

The Politics of Industrial Decarbonisation

Explaining Variation in National Policies for Decarbonising Energy-
Intensive Industries

Ebba Minas

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Abstract

Decarbonising energy-intensive industries (EIIs) represents one of the most challenging dimensions of the low-carbon transition. Emissions from industries such as steel, cement, and chemicals remain difficult to reduce due to technological constraints, high capital intensity, and exposure to international competition. Despite their central importance for achieving climate neutrality, we lack systematic knowledge about how governments design policies targeting these sectors and why such policies vary across countries and over time.

This dissertation addresses this gap by examining the political and institutional drivers of EII decarbonisation policies and their implications for emissions outcomes. Bringing together insights from climate politics and political economy, the dissertation develops a theoretical framework in which variation in policy output and policy instrument choice is shaped by economic institutions, partisan politics, and supranational governance. Empirically, the dissertation adopts a comparative approach and draws on an original dataset of EII decarbonisation policies across advanced economies, complemented by analyses of European Union climate policy and firm-level emissions data from Sweden.

Across four papers, the dissertation generates three main findings. First, it provides the first comprehensive, longitudinal, cross-national analysis of policies targeting EIIs, demonstrating that governments overwhelmingly rely on “soft” policy instruments—such as subsidies, voluntary agreements, and informational tools—rather than more coercive “hard” instruments such as regulations and taxes. While the overall number of policies has increased over time, the dominance of soft instruments remains stable. Second, the dissertation shows that variation in EII decarbonisation policies is primarily shaped by domestic institutional configurations. Corporatist economies are associated with higher levels of policy output and a greater use of hard policy instruments, while left-leaning governments are linked to more extensive and interventionist policy frameworks. In contrast, supranational governance through the EU Emissions Trading System has a lesser effect on national policy output or instrument choice. Third, the dissertation finds limited evidence that these political and institutional dynamics translate into measurable emission reductions. Neither EU carbon pricing nor partisan shifts in publicly owned energy firms are systematically associated with declining emissions trajectories, suggesting that decarbonisation outcomes in EIIs are shaped by constraints that extend beyond short-term political dynamics.

Taken together, the dissertation demonstrates that while governments play a central role in designing policies for industrial decarbonisation, these policies are structured by domestic institutions and do not automatically translate into emissions reductions. By providing the first systematic comparative analysis of EII decarbonisation policies, the dissertation contributes to research on climate governance and offers new insights into the political economy of industrial transformation.

Keywords: *Decarbonisation, Energy Intensive Industries, Policy Instruments, Political Economy, Comparative Climate Politics.*

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Introduction

The urgency of addressing climate change has intensified in recent decades, and many countries have made significant progress in reducing CO₂ emissions in parts of their economies. Rapid expansion of renewable energy, improvements in energy efficiency, and electrification in sectors such as power generation and transportation have demonstrated that substantial emissions reductions are achievable with existing technologies and policy frameworks (Lee et al., 2023; Keramidas et al., 2018). Yet these advances have also highlighted a persistent challenge: a large share of global emissions now originates from hard-to-abate sectors, where decarbonisation is technologically complex, capital-intensive, and often dependent on emerging technologies such as hydrogen, carbon capture, or new industrial processes (IEA, 2023; IRENA, 2024). These sectors include heavy industry, energy, shipping, and long-distance transport, and together they account for a significant proportion of global CO₂ emissions. Without rapid progress in decarbonising these sectors, the prospect of achieving a net-zero global economy and limiting climate change to internationally agreed targets remains uncertain (Lee et al., 2023).

Decarbonising the energy intensive industries (EIIs) is widely recognised as one of the most difficult challenges of the low-carbon transition (Åhman, Arens & Vogl, 2022). The sectors — including cement, steel, chemicals, aluminium, non-ferrous metals, paper and pulp — are responsible for roughly one fifth of global CO₂ emissions and form the backbone of modern industrial economies (IEA, 2023; Oberthür, Khandekar & Wyns, 2021). Their products are indispensable for infrastructure, construction, and the deployment of low-carbon technologies themselves. At the same time, these industries are characterised by long investment cycles, capital-intensive production processes, and strong exposure to international competition, making rapid emissions reductions particularly difficult (Wesseling et al., 2017). Achieving deep emissions reductions in these sectors therefore depends heavily on the design of policies capable of steering toward net-zero.

Existing research suggests that policymaking targeting EIIs is politically difficult (Åhman, Arens & Vogl, 2022). These sectors are economically strategic, often providing employment, anchoring regional economies, and contributing substantially to national exports (Mildenberger, 2020). Their strong exposure to international competition makes policymakers cautious about introducing measures that could raise production costs or trigger carbon leakage (Åhman, Nilsson & Johansson, 2017). As a result, governments face a political dilemma: ambitious decarbonisation policies are necessary to meet climate targets, yet such policies may impose costs on economically and politically powerful industries. In practice, this tension often leads policymakers to combine regulatory measures with subsidies, exemptions, and industrial support rather than relying solely on stringent regulatory frameworks (Hildingsson, Kronsell & Khan, 2019).

Despite the central importance of EIIs for achieving climate neutrality, progress in decarbonising these sectors has been slow. Yet we still know relatively little about the policies governments adopt to decarbonise EIIs and why these policies vary across countries and over time. Existing research on industrial decarbonisation has largely relied on qualitative case studies of individual countries or sectors, which provide valuable insights into policymaking processes and technological transitions (Nurdiawati & Urban, 2021; Hildingsson, Kronsell & Khan, 2019; Algers & Åhman, 2024; Gielen et al., 2020). However, there has been little systematic comparative research examining what types of policies governments adopt to decarbonise EIIs, how these policies differ across countries, and what political and institutional factors explain these differences. As a result, we still lack a clear understanding of how governments are attempting to steer decarbonisation in some of the most hard-to-abate sectors of the economy.

This dissertation addresses this gap by placing variation in EII decarbonisation policies at the centre of analysis. It conceptualises such policies as a distinct domain of climate governance and systematically distinguishes between different types of policy instruments and modes of steering. Drawing on an original dataset covering decarbonisation policies targeting the EIIs across advanced economies, this dissertation provides the first systematic comparative analysis of how these policies vary across time and space, what political and institutional factors explain this variation, and under what conditions these policies contribute to measurable decarbonisation outcomes.

In doing so, this dissertation draws on insights from environmental governance — particularly research on policy instruments and policy mixes — and from comparative political economy, including work on economic institutions, political systems, and partisan politics. By examining how domestic institutional configurations and international governance arrangements shape the adoption and design of industrial decarbonisation policies, the study develops an analytical framework for assessing variation in EII decarbonisation policies.

Aim and Research Question

The aim of this dissertation is to explain variation in policies targeting the decarbonisation of EIIs across time and countries, and to assess the conditions under which these policies contribute to measurable low carbon outcomes. The dissertation thus poses the following overarching research question:

What explains variation in policies for EII decarbonisation across time and space, and what are the consequences of these policies?

This overarching question is addressed through three interrelated sub-questions:

How do EII decarbonisation policies vary across countries and over time in terms of frequency and type of policy instruments?

To what extent do domestic institutional configurations, partisan politics and supranational influences explain this variation?

Under what conditions do policy instruments targeting EIIs translate into observable decarbonisation outcomes?

To answer these questions, the dissertation employs a comparative research design combining longitudinal observational analysis and quasi-experimental methods. It introduces an original dataset on decarbonisation policies targeting the EIIs across advanced economies and complements this with analyses on supranational and subnational political determinants of industrial CO₂ emissions.

The work is structured across four papers, each contributing to the overarching research question. The first paper provides a comparative

analysis of cross-national variation in EII decarbonisation policies using the original dataset. The second paper examines how supranational governance, specifically the European Union's Emissions Trading System (EU ETS), shapes the national-level policy developments and emissions reductions in EIIs. Paper three addresses key theoretical insights regarding industry-state relations and interest mediation in climate politics in national policymaking, which inform the integrated framework developed in this introduction. The fourth paper assesses whether the political ideology of municipal governments influences emissions trajectories in municipally owned industrial firms, where public ownership gives local governments direct influence over energy infrastructure. The first two papers therefore have a cross-country approach, whilst the second two move the focus to the national level.

Taken together, the dissertation advances research on climate politics and comparative political economy in three ways. It conceptualises EII decarbonisation policies as a distinct sector-specific subset of climate policies. Theoretically, it develops a comprehensive framework for analysing variation in industrial decarbonisation policies. Empirically, it introduces and analyses a novel cross-national dataset on EII-targeted policies. Methodologically, it demonstrates the value of combining large-n comparative analysis with quasi-experimental approaches to study both policy outputs and outcomes in hard-to-abate sectors.

Theorising EII Decarbonisation Policies

Theoretically, this thesis synthesises scholarship from climate politics and comparative political economy to understand the general output, type and effectiveness of EII decarbonisation policies. There is a small, albeit growing body of research that focuses on the decarbonisation of industry, where the focus is less on the technical changes required and more on the political and economic factors involved in the green transition of industries. This is the literature that has also contributed to the conceptualisation of the necessary policies and to the identification of the political and institutional dynamics shaping their development.

Building on these insights, this chapter develops a theoretical framework for analysing variation in EII decarbonisation policies across countries and over time. The chapter proceeds in two steps. First, it conceptualises EII decarbonisation policies as a specific subset of climate policy instruments aimed at reducing emissions in EIIs. Second, it identifies the key political and institutional factors expected to shape the adoption and design of such policies. Drawing on insights from climate politics and comparative political economy, the framework highlights three sets of factors that structure policymaking in this area: economic structures, partisan politics, and supranational institutions. Together, these dimensions provide an analytical framework for understanding why governments adopt different types and volumes of policies targeting the decarbonisation of EIIs.

Conceptualising EII Decarbonisation Policies

The policies at the centre of this dissertation are decarbonisation policies targeting the EIIs. These policies can be understood as a sector-specific subset of climate policy more broadly. Climate policies are typically conceptualised as public policy instruments designed to reduce greenhouse gases (GHG) emissions through mechanisms such as

regulatory standards, economic incentives, technological support, or emissions trading systems (Meckling, 2021). Much of the comparative climate policy literature therefore focuses on identifying and categorising policy instruments that aim to mitigate emissions across the economy.

