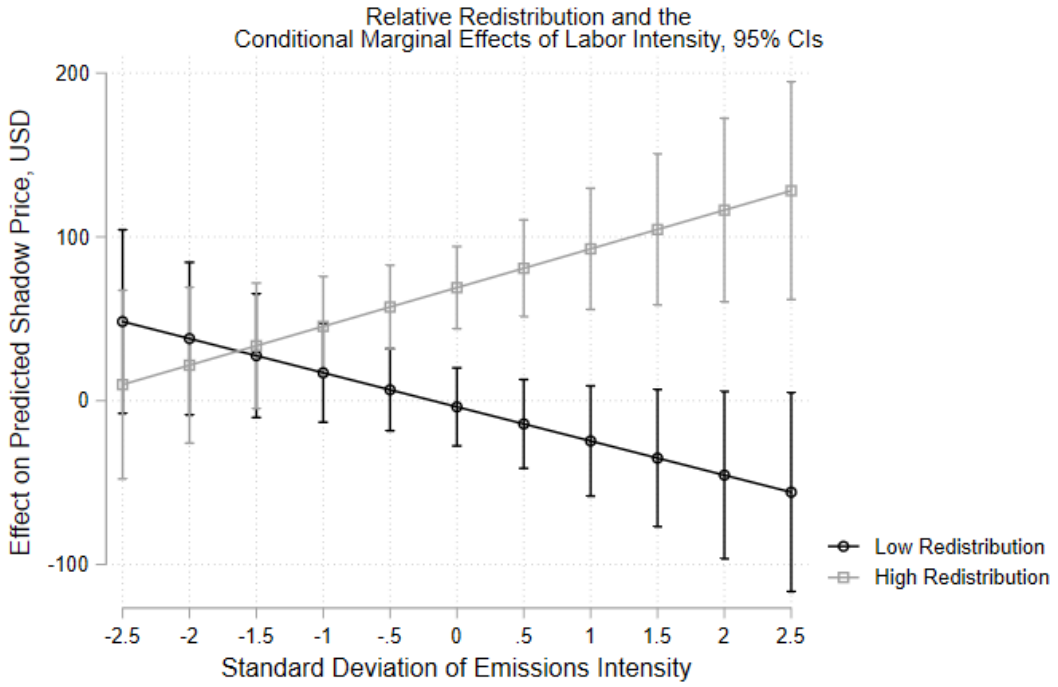

Figure 8: Effects of Relative Redistribution on the Marginal Effect of Labor Intensity

6 Conclusion

Climate change is not only a "second-order" concern for many people and countries: it is also a "second-mover" issue, one that is always constrained and shaped by organizations and policy frameworks that were established long before it became an issue. These frameworks are not always favorable to the development of climate policy. I have shown how certain kinds of arrangements can help strengthen mitigation, but I have also shown that such arrangements can end up concentrating the cost in particular ways.

Collectively, the results of the rules and policy variables tell a similar story. Institutions of coordination, the strength of unions, and the level of government intervention in labor markets all have the potential to shape whether labor-intense sectors receive higher regulatory burdens or lower ones.

It is important to remember that the main effects of the variables of interest are mainly national in scope (with the exception of sector-level union density, which is not statistically significant). So while they tell us about the effect of these variables on mitigation policy in general, only the interactions with sector-level variables can tell us about how they affect the distribution of policy burdens.

The patterns visible in these interactions help clear up some of the conflicting outcomes in the existing literature. Instead of looking for a pure positive or negative relationship between corporatism or labor strength and environmental action, it is more helpful to think about how these factors change the strategic situation facing interest groups, particularly labor.

Countries with consensual, coordinated state-market relationships, strong and centralized unions, and social policies that protect workers and redistribute wealth tend to place more of the burden of climate mitigation policy on emissions-intense, labor-intense sectors. The results are consistent with Hypothesis 2, the "offsetting effect."