Several approaches have been developed to conceptualise and measure climate policy outputs in comparative research. One influential approach focuses on policy output, defined as the adoption of concrete policy instruments aimed at reducing GHG emissions. Schaffrin, Sewerin and Seubert (2014), for example, conceptualise climate policy output as the adoption of specific policy instruments and propose a comparative framework distinguishing between different types of policy tools such as regulatory instruments, economic incentives, and informational measures. Similarly, Bernauer and Böhmelt (2013) measure national climate policies through a composite index capturing countries' mitigation policies and policy commitments, emphasising the importance of systematically comparing policy outputs across countries. More recently, Schaub et al. (2022) conceptualise climate policy ambition through a policy density perspective, focusing on the number and variety of climate policies adopted by governments over time. In this perspective, policy ambition can be assessed by examining how many policies governments adopt and how these accumulate within national policy mixes.

While these approaches provide important insights into climate policy development, they largely examine economy-wide and emissions-wide climate policy portfolios rather than policies targeting specific industrial sectors. Yet the decarbonisation of EIIs presents distinct governance challenges. These sectors — such as steel, cement, chemicals, and paper and pulp — are characterised by high capital intensity, long investment cycles, and exposure to international competition. As a result, policies targeting these sectors often combine elements of climate policy with industrial and innovation policy instruments (Meckling, 2021). Meckling (2021), for instance, highlights the importance of industrial policy tools — such as public investment, technology support, and industrial coordination — in enabling the decarbonisation of hard-to-abate sectors.

Building on this literature, this dissertation conceptualises EII decarbonisation policies as policies that aim to reduce CO₂ emissions in EIIs either directly or indirectly. Direct policies refer to instruments that specifically target these industrial sectors, such as sector-specific regulatory standards or technology support programmes aimed at facilitating

low-carbon industrial processes. Indirect policies include economy-wide climate policy instruments — such as carbon pricing mechanisms or emissions trading systems — that also include emissions from EIIs. Focusing specifically on CO₂ emissions (or CO₂ and other GHG emissions combined, if a policy has a cross-emissions type focus) is justified by the central role these emissions play in the climate impact of energy-intensive sectors, where carbon dioxide constitutes the dominant source of GHG emissions. Concentrating on policies aimed at reducing CO₂ emissions therefore allows for a systematic analysis of the different policy instruments governments employ to achieve industrial decarbonisation.

In order to capture the full range of policy instruments used to steer industrial decarbonisation, this dissertation adopts a broad conceptualisation of policy that includes both binding and non-binding instruments as well as regulatory and voluntary measures. This approach follows the broader conceptualisation of climate policy used in comparative policy research, where different types of policy instruments are included in order to capture the diversity of national climate policy mixes (Schaffrin, Sewerin & Seubert, 2014; Schaub et al., 2022; Bernauer & Böhmelt, 2013). Adopting a broad conceptualisation of policy also allows the analysis to capture the combination of regulatory, market-based, and supportive instruments that governments employ when addressing industrial decarbonisation.

More broadly, research on public policy instruments emphasises that governments may steer economic activity not only through regulation and incentives, but also through organisational instruments, including the ownership and operation of public enterprises (Peters, 2005; Howlett, 2018; Howlett, 2020). Public ownership allows governments to exercise direct influence over investment decisions, technological development, and production processes within strategic sectors. As Bernier (2014) argues, public enterprises can therefore function as policy instruments through which governments pursue economic, social, or environmental objectives. In the context of industrial decarbonisation, ownership structures may shape firms' incentives and capacities to reduce emissions, particularly in infrastructure-intensive sectors such as electricity and district heating where public ownership remains widespread. For this reason, the dissertation also treats public ownership arrangements as a form of policy intervention, through which governments may influence decarbonisation trajectories in EIIs.

Theoretical Framework

To understand what drives the output, type, and effectiveness of EII decarbonisation policies, this dissertation develops a theoretical framework that identifies key political and institutional factors shaping these policy outcomes. The framework synthesises insights from the literatures on climate politics and comparative political economy, applying them to the specific context of industrial decarbonisation. While much research on climate policy has focused on economy-wide mitigation efforts, the decarbonisation of EIIs presents distinct political and institutional challenges due to the sectors' economic importance, high emissions intensity, and exposure to international competition. A sectoral approach therefore allows for a more precise examination of how political institutions shape climate policy in industries where the trade-offs between environmental ambition and economic competitiveness are particularly pronounced.

Building on this perspective, the framework focuses on three sets of factors that are expected to structure the politics of industrial decarbonisation: economic structures, partisan politics, and supranational institutions. Economic structures shape how governments coordinate with organised economic actors, partisan politics structure partisan competition and ideological preferences in climate policymaking, and supranational institutions influence the broader governance context in which national policy decisions are made. Together, these dimensions provide a basis for analysing variation in the adoption, design, and effectiveness of EII decarbonisation policies across countries and over time.

Economic Structures

In the context of industrial decarbonisation, economic structures shape how governments coordinate with organised economic actors, and corporatist arrangements represent one of the most prominent institutional frameworks structuring such interactions.

Corporatism refers to an institutionalised system of interest intermediation in which organised economic actors, such as business associations and labour unions, are formally integrated into policy pro-

cesses alongside the state. In contrast to pluralist systems — where interests compete in relatively open and fragmented arenas — corporatist arrangements are characterised by more structured and centralised forms of representation and negotiation between organised interests and the state (Cawson, 1978; Martin, 1983). These systems typically involve a limited number of encompassing organisations representing labour and capital, which participate in structured bargaining processes with government actors. The defining feature of corporatism is therefore not simply the influence of interest groups, but the institutionalisation of coordination and negotiation mechanisms through which governments and organised interests jointly shape policy outcomes. This in turn ensures that interest groups take a wider interest in societal issues, rather than retaining a narrow focus on sectoral concerns (Cawson, 1978; Stewart, 1992).

Classic accounts of corporatism emphasise the exchange relationship between the state and organised interests. Governments grant privileged access to policymaking in return for the capacity of interest organisations to coordinate their members and facilitate compliance with negotiated policies (Cawson, 1978). As Martin (1983) notes, corporatist arrangements differ from pluralist systems in that the number of recognised actors is more restricted and their participation in policymaking is formally structured. This institutional configuration allows governments to negotiate policy compromises with organised actors capable of delivering collective compliance among their members. Stewart (1992) further highlights that corporatist systems can facilitate political learning by creating institutionalised arenas for dialogue and negotiation between state and societal actors, allowing policy actors to adapt policies through iterative bargaining processes.

These institutional features have been argued to shape policymaking in areas characterised by complex coordination problems and significant distributional conflicts, including environmental and climate policy. Scruggs (2003), for example, argues that corporatist systems influence environmental performance by structuring how governments interact with organised economic interests when designing environmental regulations. In corporatist settings, governments may be better positioned to negotiate environmental reforms with affected industries because organised interests can coordinate responses among their members and help internalise policy compromises. Similarly, Matthews (2001) shows that institutional configurations such as corporatism and pluralism influence the relationship between political institutions, organised interests, and policy outcomes in energy and environmental

policymaking. Differences in these institutional arrangements shape how governments balance environmental objectives with economic interests in the policy process.

Empirical studies of climate governance further illustrate how corporatist institutional arrangements structure interactions between state and societal actors in climate policymaking. For instance, Hildingsson, Kronsell and Khan (2019) analyse climate policymaking in Sweden and describe how decarbonisation governance operates within a corporatist “green state,” where close interactions between governmental actors, industry organisations, and other stakeholders shape policy development. Similarly, Gronow et al. (2019) demonstrate that corporatist institutional traditions influence the structure of climate policy networks in Nordic countries by shaping patterns of interaction between governmental actors and organised interests. Their comparison of Finland and Sweden shows how corporatist institutional legacies structure who participates in climate policymaking and how policy debates are organised.

Beyond the Nordic context, comparative research suggests that corporatist traditions shape broader governance arrangements for climate and energy policy. Vink et al. (2015), for example, show that state traditions influence the design of climate governance initiatives by comparing adaptation governance in the Netherlands and the United Kingdom, highlighting how corporatist institutional traditions structure deliberative policymaking processes. Similarly, Horváthová, Dobbins and Labanino (2021) identify the emergence of forms of “energy policy corporatism” in parts of Central and Eastern Europe, where organised interests are increasingly integrated into energy policymaking processes. Studies of climate politics in small European states also highlight how institutional arrangements — including corporatist traditions — shape the interaction between governments and organised interests in climate policymaking (Carter, Little & Torney, 2019). Cross-national evidence shows that corporatist systems are associated with higher levels of climate policy investment, as such arrangements allow governments to negotiate compensation with affected industries and thereby reduce opposition to costly decarbonisation policies (Finnegan, 2022). More broadly, institutional governance systems structure how actors coordinate and interact in climate policymaking, influencing both policy design and implementation (Griffiths, Haigh & Rassias, 2007).

Taken together, this literature suggests that corporatist institutions may influence the scope and type of EII decarbonisation policies by shaping the institutional context in which governments interact with or-

ganised economic actors. Decarbonising such sectors involves significant coordination challenges, societal engagement by industry actors, long-term investment decisions, and the distribution of adjustment costs across firms, workers, and governments. In corporatist systems, institutionalised bargaining arrangements between the state and organised interests may facilitate negotiated policy solutions that reconcile environmental objectives with economic concerns. By enabling structured coordination between governments and organised industries, corporatist institutions may therefore influence both the adoption and the design of policies aimed at decarbonising the EII.

Partisan Politics

Political parties represent a central mechanism through which societal preferences are translated into public policy. In climate politics literature, a large body of research suggests that parties differ systematically in their policy priorities based on ideological orientations and the social groups they represent. Left-leaning parties have historically been associated with stronger environmental protection and greater support for state intervention in markets, while right-leaning parties tend to prioritise economic growth, market solutions, and the interests of business constituencies. These ideological differences shape how parties evaluate environmental regulation and climate policy instruments (Carter et al., 2018; Gunderson, Stuart & Petersen, 2018). As a result, partisan competition can influence both the ambition and design of climate policy.

Empirical research provides substantial evidence that partisan ideology influences both climate attitudes and climate policy outcomes. Studies of public opinion demonstrate that political ideology is strongly associated with climate beliefs and support for climate policy. McCright, Dunlap and Marquart-Pyatt (2016), for example, show that political ideology structures attitudes toward climate change across European Union member states, with individuals identifying with the political right generally expressing greater scepticism toward climate science and climate policy. Similar findings are reported by Knollenborg and Sommer (2023), who demonstrate that political orientation plays a significant role in shaping beliefs about climate change and support for climate policy instruments.

At the level of policymaking, research suggests that partisan dynamics influence the adoption and stringency of environmental and

climate policies. Schulze (2021) and Carter (2013) shows that party ideology affects climate policy adoption and design, although the relationship varies depending on the type of policy instrument and political context. Similarly, Tawiah (2022) finds that political ideology is associated with differences in the stringency of environmental policies across countries. Studies of party competition also highlight how ideological differences among political parties shape climate policy debates and electoral competition around environmental issues (Carter & Little, 2021). Together, this literature indicates that partisan politics can influence climate policymaking through both ideological commitments and strategic electoral incentives.

Partisan dynamics may also shape decarbonisation outcomes through public ownership arrangements. Governments often exercise direct influence over strategic sectors through ownership of firms or infrastructure, allowing political actors to shape corporate strategies, investment decisions, and technological development. In this sense, public ownership can function as a policy instrument through which governments pursue policy objectives. This policy choice is more frequently used by left-leaning parties, as empirical work has found a higher pervalence of publicly owned firms in constituents ruled by parties on the left (Andrews, 2023; Avsar, Karayalcin & Ali Ulubasoglu, 2013; Bernier, 2014).

A key theoretical mechanism linking partisan politics to climate policymaking concerns the distributional consequences of environmental regulation. Climate policies often impose concentrated costs on specific sectors and groups while generating more diffuse societal benefits. Political parties therefore respond to these distributional dynamics by advancing policies aligned with the preferences of their core constituencies. In his analysis of climate politics in advanced democracies, Mildemberger (2020) emphasises how these dynamics are shaped by the interaction between economic interests and partisan politics.

Mildemberger therefore introduces the concept of “double representation of carbon polluters,” referring to situations in which carbon-intensive industries are politically represented across the ideological spectrum: on the political right through business associations concerned about regulatory costs, and on the political left through industrial labour unions concerned about employment losses. When carbon-intensive sectors enjoy such dual political representation, governments face strong political constraints in adopting ambitious climate policies, as both major political blocs have incentives to protect the interests of

affected industries. As a result, climate policymaking is often characterised by cautious and incremental policy approaches, particularly in sectors where decarbonisation threatens established industrial structures. In this sense, political parties operate within broader political-economic coalitions that shape the feasibility and design of climate policy reforms.

These partisan dynamics can consequently be particularly relevant in policy areas involving large economic adjustments, such as the decarbonisation of EIIs. Policies targeting these sectors often involve substantial economic trade-offs, including regulatory costs and industrial restructuring. Because political parties differ in their ideological orientations toward environmental protection, industrial policy, and market regulation, partisan control of government may shape both the ambition and design of decarbonisation policies targeting EIIs. Governments led by parties with stronger environmental commitments may be more likely to adopt ambitious regulatory or investment-based policies targeting industrial emissions, whereas governments prioritising economic competitiveness may favour more incremental or market-based approaches. Partisan politics may therefore influence variation in both the adoption and the composition of policies aimed at decarbonising energy-intensive sectors.

Supranational Institutions

Beyond domestic institutions, supranational and intergovernmental institutions and governance arrangements increasingly shape the conditions under which states pursue industrial decarbonisation. Climate change is inherently transnational, and many of the sectors responsible for high emissions — such as steel, cement, and chemicals — operate in highly globalised markets. As a result, national efforts to decarbonise EIIs are influenced by international regulatory frameworks, intergovernmental cooperation initiatives, and supranational policy regimes that structure incentives and constraints for domestic policymaking (Oberthür, Khandekar & Wyns, 2021). Supranational and international institutions can therefore influence national climate policy both by establishing shared rules and by facilitating coordination among states facing similar decarbonisation challenges. Examples of this are supranational institutions like the EU (Biesbroek & Swart, 2019), international agreements like the Paris Agreement (Falkner,

2016), and initiatives like the Leadership Group for Industry Transition (Otto & Oberthür, 2024).

A central theoretical argument in this literature is that international governance can help address coordination problems that arise in the decarbonisation of EIIs. Because these industries are highly exposed to international competition, governments may hesitate to introduce ambitious climate policies if such measures risk undermining the competitiveness of domestic firms. International cooperation and regulatory coordination can mitigate these concerns by creating more level playing fields across jurisdictions and by facilitating joint technological development and policy learning (Oberthür, Khandekar & Wyns, 2021; Otto & Oberthür, 2024). In this sense, intergovernmental and supranational institutions may enable more ambitious national policies by reducing the perceived risks associated with unilateral action in globally integrated industries.

Empirical research on industrial decarbonisation highlights the growing role of international and supranational policy frameworks in shaping domestic industrial transitions. The primary example of this is the EU, whose climate policy framework has evolved into an increasingly integrated policy mix combining regulatory instruments, market-based mechanisms, and industrial policy initiatives (Oberthür & von Homeyer, 2023). Instruments such as the EU ETS have created common regulatory frameworks for emissions reductions across member states, while broader initiatives such as the European Green Deal aim to align climate policy with industrial and innovation policy objectives. The EU has also sought to exercise international climate leadership by promoting ambitious climate policies and encouraging cooperation on decarbonisation strategies beyond its borders (Oberthür & Dupont, 2021).

More specifically, research on industrial decarbonisation emphasises that international governance frameworks shape both the technological and policy pathways available to EIIs. Reviews of decarbonisation strategies highlight the importance of coordinated policy frameworks, international technology cooperation, and regulatory standards in accelerating the deployment of low-carbon industrial technologies (Nurdiawati & Urban, 2021; Teske, Niklas & Talwar, 2022). At the same time, economic analyses underline that international policy coordination can reduce the cost burdens associated with industrial decarbonisation by spreading technological development and investment risks across countries (Fragkos, Fragkiadakis & Paroussos, 2021).

Similarly, research on EU industrial decarbonisation strategies highlights the importance of integrating climate policy with trade and industrial policy in order to support the transition of EIIs while maintaining economic competitiveness (Åhman & Nilsson, 2015).

More broadly, interdisciplinary work on industrial transformation emphasises that the decarbonisation of EIIs depends on the interaction between technological innovation, industrial policy, and multi-level governance arrangements (Svensson, Khan & Hildingsson, 2020). International institutions can play an important role in this process by facilitating knowledge exchange, coordinating policy approaches, and supporting the diffusion of low-carbon technologies across countries (Otto & Oberthür, 2024). However, existing research also suggests that the potential of international governance for industrial decarbonisation remains only partially realised, as coordination between national policies and international initiatives is often fragmented (Oberthür, Khandekar & Wyns, 2021).

Taken together, this literature suggests that international institutions influence the domestic politics of industrial decarbonisation by shaping the broader governance environment in which national policy decisions are made. International cooperation frameworks, supranational regulatory regimes, and transnational policy initiatives can alter the incentives facing governments and industries, thereby affecting the adoption and design of EII decarbonisation policies. In this sense, international institutions represent an important explanatory factor for variation in EII decarbonisation policies, as they shape both the opportunities and constraints facing national policymakers seeking to steer industrial transitions.

To synthesise the theoretical arguments developed in this chapter, the dissertation advances a framework in which variation in EII decarbonisation policies is shaped by three sets of institutional factors: economic structures, partisan politics, and supranational institutions. These institutional configurations are expected to structure how governments interact with organised economic actors, how political competition and ideological preferences are translated into policy, and how supranational governance arrangements shape domestic policy-making. Together, they influence both the overall policy output and the composition of policy instruments adopted across countries and over time. While these policies are intended to facilitate emissions reductions in EIIs, the extent to which they translate into observable decarbonisation outcomes remains an empirical question, contingent on

the interaction between policy design, sectoral characteristics, and broader technological and economic constraints.

Previous research

Guided by the theoretical framework outlined above, this section reviews the empirical literature relevant to the politics of industrial decarbonisation. While existing research has generated extensive knowledge on the technological and economic pathways required to decarbonise heavy industry, the political drivers shaping the design and variation of industrial decarbonisation policies remain comparatively underexplored.

The literature review focuses on three strands that are central to explaining variation in EII decarbonisation policies. First, research in climate politics has examined the adoption and design of climate policies and the political factors that shape variation in national climate policy ambition. Second, the political economy of decarbonisation has analysed the role of industrial actors, interest group coalitions, and state–industry relations in shaping climate policymaking. Third, sector-specific studies examine the governance of industrial decarbonisation, providing detailed insights into policy design and implementation challenges in EIIs.

Taken together, these literatures provide important insights into the politics of decarbonisation, but they remain limited in three key respects. First, much of the existing research focuses on climate policy in aggregate rather than on sector-specific policies targeting EIIs. Second, a large share of the literature relies on qualitative case studies, limiting our ability to systematically compare policy variation across countries and over time. Third, existing studies rarely examine variation in the composition of policy instruments, focusing instead on aggregate indicators of policy ambition. As a result, we still lack systematic comparative evidence on how industrial decarbonisation policies vary across countries and over time, what political and institutional factors explain this variation, and how different governance arrangements influence emissions outcomes in these sectors. Addressing these gaps is central to advancing our understanding of the politics of industrial decarbonisation.

National Climate Policy

A substantial body of research in climate politics examines how and why governments adopt climate policies. This literature provides important insights into the political dynamics shaping climate policy development, including the role of policy instruments, institutional arrangements, and political leadership. While most of this research focuses on climate policy more broadly rather than on EIs specifically, it provides the conceptual and methodological foundations for analysing variation in industrial decarbonisation policies.

One important strand of research examines variation in national climate policy outputs across countries. Comparative studies measure policy development through indicators such as the number of policies adopted, the types of policy instruments employed, or composite indicators of policy ambition (Bernauer & Böhmelt, 2013; Schaffrin, Sewerin & Seubert, 2014; Schaub et al., 2022; Schmidt & Fleig, 2018). Two main approaches can be distinguished: policy density, which captures the accumulation of policies over time, and policy intensity, which focuses on the stringency of individual measures (Nascimento & Höhne, 2023; Chen et al., 2024). While these approaches emphasise different dimensions of policy ambition, both provide important foundations for systematically analysing policy output across countries and over time.