For a couple of variables, namely union centralization and employment protections,

the main effects were negative while some of their interactions were positive. This suggests that the ambiguous effects of labor strength observed in the case literature are at work here too. Institutions of coordination and protection indicate that labor has more power to block policy changes.[5] At the same time, such institutions also mean that labor can trust that its interests will be shielded when mitigation policy is imposed. These two effects—enhanced power but also enhanced protection—are in tension with each other. This tension helps explain why labor sometimes appears to help and other times appears to hinder environmental policy.

Future work should test whether the burden offsetting implied by the theory and findings here is actually taking place. In what form is such offsetting being provided? Is labor receiving the kind of retraining help or trade protection or subsidies that will insulate labor interests? Do we see new policies being passed, or more reliance on existing ones? Are there explicit deals we can observe? For example, in 2018 the German metalworkers' union IG Metall successfully negotiated a 28-hour workweek, along with substantial annual pay rises. At the same time, the union has endorsed higher carbon dioxide standards for cars. To what extent are these linked? Michael Brecht, Chairman of the Central Works Council (*Betriebsrat*) at Daimler, explicitly highlights the importance of workers beings able to trust that they will be protected in order to accept environmental regulation:

> "Employees in the automotive industry are relying on technological and societal change in the direction of sustainable mobility opening up future opportunities for them. They must be able to believe and trust in the assurance that structural change associated with all this will not put them at risk. That is why it is crucial for environmental, economic and social issues to be put in a healthy balance along these lines."(IG Metall, 2014, p. 23)

The results here help illuminate whether that "healthy balance" will be possible. Au-

[5]The institutions could either be creating special channels of influence for labor interests, or they could simply be markers of a more powerful labor movement.

thors like Gough (2015) and Fitzpatrick (2011) have provided visions about how environmental policy can be integrated with the welfare state. Instead of simply "layering" environmental policy on top of existing frameworks, Gough argues for "linkage" in which the economy is more radically transformed through new "eco-social" policies. The empirical findings suggest that social protection is compatible with environmental protection, but also that this compatibility relies on labor accepting a larger share of burdens than it otherwise would. Any attempt at linkage will have to balance these two concerns.

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Table A1: Summary Statistics

	Mean	S.D.	Min	Max	Count	Unit
Shadow Price	.0063	.98	-2.7	6.2	3555	Std. Log $ / toe*
Labor Intensity	-.044	.87	-1.5	3.8	3555	Std. %
Corporatism	-.031	1	-1.1	1.9	2444	Ordinal Index
Labor Coordination	.53	.3	0	1	2227	Ordinal Index
Union Density	-.02	1	-1.4	2.3	2444	%
Union Cent.	2.4	1.5	0	7	2444	
EPL	-.067	.95	-1.8	1.7	2359	
ALMP	-.0014	.99	-1.2	2.8	3383	
Wage Cent.	-.0081	1	-1.7	3.1	2113	
Redistribution	-.073	1	-3.3	2.1	2444	
Output	.2	.84	-3.4	2.6	3555	Std. Log $
CO_2 Intensity	-.078	.93	-4.3	3.9	3555	Std. Log Tons / $ Output
Nat. CO_2 Intensity	-.21	.79	-2.6	2.1	3555	Std. Log Tons / $ GDP
GDP per Capita	.42	.61	-1	1.6	3555	Std. Log $ / Person
GDP Growth	.0064	.67	-1.6	1.6	3555	% Annual Change
Fossil Fuel Inc. per Cap.	.099	1	-1.8	1.7	3470	Inverse Hyperbolic Sign of $ / Person
E.U. Member	.59	.49	0	1	3555	Binary

*"toe" stands for a metric "ton of oil equivalent." This represents the energy derived from burning one ton of oil, and is equivalent to 11.63 Megawatt hours (MWh). To put these units in context, the European Union used approximately 3.2 toe or 37.2 MWh of energy per capita in 2015, while the United States used 6.8 toe or 79.1 MWh per capita (World Bank, 2019). Imposing the mean shadow price (across all countries and countries) would cost $344.29 per person in the EU, and $731.61 per person in America, based on their relative average energy consumption. This would represent a substantial expenditure in either jurisdiction.