Another body of work examines the political drivers of national climate policy. Studies highlight how domestic political institutions, economic structures, and political actors shape governments' willingness and capacity to adopt climate policies (Lachapelle & Paterson, 2013; Kammerer & Namhata, 2018; Trachtman, 2020; Clare, Frankhauser & Gennaioli, 2017). Political leadership also plays an important role in translating international climate commitments into domestic policy agendas. Willis (2020), for example, emphasises how national politicians shape the framing of climate issues and the development of domestic climate policy strategies. These studies demonstrate that climate policy development is embedded in domestic political processes. By systematically comparing policy outputs across countries, these studies identify patterns of climate policy development and distinguish between countries that emerge as environmental policy "leaders" and those that lag behind in policy adoption (Lieberfink et al., 2009).

Research has also examined how climate policies evolve over time, and how these should be interpreted. Policy change does not necessarily involve clear expansions or reversals of policy goals, but may

instead occur through more subtle forms of policy adjustment or re-trenchment. For example, changes in policy instruments included in a policy package or mix can give the appearance of deregulation, even when the underlying goals remain unchanged (Jordan et al., 2005; Jordan et al., 2013). Policy dismantling, conceptualised as the reduction or removal of existing policies, is not always highly visible nor deliberate (Burns, Tobin & Sewerin, 2019). Burns, Tobin and Sewerin (2019) shed light on the fact that environmental policy change can take several forms, including symbolic actions that signal policy change without substantive dismantling, policy drift where standards fail to adjust to changing conditions, and arena shifting where policy-making authority is moved to different political arenas. At the same time, research has also emphasised the importance of identifying cases of policy expansion and policy stability when analysing environmental policy development (Steinebach & Knill, 2016). Together, this literature draws attention to the difficulty of tracking and measuring policy output over time, as changes in policy mixes can both go unnoticed and signal misleading intentions.

Rather than evaluating individual policies in isolation, scholars increasingly emphasise the importance of analysing broader policy portfolios. Dimanchev and Knittel (2023), for example, use quantitative modelling to assess how combinations of policy instruments influence emissions reductions and economic outcomes across sectors. Their findings highlight that the effectiveness and political feasibility of climate policy often depend on how instruments interact with one another rather than on the properties of individual measures alone. Earlier work on environmental policy instruments similarly emphasises that different regulatory approaches — such as market-based mechanisms, regulatory standards, and fiscal instruments — operate within broader policy mixes that shape both environmental effectiveness and economic costs (Braathen, 2005; Braathen, 2007).

At the same time, comparative policy research suggests that the design and deployment of policy instruments varies systematically across political systems. Institutional structures and policymaking traditions shape which types of instruments governments adopt and how these instruments are combined within broader policy frameworks (Filgueiras, Palotti & Testa, 2023; Garritzmann, Röth & Kleider, 2021). Yet despite these advances, cross-national research on policy instrument choice remains relatively limited, particularly in relation to sector-specific climate policy. Capano and Howlett (2020) note that much of the policy instrument literature still operates at a high level of

abstraction, making it difficult to understand how policy mixes operate in specific sectors such as heavy industry.

Taken together, this literature provides important insights into the political dynamics shaping climate policymaking and the design of policy instruments. However, the comparative climate policy literature examines climate policy in aggregate rather than focusing on specific sectors. As a result, we still know relatively little about how governments design policies targeting hard-to-abate industries.

Political Economy of Industrial Decarbonisation

A central strand of research examines the political economy of decarbonisation. This research emphasises how economic structures, industrial interests, and state–industry relations shape the politics of climate policy. While early climate policy research often focused primarily on environmental governance or policymaking, political economy perspectives highlight how decarbonisation is embedded within broader economic structures, patterns of industrial production, and international competition.

One important theme in this literature concerns the relationship between decarbonisation and industrial development. Climate politics is increasingly understood not only as environmental governance but as industrial strategy, where states seek to balance emissions reductions with economic competitiveness (Lachapelle, MacNeil & Paterson, 2017; Ban & Hasselbalch, 2025; Arcand, 2026). From this perspective, policy choices are shaped by the position of industries within national and global production systems, linking decarbonisation to broader patterns of economic coordination and technological development.

A related strand of research focuses on the interaction between governments and organised economic interests in shaping climate policymaking. Firms operating in carbon-intensive and trade-exposed sectors often possess significant political influence due to their economic importance and organisational capacity (Genovese, 2019; Skodvin, Gullberg & Aakre, 2010). Studies of interest group politics demonstrate how well-organised industry coalitions can exert considerable influence over climate policy debates and may counterbalance environmental advocacy when regulatory proposals threaten established economic interests (Böhler, Hanegraaff & Schulze, 2022; Cullenward & Victor, 2021). Industry actors have also been shown to employ a

range of political strategies – including agenda-setting, framing, and delaying tactics – to influence climate legislation and shape policy outcomes (Srivastav & Rafaty, 2023; Vesa, Gronow & Ylä-Anttila, 2020).

At the same time, industry actors do not necessarily oppose climate policy uniformly. Research has shown that firms may adopt different strategic positions depending on how policy instruments affect their economic interests (Downie, 2017; Kelsey, 2018). Meckling (2015), for example, distinguishes between strategies of opposition, support, and hedging among business actors in climate policy debates. In some cases, incumbent firms may support certain regulatory measures if these provide policy stability or create barriers to entry for competitors, while simultaneously seeking to constrain more transformative policy changes that can threaten existing business models (Cullenward & Victor, 2021; Smink, Hekkert & Negro, 2015).

These dynamics are often characterised by negotiation and coalition-building rather than simple conflict. Research on climate policy coalitions suggests that policymakers may attempt to design policy instruments that mobilise supportive economic actors while managing opposition from incumbent sectors. Meckling (2019) argues that effective climate policy often depends on creating political coalitions that support decarbonisation, rather than focusing solely on overcoming resistance. Related work by Meckling and Nahm (2018, 2022) emphasises the role of strategic state capacity in this process, showing how governments may use policy sequencing, targeted stakeholder engagement, and adaptive policy mixes to build supportive coalitions and reduce the influence of veto players. Similarly, Kupzok and Nahm (2024) introduce the concept of the “decarbonisation bargain”, in which states and sectors negotiate the distribution of costs and benefits of transition. When sectors perceive opportunities for technological leadership or economic gain, they may become allies in the transition rather than opponents of climate policy.

Nevertheless, these dynamics are often shaped by the structural importance of carbon-intensive sectors within national economies (Hughes and Urpelainen, 2015). Industries such as steel, cement, and chemicals are frequently deeply embedded in regional economies and labour markets, which can make ambitious decarbonisation policies politically challenging. Trade unions have historically been strong in many emission-intensive sectors and may resist policies perceived as threatening employment or industrial competitiveness (Mildenberger,

2020; Gingrich, 2012). Studies of Nordic climate governance, for example, suggest that EIIs have gained increasing influence in climate policymaking processes, while environmental organisations have sometimes become less central in policy dialogues (Hildingsson, Kronsell & Khan, 2019). Similar findings emerge from comparative network analyses showing that policy networks in different political economies may prioritise economic growth considerations over environmental objectives (Vesa et al., 2020). As a result, climate policy debates in industrial sectors often involve complex negotiations over the distribution of economic costs and benefits.

EIIs occupy a distinctive position in the political economy as these sectors tend to be highly concentrated, capital-intensive, and strongly integrated into international markets, making them both economically strategic and politically organised. As a result, EIIs often wield disproportionate influence over regulatory processes and climate policymaking (Hildingsson, Kronsell & Khan, 2019). Their exposure to international competition and dependence on energy-intensive production also make them particularly sensitive to policy-induced cost increases, which can generate strong political resistance to stringent regulatory measures (Cullenward & Victor, 2021). Governments therefore face a persistent dilemma: industrial decarbonisation policies must simultaneously reduce CO₂ emissions while maintaining industrial competitiveness and avoiding carbon leakage. These dynamics shape the political feasibility of different policy instruments and influence how governments design climate policy frameworks.

Taken together, this literature demonstrates that policies targeting EIIs are shaped by broader political economy dynamics, including industrial competitiveness, employment concerns, and patterns of state–industry coordination. However, most studies focus on qualitative analyses of specific sectors or countries, leaving limited systematic comparative evidence on how governments design policies targeting EIIs across different political and institutional contexts.

Policymaking for Industrial Decarbonisation

While the political economy literature explains why policies are contested, this strand of research focuses more directly on how policy instruments are designed and combined in practice in hard-to-abate sectors. A growing body of research examines how policy instruments

are designed and combined in practice to drive industrial decarbonisation. Research on green industrial policy (GIP) highlights the strategic role of policy design in aligning environmental objectives with industrial transformation (Rodrik, 2014; Nahm, 2025). Rather than focusing solely on economic development, GIP integrates climate mitigation with industrial competitiveness and technological change (Allan, Lewis & Oatley, 2021; Lewis, 2021). A central mechanism in this literature is coalition-building: policy instruments that create economic opportunities can mobilise supportive business constituencies and sustain climate policy over time (Meckling, 2015; Meckling, 2021).

However, applying these insights to EII presents additional challenges. EII face significant technological constraints and infrastructure requirements that limit the feasibility of rapid emissions reductions. As a result, research increasingly emphasises the need for coordinated policy frameworks combining multiple instruments (Johansson, Åhman & Nilsson, 2018; Svensson, Khan & Hildingsson, 2020). Effective industrial decarbonisation strategies typically involve combinations of “technology-push” policies, such as innovation funding and research support, together with “demand-pull” instruments, including carbon pricing, regulatory standards, and public procurement (Nilsson et al., 2021; Stechemesser et al., 2024). In addition, large-scale infrastructure investments — such as hydrogen networks or carbon capture and storage systems — are often required to enable deep emissions reductions in heavy industry (Sovacool et al., 2024).

Consequently, several scholars argue that no single policy instrument is sufficient to drive industrial decarbonisation. Instead, effective strategies require coordinated policy packages integrating regulatory standards, market-based instruments, innovation policies, and infrastructure investments (Napp et al., 2014; Bayer & Aklin, 2020; Calel, Dechezlepretre & Venmans, 2025). Implementing such policy mixes, however, is politically and institutionally challenging. Evidence from the Nordic countries and Switzerland suggests that industrial decarbonisation policies have often been only partially aligned with industry needs, with regulatory uncertainty, infrastructure constraints, and misaligned incentives limiting their effectiveness (Hansen et al., 2024; Hafner et al., 2022). Similarly, research on European climate governance shows that fragmented institutional arrangements and coordination challenges can undermine policy stability, even where ambitious climate targets exist (Szulecki, 2016).

Existing research therefore provides valuable insights into the design and coordination of policy instruments for industrial decarbonisation. At the same time, much of this literature relies on qualitative case studies or focuses on emerging green industries rather than hard-to-abate sectors. Consequently, systematic comparative evidence on how governments design policies targeting EIIs and how these policies vary across countries remains limited.

Gaps and Contribution

Taken together, the three strands of literature reviewed above highlight several important limitations in existing research on industrial decarbonisation. In particular, the literature lacks comparative evidence on how governments design policies targeting EIIs, what political and institutional factors shape these policies, and under what conditions they translate into observable decarbonisation outcomes. This dissertation advances the research field through four main contributions: conceptual, theoretical, methodological, and empirical.

Conceptual Contribution

First, the dissertation contributes conceptually by developing and applying a novel conceptualisation of EII decarbonisation policies as a distinct domain of climate governance. Much of the existing climate policy literature analyses climate policy in aggregate or focuses on individual policy instruments such as carbon pricing or renewable energy support. As a result, policies targeting EIIs often remain embedded within broader climate policy frameworks and are rarely analysed as a coherent category of policy intervention.

By conceptualising decarbonisation policies targeting the EIIs as a distinct policy domain and systematically distinguishing between different types of policy instruments, this dissertation provides a framework for analysing how governments seek to steer decarbonisation in hard-to-abate sectors. This conceptualisation enables a more systematic comparison of industrial decarbonisation strategies across countries and over time.

Theoretical Contribution

Second, the dissertation contributes theoretically by developing a comprehensive framework for analysing variation in industrial decarbonisation policies. Existing research on climate policymaking has often developed within relatively separate research traditions. The climate politics literature has focused primarily on policy instruments, policy ambition, and environmental governance, while comparative political economy research has emphasised the role of political institutions, economic structures, and state–industry relations in shaping policy outcomes.

This dissertation brings these strands of research together by integrating insights from climate policy research – particularly work on policy instruments and policy mixes – with comparative political economy perspectives on economic institutions, political institutions, interest intermediation, and partisan politics. By combining these perspectives, the theoretical framework developed in the dissertation provides a more comprehensive explanation of why industrial decarbonisation policies vary across countries and over time.

Methodological Contribution

Third, the dissertation contributes methodologically by employing a comparative research design combining longitudinal observational analysis and quasi-experimental methods to study industrial decarbonisation policies. Much of the previous research on industrial decarbonisation relies on small-n or qualitative case studies of individual sectors or countries. While these studies provide valuable insights into policymaking processes and technological transitions, their findings are often difficult to generalise across contexts.

By adopting a comparative approach across advanced economies, the dissertation enables the identification of broader empirical patterns in decarbonisation policies targeting the EIIs. This design enhances the external validity of the findings while still allowing the analysis of causal relationships through panel data models and quasi-experimental methods. The combination of cross-national panel analysis and difference-in-differences designs therefore allows the dissertation to analyse both policy adoption and policy outcomes within a unified empirical framework.

Empirical Contribution

Finally, the dissertation contributes empirically by focusing specifically on EIIs and by constructing new datasets that enable systematic comparative analysis of industrial decarbonisation policies and climate mitigation outcomes. EIIs account for a substantial share of CO₂ emissions and are widely recognised as some of the most difficult sectors to decarbonise. Despite their importance for achieving climate neutrality, systematic comparative data on policies targeting these sectors have been largely absent from the literature.

To address this gap, the dissertation introduces an original cross-national dataset on industrial decarbonisation policies covering OECD countries and EU member states between 1990 and 2022. By systematically coding policies targeting EIIs and classifying them according to policy instrument type, the dataset enables a longitudinal analysis of how governments design and deploy policy instruments to steer industrial decarbonisation. In addition, a sub-national approach is applied as the dissertation compiles a firm-level dataset covering emissions from municipally owned energy firms in Sweden between 2011 and 2023, allowing the analysis of how local political governments influence decarbonisation outcomes in publicly owned infrastructure. Whilst energy firms are not technically part of the EIIs, the sectoral choice was motivated by the similar institutional challenges of the sectors as well as the large share of publicly owned firms.

Taken together, these contributions advance the study of climate politics and industrial decarbonisation in several ways. By bringing these elements together, the dissertation provides a more nuanced understanding of how governments attempt to steer the decarbonisation of EIIs and why these efforts vary across countries and over time.

Research Design

This chapter outlines the research design used to examine variation in policies aimed at decarbonising EIIs. The dissertation employs a comparative research design combining cross-national analysis, quasi-experimental methods, and firm-level analysis. This approach allows the study to identify patterns in policy adoption across countries while also examining more specific mechanisms linking governance structures to industrial decarbonisation outcomes. The research design rests on three central elements: a comparative research strategy, complementary quantitative analytical methods, and the construction of two original datasets.

The dissertation consists of four articles that examine industrial decarbonisation from different analytical perspectives and levels of analysis. While the overarching focus lies on explaining variation in EII decarbonisation policies, the individual articles address different aspects of this question using complementary empirical strategies. Table 1 summarises the relationship between the articles, their units of analysis, datasets, and methodological approaches.

Table 1 Overview of articles, analytical focus, and empirical approaches

Article	Unit of analysis	Data	Method	Contribution to research question
Article 1	Countries (OECD)	Original dataset on EII decarbonisation policies	Panel data models (fixed effects, count models)	Explains cross-national variation in decarbonisation policies targeting EII
Article 2	Countries (EU vs non-EU)	Original dataset on EII decarbonisation policies + emissions data	Difference-in-differences	Estimates impact of EU climate governance on national policy action and EII CO ₂ emissions
Article 3	Conceptual / literature	Existing literature	Conceptual synthesis	Identifies theoretical explanations for variation in decarbonisation policies targeting EIIs
Article 4	Firms (Sweden, municipal level)	Original firm-level emissions dataset	Panel models (fixed effects)	Examines how partisan politics influences decarbonisation outcomes in publically owned firms

Note: The dissertation draws on multiple original datasets compiled by the author. Papers 1 and 2 are based on the same cross-national dataset on EII decarbonisation policies across OECD and EU countries, with Paper 2 extending this dataset by incorporating emissions data and EU ETS variables. Paper 4 relies on an original firm-level dataset on municipally owned energy companies in Sweden, including emissions and political variables.

Comparative Research Strategy

Comparative research has long been considered a central methodological approach in political science for identifying systematic relationships between political institutions, policy choices, and policy outcomes (Lijphart, 1971). By comparing multiple political systems facing similar policy challenges, researchers can identify patterns of variation and evaluate competing explanations for observed outcomes. In policy analysis, comparative approaches are particularly valuable for understanding how institutional and political contexts shape the design and implementation of public policies (Peters, 2020).

The logic of comparison rests on the assumption that meaningful explanations of political phenomena emerge through systematic comparison of cases that share certain characteristics while differing in others (Faure, 1979). Decarbonisation policies targeting the EIIs provide a suitable domain for such analysis: countries face similar structural pressures to reduce industrial emissions but differ substantially in their po-

litical institutions, economic structures, and climate governance frameworks. Comparative analysis therefore enables the identification of systematic variation in policy adoption and climate mitigation outcomes across institutional contexts.

At the same time, comparative research designs involve methodological trade-offs. Broad cross-national analyses enhance external validity and allow for more generalisable conclusions, but they may sacrifice contextual depth and make it more difficult to isolate causal mechanisms than more tightly controlled experimental designs (Lijphart, 1971; Peters, 2020). This dissertation addresses this trade-off by combining cross-national comparison with more focused analyses at the regional and firm levels. This layered research design allows the identification of broad empirical patterns while also examining more specific mechanisms linking governance structures to industrial decarbonisation outcomes.

Case selection follows a logic commonly associated with the “most similar systems” design. By focusing on advanced industrialised states that share similar levels of economic development and institutional capacity, the analysis reduces background variation and increases the ability to identify the political and institutional factors that explain policy differences (Anckar, 2008). This strategy improves comparability while still allowing meaningful variation in the key explanatory variables examined in the dissertation.

This comparative approach allows the dissertation to analyse why governments adopt different policies to decarbonise EIIs despite facing similar structural pressures to reduce industrial emissions.

Methodological Approach and Causal Inference

The empirical analyses in this dissertation rely on observational data rather than experimental research designs. In experimental research, causal inference is strengthened through the random assignment of subjects to treatment and control groups, allowing researchers to isolate the causal effect of a specific intervention (McNabb, 2010). Such designs are widely regarded as the strongest method for establishing causal relationships because randomisation minimises the influence of confounding factors. In the study of climate policy and industrial decarbonisation, however, experimental designs are rarely feasible. Public policies cannot be randomly assigned by researchers, and governments

adopt climate policies in response to political, economic, and institutional factors. As a result, much empirical research in political economy relies on observational data.

In observational settings, regression analysis provides a systematic framework for estimating relationships between variables while controlling for confounding factors (Angrist & Pischke, 2009). By including relevant control variables, regression models help account for observable differences between units and approximate causal relationships. Although regression analysis cannot fully eliminate concerns about endogeneity, it allows researchers to analyse policy outcomes using observational data while accounting for potential confounding influences.

To strengthen causal inference within this context, this dissertation employs several econometric strategies commonly used in observational research, including panel data models, fixed effects estimators, and quasi-experimental designs such as difference-in-differences. These approaches approximate the logic of experimental inference by exploiting variation across time and units while controlling for unobserved heterogeneity (Angrist & Pischke, 2009; Wooldridge, 2010).