Table A2: Pairwise Correlations

		1	2	3	4	5	6	7	8
1	Shadow Price	1.00							
2	Labor Intensity	0.20	1.00						
3	Corporatism	0.28	0.03	1.00					
4	Labor Coordination	0.38	0.03	0.55	1.00				
5	Union Density	0.24	-0.01	0.59	0.14	1.00			
6	Union Cent.	0.22	-0.02	0.58	0.47	0.48	1.00		
7	EPL	0.14	-0.01	0.03	0.62	-0.04	0.32	1.00	
8	ALMP	0.36	0.10	0.57	0.30	0.54	0.32	0.24	1.00
9	Wage Cent.	0.21	0.01	0.75	0.53	0.33	0.77	0.20	0.35
10	Redistribution	0.16	0.01	0.71	0.28	0.61	0.35	-0.02	0.68
11	CO_2 Intensity	-0.24	-0.19	-0.11	-0.15	-0.09	-0.13	-0.12	-0.13
12	Output	0.10	0.13	-0.22	-0.09	-0.42	-0.38	-0.29	0.06
13	Nat. CO_2 Intensity	-0.38	-0.09	-0.37	-0.37	-0.08	-0.18	-0.12	-0.41
14	GDP per Capita	0.25	0.15	0.26	-0.34	0.05	-0.15	-0.75	0.43
15	GDP Growth	-0.11	-0.00	-0.06	-0.21	0.06	0.01	-0.02	-0.01
16	Fossil Fuel Inc. per Cap.	-0.15	-0.00	-0.20	-0.44	-0.37	-0.31	-0.52	-0.26
17	E.U. Member	0.40	0.08	0.33	0.37	0.34	0.33	0.60	0.60

		9	10	11	12	13	14	15	16	17
9	Wage Cent.	1.00								
10	Redistribution	0.36	1.00							
11	CO_2 Intensity	-0.12	-0.08	1.00						
12	Output	-0.42	-0.17	-0.15	1.00					
13	Nat. CO_2 Intensity	-0.17	-0.28	0.21	-0.34	1.00				
14	GDP per Capita	0.05	0.26	-0.14	0.37	-0.71	1.00			
15	GDP Growth	0.10	-0.11	0.04	-0.13	0.12	-0.10	1.00		
16	Fossil Fuel Inc. per Cap.	-0.08	-0.13	0.08	0.06	0.32	-0.00	0.06	1.00	
17	E.U. Member	0.35	0.32	-0.23	-0.02	-0.61	0.43	0.02	-0.27	1.00

Table A3: Corporatism

	(1)	(2)
Labor Share of Value-Added	32.68***	31.47***
	(7.76)	(7.64)
Corporatism	27.08	17.48
	(46.50)	(46.94)
Corporatism × Labor Intensity		22.29***
		(5.17)
Corporatism × CO_2 Intensity		-27.81***
		(4.97)
Corporatism × CO_2 Intensity × Labor Intensity		16.67***
		(4.30)
CO_2 Intensity	-65.40***	-64.30***
	(9.93)	(9.85)
CO_2 Intensity × Labor Intensity		1.77
		(6.49)
National CO_2 Intensity	-178.91***	-187.83***
	(33.52)	(32.97)
Fossil Fuel Income per Capita	-42.12***	-40.63***
	(12.01)	(11.80)
GDP per Capita	22.82	18.80
	(65.56)	(64.45)
European Union Member	50.69	59.69
	(117.09)	(117.98)
Year	3.89	3.55
	(3.10)	(3.05)
Sector Random Effect	4.78***	4.78***
	(0.13)	(0.13)
Country Random Effect	5.22***	5.23***
	(0.17)	(0.17)
Residual Random Effect	5.37***	5.35***
	(0.01)	(0.01)
Constant	4.94	-6.03
	(120.48)	(120.68)
N	2,359	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A4: Varieties of Capitalism