The empirical analyses proceed in three stages. The first empirical article employs panel data analysis with fixed effects models to examine the adoption of EII decarbonisation policies across OECD countries. Panel data combine cross-sectional and longitudinal observations, allowing researchers to analyse multiple countries observed repeatedly over time. Fixed effects models control for unobserved time-invariant characteristics — such as geography, industrial structure, or institutional traditions — by focusing on within-unit variation over time. By removing time-invariant sources of heterogeneity, fixed effects models reduce omitted variable bias and strengthen causal inference in observational research (Angrist & Pischke, 2009; Wooldridge, 2010).

Because several of the dependent variables represent counts of policy instruments, the empirical analyses employ count data models such as negative binomial regression. These models are commonly used when analysing non-negative integer outcomes that exhibit overdispersion relative to the Poisson distribution, which is often the case when modelling policy adoption counts (Wooldridge, 2010).

The second empirical article employs a difference-in-differences (DiD) design to examine the impact of the EU ETS on national policy-making and industrial emissions. DiD designs approximate the logic of natural experiments by comparing changes in outcomes between treated and untreated groups before and after a policy intervention (Angrist &

Pischke, 2009). In this case, EU member states subject to the EU ETS are compared with non-member states to estimate the causal effect of supranational climate governance. The validity of this approach depends on the parallel trends assumption — that treated and control groups would have followed similar trajectories in the absence of the policy intervention.

The final empirical article shifts the unit of analysis from states to firms in order to examine how partisan arrangements influence emissions outcomes at the firm level. While the dissertation primarily focuses on national policies, ownership structures represent an important channel through which governments can influence industrial decarbonisation. In sectors where public ownership remains significant, states can shape corporate strategies, investment decisions, and emissions trajectories. Analysing firm-level emissions therefore complements the state-level analysis by examining whether governance structures translate into measurable decarbonisation outcomes.

Together, these analytical strategies allow the dissertation to examine variation in industrial decarbonisation policies and outcomes across multiple levels of governance. While observational research cannot fully replicate the internal validity of randomised experiments, econometric techniques such as fixed effects models, DiD designs, and appropriate regression modelling substantially strengthen causal inference by exploiting variation across time and units (Angrist & Pischke, 2009; Wooldridge, 2010).

Country Selection

Case selection reflects both theoretical and practical considerations. This dissertation focuses on advanced and upper-middle income industrialised economies, which possess relatively high levels of institutional capacity and are central to global industrial emissions. While not all countries in the sample are formally classified as Annex I parties under the UN climate regime, many OECD members have nonetheless adopted ambitious climate policy frameworks and play an important role in shaping global decarbonisation efforts (Åhman, Arens & Vogl, 2022).

The empirical scope encompasses three overlapping but distinct units of analysis. First, the OECD member states represent a group of economically developed and industrialised countries with comparatively strong technical, financial, and institutional capacity for large-

scale transitions (Marques et al., 2012). At the same time, the OECD includes countries with different formal statuses under the UN climate regime, which introduces variation in climate policy obligations and governance contexts within the sample. Second, the analysis on the EU as a supranational institution focuses on European Union member states; the EU has emerged as a global leader in decarbonisation, introducing pioneering frameworks such as the European Green Deal and achieving notable progress in decoupling economic growth from carbon emissions (Nurdiawati & Urban, 2021). Lastly, Sweden, selected as an in-depth case study due to its reputation as a frontrunner in industrial decarbonisation (Nurdiawati & Urban, 2021; Marquardt et al., 2024), making it a valuable context for examining state-industry dynamics in climate policy.

Focusing on the OECD countries and EU member states also reflects a most-similar-systems logic in comparative research. These countries share relatively similar levels of economic development and institutional capacity, which reduces background variation and improves the ability to identify the political and institutional factors that explain policy differences (Anckar, 2008).

Nevertheless, the scope of this selection entails trade-offs. Restricting attention to more advanced economies risks producing a skewed picture of global transition strategies, since lower-income countries often face distinct constraints and employ alternative instruments. Major industrial powers outside these groupings, such as China and India, are also excluded despite their global importance.

Data Collection and Dataset

The empirical analyses in this dissertation are based on two original datasets. The first dataset captures EII decarbonisation policies across OECD and EU member states, while the second focuses on firm-level emissions data for Sweden's electricity and district heat sector.

The cross-national policy dataset provides the empirical foundation for Articles 1 and 2. It includes 43 OECD and/or EU member states and covers the period 1990-2022. The dataset was constructed by compiling policies from two complementary international repositories: the International Energy Agency's Policies and Measures Database and the Grantham Research Institute's Climate Change Laws of the World (CCLW). Together, these sources provide extensive coverage

of national climate policies, allowing for a systematic mapping of measures targeting CO₂ emissions and industrial decarbonisation.

Policies were filtered for relevance to EIIs, by extracting those focused on the specific industrial sub-sectors or economy-wide policies targeting all sectors. They were then manually coded into seven categories following the typology developed by the Intergovernmental Panel on Climate Change (Gupta et al., 2007): standards and regulations, taxes and charges, tradable permits, voluntary agreements, subsidies and incentives, research and development, and informational instruments. To enable analytical clarity, the first three categories were grouped as “hard” instruments and the latter four as “soft” instruments, following the conceptual distinction outlined by Schulze (2021). Hard instruments were defined as those imposing compliance costs and containing explicit consequences for non-adherence, while soft instruments relied on encouragement, incentives, or information provision without sanctions.

In total, 687 policies were coded, of which 300 were classified as hard and 387 as soft, producing 1,419 country-year observations. The construction of this dataset constitutes an important empirical contribution of the dissertation, as systematic cross-national data on policies targeting industrial decarbonisation have previously been limited.

The second dataset, which forms the basis of Article 4, focuses on firm-level emissions data from municipally owned electricity and district heating companies in Sweden. Municipal ownership of energy infrastructure can be understood as a policy choice through which governments retain direct control over the provision of energy services and investment decisions in carbon-intensive sectors. The dataset combines installation-level CO₂ emissions data from the Swedish Environmental Protection Agency with information on municipal ownership and political control across Swedish municipalities, covering the period 2011–2023. The final dataset includes 112 installations located in 96 municipalities, resulting in 1,341 firm-year observations. This period captures several municipal electoral cycles, allowing the analysis to exploit variation in the partisan composition of municipal governing coalitions over time. By linking emissions trajectories to changes in municipal political leadership, the dataset enables an examination of whether shifts in political control influence the environmental performance of publicly owned energy firms.

These datasets were motivated by two main considerations. First, they address a clear gap in the literature: while qualitative and small-n

studies of industrial decarbonisation are numerous, large-n comparative analyses remain rare (Allan, Lewis & Oatley, 2021). As highlighted in the previous section, the absence of comprehensive, large-scale policy datasets has restricted the study of industrial decarbonisation, leaving a substantial gap in the field. Constructing these datasets therefore made it possible to conduct a longitudinal, comparative mapping of policy instruments and emissions across countries and sectors. Second, large-n data enable the identification of systematic patterns and long-term trends across diverse political and institutional contexts, thereby complementing the contextual depth provided by existing case studies.

As with any observational dataset, several limitations must be acknowledged. Policy data rely partly on state reporting and vary in detail across sources, requiring extensive manual coding and verification. Firm-level data also present challenges, including changes in sector classifications and inconsistent firm representation across years. While these limitations introduce potential measurement challenges, the datasets nonetheless provide a unique opportunity to analyse industrial decarbonisation policies and emissions outcomes across multiple levels of governance.

Descriptive Overview of Data

Before turning to the papers, it is useful to present descriptive statistics illustrating the main characteristics of the policy dataset. The empirical analysis in the dissertation relies on two original datasets that capture industrial decarbonisation policies and firm-level emissions outcomes. Table 2 provides an overview of the datasets, their units of analysis, temporal coverage, and their use across the individual articles. The policy dataset consists of country–year observations covering 43 OECD and EU member states between 1990 and 2022 and forms the empirical basis for the comparative analyses in Articles 1 and 2. The firm-level dataset focuses on electricity and district heating firms in Sweden and covers the period 2011–2023. This dataset enables an analysis of emissions trajectories at the firm level and is used in Article 4 to examine how ownership and political governance influence industrial decarbonisation outcomes.

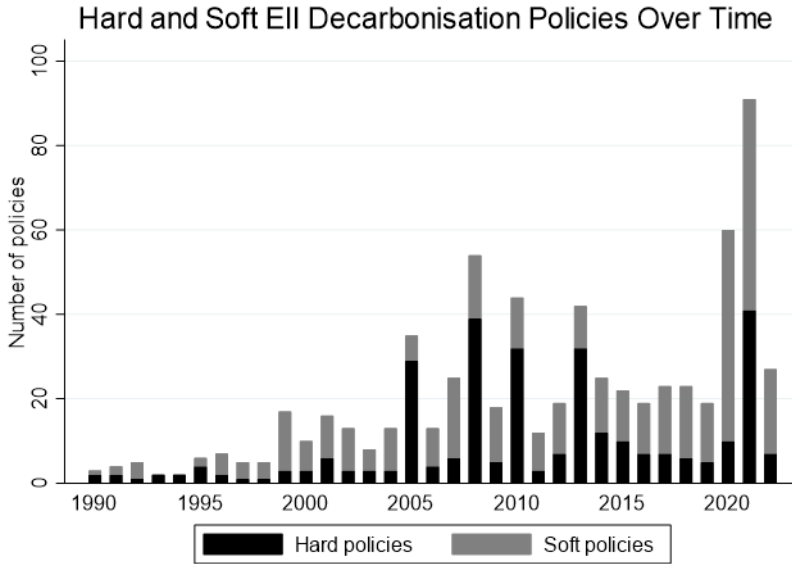
Table 2 Overview of datasets used in the dissertation

Dataset	Unit of analysis	Coverage	Observations	Used in
Policy dataset	Country-year	43 countries, 1990–2022	1419	Articles 1 & 2
Firm dataset	Firm-year	112 firms, 2011–2023	1341	Article 4

Note: The dissertation draws on two original datasets: a cross-national country–year dataset and a firm-level dataset on Swedish municipally owned energy companies.