	(1)	(2)
Labor Share of Value-Added	29.49***	2.13
	(8.36)	(13.15)
Labor Relations Coordination	208.17	201.74
	(164.78)	(165.55)
Labor Coordination × Labor Intensity		53.93***
		(18.85)
Labor Coordination × CO_2 Intensity		-92.97***
		(21.32)
Labor Coordination × CO_2 Intensity × Labor Intensity		46.04**
		(18.12)
CO_2 Intensity	-88.26***	-31.11*
	(11.09)	(16.47)
CO_2 Intensity × Labor Intensity		-23.70*
		(12.31)
National CO_2 Intensity	-167.66***	-175.04***
	(35.94)	(35.58)
Fossil Fuel Income per Capita	-39.66***	-36.19***
	(12.33)	(12.23)
GDP per Capita	37.87	42.63
	(66.85)	(66.16)
European Union Member	21.83	35.30
	(115.47)	(115.96)
Year	3.02	2.67
	(3.18)	(3.15)
Sector Random Effect	4.82***	4.81***
	(0.13)	(0.13)
Country Random Effect	5.20***	5.21***
	(0.18)	(0.18)
Residual Random Effect	5.39***	5.38***
	(0.02)	(0.02)
Constant	-94.19	-111.91
	(129.03)	(129.10)
N	2,227	2,227

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A5: Unions

	(1)	(2)	(3)
Union Density	-2.85	-6.80	-9.33
	(39.15)	(39.07)	(39.16)
Labor Share of Value-Added	32.73***	31.08***	31.72***
	(7.76)	(7.71)	(7.70)
Union Density × CO_2 Intensity		-29.76***	-24.31***
		(4.63)	(4.99)
Union Density × Labor Intensity			16.77***
			(5.13)
Union Density × CO_2 Intensity × Labor Intensity			6.85
			(4.48)
CO_2 Intensity	-65.43***	-61.33***	-58.33***
	(9.93)	(9.89)	(9.97)
CO_2 Intensity × Labor Intensity			-0.78
			(6.50)
National CO_2 Intensity	-180.85***	-188.35***	-189.51***
	(33.57)	(33.32)	(33.26)
Fossil Fuel Income per Capita	-42.51***	-42.80***	-42.73***
	(12.02)	(11.91)	(11.89)
GDP per Capita	27.95	25.02	23.42
	(65.39)	(64.87)	(64.77)
European Union Member	75.00	74.51	77.44
	(116.07)	(116.01)	(116.37)
Year	3.54	3.35	3.36
	(3.20)	(3.17)	(3.17)
Sector Random Effect	4.78***	4.78***	4.79***
	(0.13)	(0.13)	(0.13)
Country Random Effect	5.24***	5.24***	5.25***
	(0.19)	(0.18)	(0.19)
Residual Random Effect	5.37***	5.36***	5.36***
	(0.01)	(0.01)	(0.01)
Constant	-19.46	-21.79	-22.86
	(116.68)	(116.46)	(116.69)
N	2,359	2,359	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A6: Sector-Level Union Density

	(1)	(2)	(3)
Union Density	9.66	4.56	3.48
	(15.34)	(15.28)	(15.27)
Labor Share of Value-Added	29.38**	32.07**	41.97***
	(13.69)	(13.71)	(14.03)
Union Density × CO_2 Intensity		-44.45***	-18.20
		(11.50)	(13.36)
Union Density × Labor Intensity			-0.07
			(9.54)
Union Density × CO_2 Intensity × Labor Intensity			39.89***
			(10.24)
CO_2 Intensity	-134.19***	-135.97***	-144.35***
	(18.47)	(18.54)	(18.94)
CO_2 Intensity × Labor Intensity			24.05*
			(12.42)
National CO_2 Intensity	-140.60**	-146.78**	-145.15**
	(63.41)	(62.95)	(62.85)
Fossil Fuel Income per Capita	-54.94***	-56.91***	-58.72***
	(19.86)	(19.66)	(19.45)
GDP per Capita	78.55	75.94	76.75
	(79.66)	(79.49)	(80.83)
European Union Member	101.54	99.65	97.58
	(67.70)	(67.15)	(66.92)
Year	5.39	5.26	5.01
	(4.85)	(4.81)	(4.80)
Sector Random Effect	4.67***	4.75***	4.94***
	(0.23)	(0.23)	(0.24)
Country Random Effect	5.43***	5.43***	5.48***
	(0.16)	(0.16)	(0.16)
Residual Random Effect	5.39***	5.38***	5.36***
	(0.03)	(0.03)	(0.03)
Constant	-4.34	-2.45	9.82
	(78.57)	(79.40)	(83.95)
N	690	690	690

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A7: Union Centralization

	(1)	(2)	(3)
Union Centralization	-233.40***	-234.13***	-237.17***
	(33.94)	(33.76)	(33.73)
Labor Share of Value-Added	32.78***	31.41***	33.95***
	(7.67)	(7.65)	(7.66)
CO_2 Intensity	-64.60***	-57.25***	-56.79***
	(9.83)	(9.93)	(9.93)
Union Cent. $\times$ CO_2 Intensity		-22.12***	-15.33***
		(4.83)	(5.24)
CO_2 Intensity $\times$ Labor Intensity			-2.45
			(6.69)
Union Cent. $\times$ Labor Intensity			18.99***
			(5.42)
Union Cent. $\times$ CO_2 Intensity $\times$ Labor Intensity			11.17**
			(4.44)
National CO_2 Intensity	-187.29***	-190.19***	-190.08***
	(34.04)	(33.89)	(33.79)
Fossil Fuel Income per Capita	-62.02***	-60.10***	-61.03***
	(12.31)	(12.26)	(12.23)
GDP per Capita	-11.80	-11.64	-11.26
	(66.36)	(66.05)	(65.86)
European Union Member	226.75	230.28	233.65
	(182.96)	(181.17)	(182.05)
Year	4.57	4.55	4.65
	(3.11)	(3.10)	(3.09)
Sector Random Effect	4.78***	4.78***	4.78***
	(0.13)	(0.13)	(0.13)
Country Random Effect	5.75***	5.74***	5.75***
	(0.19)	(0.19)	(0.19)
Residual Random Effect	5.36***	5.35***	5.35***
	(0.01)	(0.01)	(0.01)
Constant	-98.42	-104.40	-106.40
	(171.22)	(169.65)	(170.34)
N	2,359	2,359	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A8: Employment Protection

	(1)	(2)	(3)
Labor Share of Value-Added	32.33***	32.33***	32.04***
	(7.71)	(7.71)	(7.71)
Employment Protection Legislation	-136.14***	-136.14***	-133.99***
	(23.68)	(23.68)	(23.57)
EPL × Labor Intensity			9.20*
			(5.46)
EPL × CO_2 Intensity			23.51***
			(5.85)
EPL × CO_2 Intensity × Labor Intensity			18.52***
			(5.13)
CO_2 Intensity	-65.81***	-65.81***	-74.74***
	(9.87)	(9.87)	(10.11)
CO_2 Intensity × Labor Intensity			-3.40
			(6.60)
National CO_2 Intensity	-192.28***	-192.28***	-188.22***
	(33.60)	(33.60)	(33.44)
Fossil Fuel Income per Capita	-32.94***	-32.94***	-36.89***
	(12.14)	(12.14)	(12.11)
GDP per Capita	71.76	71.76	73.15
	(65.55)	(65.55)	(65.22)
European Union Member	278.46**	278.46**	269.66**
	(131.33)	(131.33)	(130.28)
Year	-2.19	-2.19	-2.13
	(3.22)	(3.22)	(3.21)
Sector Random Effect	4.78***	4.78***	4.78***
	(0.13)	(0.13)	(0.13)
Country Random Effect	5.37***	5.37***	5.36***
	(0.18)	(0.18)	(0.18)
Residual Random Effect	5.36***	5.36***	5.36***
	(0.01)	(0.01)	(0.01)
Constant	-219.24*	-219.24*	-211.25
	(130.76)	(130.76)	(129.84)
N	2,359	2,359	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A9: Active Labor Market Programs