The cross-national dataset includes 687 policies targeting industrial decarbonisation across 43 countries between 1990 and 2022. Of these, 300 are classified as hard instruments and 387 as soft instruments. Figure 1 illustrates the number of hard and soft industrial decarbonisation policies adopted across the countries in the dataset between 1990 and 2022. Several trends are immediately apparent. First, policy activity increases substantially over time, particularly after the mid-2000s. This pattern reflects the growing political attention to industrial emissions following the expansion of international and EU climate governance frameworks and the increasing recognition of the role of heavy industry in national decarbonisation strategies. Second, the figure reveals a clear shift in the composition of policies. While hard regulatory instruments were relatively prominent in earlier years, soft policy instruments — including subsidies, information policies, and research and development support — have become increasingly dominant over time. This development is consistent with the broader literature on climate policy mixes, which highlights the growing role of supportive industrial policies in facilitating low-carbon technological change.

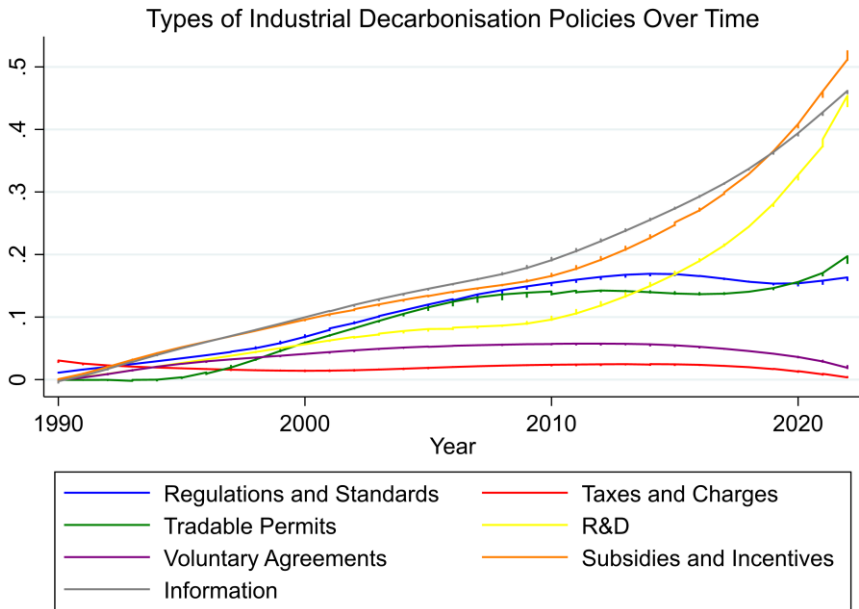
Figure 1 Hard and Soft EII Decarbonisation Policies over Time (OECD and EU sample, 1990–2022)



Note: The figure shows the annual number of policies implemented targeting EIIs, across OECD and EU member states, distinguishing between hard (black) and soft (grey) policy instruments.

Figure 2 presents the distribution of industrial decarbonisation policies across OECD and EU member states in the dataset. The figure highlights considerable cross-national variation in policy adoption. A small number of countries account for a relatively large share of policies, while many countries have adopted only a limited number of measures targeting industrial decarbonisation. This variation underscores the importance of examining the institutional and political factors that shape national policy strategies. The comparative nature of the dataset allows the dissertation to explore why some countries adopt more extensive policy frameworks for industrial decarbonisation than others.

Figure 3 Types of EII Decarbonisation Policy Instruments over Time (OECD and EU sample, 1990–2022)



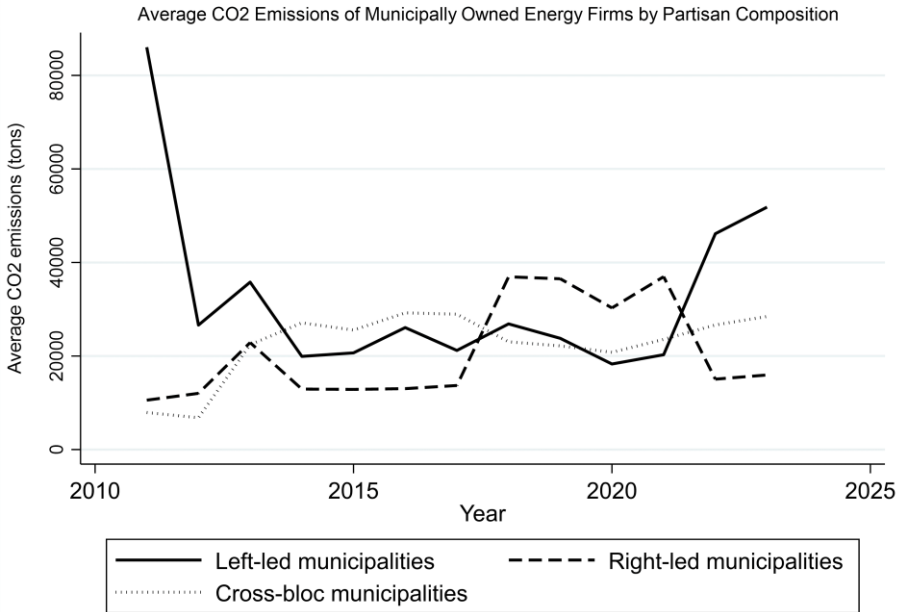
Note: The figure shows the development of different types of policy instruments targeting EIIs across OECD and EU member states.

The second dataset contains 112 municipally owned electricity and district heating firms located in 96 Swedish municipalities, resulting in 1,341 firm–year observations between 2011 and 2023. To illustrate the structure of the firm-level dataset, Figure 4 presents the average CO₂ emissions of municipally owned electricity and district heating firms over the study period, disaggregated by the partisan composition of the governing municipal coalition.

The figure provides a descriptive overview of emissions trajectories across municipalities governed by different political majorities. Overall, emissions from municipally owned energy firms show a gradual downward trend over time, reflecting broader decarbonisation efforts in the Swedish energy sector. At the same time, the figure suggests variation in emissions levels and trajectories across political contexts. In particular, municipalities governed by different partisan coalitions appear to exhibit somewhat different emissions patterns over time.

These patterns illustrate the variation that motivates the empirical analysis presented in Article 4. The article examines whether the partisan composition of municipal governments influences the emissions trajectories of publicly owned electricity and district heating firms using panel regression models.

Figure 4 Average CO₂ Emissions of Municipally Owned Energy Firms by Partisan Composition (Sweden, 2011–2023)



Note: The figure shows the average emissions of municipally owned energy firms across Swedish municipalities, disaggregated by the partisan composition of local governments.

Overall, the descriptive statistics highlight three key features of the policy dataset: a substantial increase in industrial decarbonisation policies over time, considerable variation across countries, and important changes in the composition of policy instruments. These patterns provide the empirical foundation for the comparative analyses presented in the following chapters, which examine the political and institutional factors that explain variation in the adoption and design of industrial decarbonisation policies. In addition, the descriptive analysis of the Swedish firm-level dataset reveals an initial decline followed by a period of stability in CO₂ emissions among municipally owned electricity and district heating firms between 2011 and 2023, while also indicating variation across municipalities governed by different partisan coalitions.

The Four Papers

This dissertation consists of four papers that together examine variation in policies targeting the decarbonisation of EIIs and the political and institutional factors shaping these policies. While the papers address different empirical contexts and levels of governance, they collectively contribute to answering the dissertation’s overarching research question: what explains variation in EII decarbonisation policies across time and countries, and what consequences do these policies have with regards to CO₂ emissions reduction? The first two papers analyse cross-national variation in industrial decarbonisation policies and the role of domestic institutions and EU governance in shaping these policies. The third paper provides a conceptual discussion of industry–state relations in national policymaking, while the fourth paper examines emissions outcomes in publicly owned energy firms and explores how partisan politics may influence decarbonisation trajectories through ownership structures.

Paper 1 – Steering Industrial Decarbonisation: Explaining OECD Policy Variation

The ongoing rise in CO₂ emissions driven by energy-intensive industries highlights the urgent need for targeted policy interventions, with national strategies playing a crucial role in the low-carbon transition. However, the factors that shape the ambition of industrial decarbonisation policies remain poorly understood. Previous research suggests that this sector presents significant challenges for policymakers. In this study I argue that a deeper understanding of the state and industry dynamics that influence policymaking is essential to explain the variation in policy ambition across countries. By analysing the policy output of 30 OECD countries from 1990 to 2022, the findings reveal that corporatism positively influences policy output — especially in the case of

hard policies — whilst right-wing governments decrease policy output. This highlights the role of institutional structures and political ideology in shaping the trajectory of industrial decarbonisation.

Paper 2 – Thin Policy Mixes, Thick Challenges: EU Carbon Pricing and National Decarbonisation of Energy-Intensive Industries

Decarbonising energy-intensive industries (EIIs) is a major challenge for EU climate governance. The EU Emissions Trading System (EU ETS) is the flagship instrument for industrial mitigation, but its effectiveness as a stand-alone policy tool remains contested. Drawing on policy mix theory, this article examines whether increases in ETS stringency (i) thin national policy mixes, (ii) stimulate the adoption of incentive-based instruments, and (iii) reduce industrial CO₂ emissions intensity. Using a heterogeneity-robust difference-in-differences design that treats ETS stringency as a continuously increasing dose across four successive phase transitions, it analyses policy mixes and emissions trajectories across EU member states and never-treated control countries from 1995 to 2022. The results suggest that the EU ETS, as implemented across the phases examined, has neither catalysed complementary national policy responses nor generated measurable abatement effects at the national level. Industrial carbon intensity trended upward rather than downward relative to control countries across most of the study period, though tentative signs of an emerging abatement effect are visible in the most recent years. There is also directional evidence of a gradual thinning of national policy instrument portfolios, though this pattern varies across phases and should be treated with caution. These findings highlight the limits of a predominantly market-based approach to industrial decarbonisation and underscore the importance of complementary national policy frameworks that can work alongside — rather than be displaced by — EU-level carbon pricing.