	(1)	(2)	(3)
Labor Share of Value-Added	43.75***	38.38***	37.89***
	(6.28)	(6.13)	(6.13)
Active Labor Market Programs	14.55	9.84	9.54
	(17.33)	(16.90)	(16.92)
ALMP $\times$ CO_2 Intensity		-57.93***	-55.73***
		(4.16)	(4.67)
ALMP $\times$ Labor Intensity			10.06**
			(4.17)
ALMP $\times$ CO_2 Intensity $\times$ Labor Intensity			4.65
			(3.89)
CO_2 Intensity	-66.11***	-70.97***	-68.58***
	(7.64)	(7.47)	(7.51)
CO_2 Intensity $\times$ Labor Intensity			13.15***
			(5.08)
National CO_2 Intensity	-159.36***	-164.82***	-164.40***
	(28.60)	(27.87)	(27.85)
Fossil Fuel Income per Capita	-53.05***	-52.78***	-52.98***
	(11.33)	(11.02)	(11.01)
GDP per Capita	-94.35**	-92.11**	-90.37**
	(41.73)	(40.78)	(40.83)
European Union Member	48.84*	58.22**	56.84**
	(25.59)	(24.90)	(24.88)
Year	8.65***	7.83***	7.96***
	(2.34)	(2.28)	(2.27)
Sector Random Effect	4.60***	4.62***	4.62***
	(0.13)	(0.13)	(0.13)
Country Random Effect	5.09***	5.08***	5.08***
	(0.15)	(0.15)	(0.15)
Residual Random Effect	5.37***	5.35***	5.34***
	(0.01)	(0.01)	(0.01)
Constant	84.38**	70.38*	71.12*
	(41.89)	(41.56)	(41.77)
N	3,298	3,298	3,298

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged

Table A10: Redistribution

	(1)	(2)	(3)
Relative Redistribution	18.34	16.71	14.14
	(11.78)	(11.73)	(11.72)
Labor Share of Value-Added	32.75***	30.73***	32.62***
	(7.76)	(7.73)	(7.72)
Redistribution × CO_2 Intensity		-23.73***	-18.08***
		(4.65)	(4.92)
Redistribution × Labor Intensity			18.20***
			(4.91)
Redistribution × CO_2 Intensity × Labor Intensity			11.13**
			(4.58)
CO_2 Intensity	-65.57***	-69.16***	-65.43***
	(9.93)	(9.91)	(9.97)
CO_2 Intensity × Labor Intensity			1.42
			(6.53)
National CO_2 Intensity	-176.79***	-178.65***	-180.29***
	(33.53)	(33.36)	(33.27)
Fossil Fuel Income per Capita	-40.41***	-40.08***	-40.72***
	(12.07)	(12.01)	(11.97)
GDP per Capita	28.63	25.46	24.64
	(64.88)	(64.56)	(64.38)
European Union Member	63.11	62.89	64.70
	(111.50)	(111.50)	(112.02)
Year	3.45	3.20	3.42
	(3.07)	(3.05)	(3.04)
Sector Random Effect	4.78***	4.78***	4.78***
	(0.13)	(0.13)	(0.13)
Country Random Effect	5.23***	5.23***	5.24***
	(0.17)	(0.17)	(0.17)
Residual Random Effect	5.37***	5.36***	5.36***
	(0.01)	(0.01)	(0.01)
Constant	-7.91	-7.98	-9.37
	(114.59)	(114.46)	(114.80)
N	2,359	2,359	2,359

Multilevel Mixed-Effects Linear Regression
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$
S = Standardized, L = Logged