Paper 3 – Industry Actors’ Influence on Policymaking in Democratic States: The Energy Intensive Industries

This chapter explores the influence of industry actors on decarbonisation policymaking. First, an introduction to the challenges of decarbonising the energy intensive industries is provided. This is followed by a discussion of the two main arguments presented in this chapter, namely that industry actors utilise different strategies to protect carbon-dependence in different political-economic systems and that organisational ties between industry and political parties protect the status quo. The first argument draws from the political economy literature and demonstrates that industry actors in corporatist states have institutionalised access to decision-making and can therefore influence policymaking through dialogue and consultation. Industry actors in pluralist states, on the other hand, rely more on political allies and public lobbying to shape policies. The second argument, which draws from the comparative climate politics literature, illustrates how the close ties between industry actors and political parties on both the left and right side of the political spectrum result in the protection of industry interests. Governments on both sides of the spectrum are found to avoid regulatory policies and provide protective measures which reinforces carbon-dependence. Lastly, the chapter discusses concrete steps which have been taken to decarbonise the energy intensive industries. On the national level, states have introduced decarbonisation roadmaps and green industrial policies to steer the sector. On the global level, international agreements have been highlighted as useful tools to guide policymakers in the decarbonisation of the energy intensive industries.

Paper 4 – Who Governs the Green Transition? Partisan Compositions and Emissions in Municipally Owned Firms

Municipal governments play an increasingly important role in climate governance, often delivering energy services through municipally owned companies. Yet relatively little is known about how political dynamics within local governments shape the environmental performance

of these organisations. This article examines whether shifts in the partisan composition of municipal governments influence emissions trajectories in publicly owned energy firms. Focusing on Sweden's electricity and district heating sector — where municipal ownership remains widespread — the study analyses a firm-level panel dataset covering 112 installations across 96 municipalities between 2011 and 2023. The analysis exploits variation in municipal governing coalitions across electoral cycles to examine whether changes in political control are associated with changes in firm-level CO₂ emissions. The results provide little evidence that either the partisan composition of municipal governments or shifts in governing coalitions systematically affect emissions trajectories. These findings contrast with existing research linking partisan politics to climate policy ambition and suggest that emissions outcomes in infrastructure-intensive sectors may be shaped more strongly by technological, organisational, and institutional constraints than by short-term political turnover. The article contributes to research on public ownership, subnational climate governance, and the political economy of decarbonisation.

Main Findings

This dissertation set out to explain variation in EII decarbonisation policies across countries and over time, as well as the consequences of these policies for industrial emissions trajectories. More specifically, the dissertation examined how EII decarbonisation policies vary in terms of their policy output and the types of policy instruments adopted, what political and institutional factors explain this variation, and under what conditions these policies contribute to measurable decarbonisation outcomes. In addressing these questions, the dissertation makes three principal contributions to the literature on climate policy-making and the political economy of industrial decarbonisation.

How do EII decarbonisation policies vary?

The dissertation provides the first comprehensive, longitudinal, cross-country analysis of policy action in the decarbonisation of EIIs. Using a novel dataset of EII decarbonisation policies adopted by advanced economies over three decades, it shows that states overwhelmingly prioritise “soft” policy instruments — such as informational tools, subsidies, and voluntary agreements — over “hard” policy instruments — such as taxes, charges, and regulations. Policies imposing direct compliance costs on EIIs appear considerably less frequently, suggesting that policymakers often favour instruments that encourage or support industrial transition rather than those that impose stringent regulatory obligations.

This finding provides new empirical insight into the composition of industrial decarbonisation policy portfolios. While the overall number and diversity of policies targeting EIIs have increased substantially over time, the relative dominance of soft instruments has remained remarkably stable. The results therefore indicate that variation in EII decarbonisation policies is driven less by shifts in the balance between regulatory

and non-regulatory approaches than by the expansion and diversification of incentivising policy instruments over time. This descriptive finding establishes an important empirical baseline for the dissertation, documenting how governments have approached industrial decarbonisation policy in practice before examining the political and institutional factors that explain this variation.

What explains variation in EII decarbonisation policies?

Second, the dissertation identifies several political and institutional factors that help explain variation in EII decarbonisation policies across countries and over time. The findings provide empirical support for the importance of economic and partisan institutions, two of the central explanatory dimensions identified in the theoretical framework.

With regard to economic institutions, the analysis shows that corporatist political economies are associated with higher levels of overall policy output and a greater use of hard policy instruments, such as regulatory measures and fiscal instruments imposing compliance costs on industry. At the same time, corporatist structures do not appear to significantly influence the adoption of soft policy instruments, such as subsidies, voluntary agreements, or informational measures. These findings suggest that institutionalised coordination between governments and organised economic interests may facilitate the adoption of more interventionist policies targeting EIIs.

The results also reveal a clear role for partisan institutions. Governments led by left-leaning parties are associated with higher levels of both aggregate policy output and the adoption of hard policy instruments. This indicates that ideological differences between parties continue to shape climate policy choices, particularly in sectors where decarbonisation involves significant economic trade-offs.

By contrast, the findings provide more limited support for the role of supranational institutions, at least in the form of EU membership. The analysis finds no discernible impact of EU ETS on the overall density of national industrial decarbonisation policies or on the adoption of soft, incentive-based policy instruments. While EU climate governance establishes an important regulatory framework in other sectors, these results suggest that variation in national EII decarbonisation policies is primarily shaped by domestic institutional and political dynamics rather than by supranational policy diffusion.

Taken together, these findings support the central argument of the theoretical framework: variation in industrial decarbonisation policies is strongly conditioned by domestic institutional configurations, particularly the structure of economic coordination and partisan competition.

Do EII decarbonisation policies translate into emissions reductions?

Third, the dissertation examines whether policy instruments targeting EIIs translate into observable emissions reductions. In particular, the analysis considers two policy channels through which governments may influence industrial decarbonisation: supranational climate regulation using tradable permits and public ownership of industrial infrastructure. Across both cases, the findings provide limited evidence that these policy arrangements directly affect emissions trajectories in energy-intensive sectors.

The first analysis examines the impact of supranational climate governance through the EU ETS. The results show no discernible effect of the EU ETS on emissions trajectories in EIIs across EU member states. While EU climate governance establishes an important regulatory framework for emissions reductions, the empirical results suggest that its influence on emissions outcomes in EIIs is difficult to detect at the aggregate sectoral level during the period studied.

The second analysis examines emissions outcomes through a different policy channel: public ownership of energy infrastructure. The firm-level analysis of Swedish municipally owned electricity and district heating companies finds no systematic relationship between changes in the partisan composition of municipal governments and emissions trajectories. Despite political turnover across municipalities over time, emissions reductions in publicly owned energy firms appear largely independent of local partisan dynamics.

Taken together, these findings suggest that policy arrangements targeting energy-intensive sectors do not necessarily translate into immediate or observable emissions reductions. This may reflect the structural characteristics of these industries, including long investment cycles, capital-intensive production processes, and technological constraints that limit the responsiveness of emissions trajectories to short-term po-

litical change. While domestic political institutions shape the development of industrial decarbonisation policies, emissions outcomes in EIIs may therefore be more strongly conditioned by technological, organisational, and infrastructural factors.

Implications and Conclusion

This dissertation set out to explain variation in policies targeting the decarbonisation of EIIs across countries and over time. By examining how these policies vary in terms of policy output and policy instruments, what political and institutional factors shape this variation, and whether such policies translate into observable CO₂ emissions outcomes, the dissertation has contributed to a more systematic understanding of the politics of industrial decarbonisation.

Taken together, the findings highlight that the development of decarbonisation policies targeting the EIIs is shaped primarily by domestic political and institutional dynamics. The analysis shows that governments across advanced economies have expanded their policy portfolios targeting industrial CO₂ emissions, yet this expansion has largely taken the form of supportive and incentive-based policy instruments, rather than binding regulatory measures. At the same time, the findings demonstrate that the adoption of more ambitious policy instruments is not random, but systematically related to institutional features of political economies and patterns of partisan competition. In particular, corporatist institutional arrangements and left-leaning governments are associated with higher levels of policy output and a greater use of more interventionist policy instruments.

These findings contribute to the theoretical literature on climate governance and comparative political economy by highlighting the importance of institutional coordination mechanisms in shaping EII decarbonisation policy outcomes. The results suggest that the capacity to develop more ambitious industrial decarbonisation policies may depend not only on political preferences or economic resources, but also on the institutional structures through which governments interact with organised economic actors. Corporatist systems appear to provide institutionalised arenas in which governments and industry can negotiate policy frameworks and distribute the costs of industrial transformation. Rather than necessarily constraining climate ambition, such coordination mechanisms may therefore facilitate the adoption of

more comprehensive policy frameworks in sectors characterised by high adjustment costs and strong incumbent interests.

At the same time, the findings highlight an important distinction between policy development and decarbonisation outcomes. While domestic and EU institutions shape the adoption and design of industrial decarbonisation policies, the empirical analyses provide limited evidence that these institutional dynamics directly translate into measurable CO₂ emissions reductions in energy-intensive sectors. Neither the EU ETS nor changes in the partisan composition of sub-national governments overseeing publicly owned energy firms appear to systematically affect emissions trajectories in the contexts examined here. This suggests that emissions outcomes in EIIs may be shaped not only by political decisions, but also by structural features of these sectors, including technological constraints, long investment cycles, and capital-intensive production processes.

From a policy perspective, these findings carry several implications. First, the dominance of incentivising policy instruments suggests that governments remain cautious about imposing stringent regulatory costs on EIIs. While subsidies, voluntary agreements, and informational measures can support technological development and investment, relying primarily on such instruments may limit the pace of industrial decarbonisation. Second, the results suggest that institutionalised coordination between governments and organised economic actors may facilitate the adoption of more ambitious policy frameworks, particularly in sectors where decarbonisation requires large-scale technological transformation and investment. Policymakers seeking to accelerate industrial decarbonisation may therefore benefit from governance arrangements that enable negotiation and coordination with affected industries rather than relying solely on fragmented or adversarial policy processes.

More broadly, the dissertation highlights the importance of understanding industrial decarbonisation as a political and institutional challenge, rather than solely a technological one. Achieving deep emissions reductions in hard-to-abate sectors will require not only technological innovation but also policy frameworks capable of coordinating investment, managing distributional conflicts, and sustaining long-term political support for industrial decarbonisation.

Finally, this dissertation provides a foundation for future research on the politics of industrial decarbonisation. By constructing a novel dataset of EII decarbonisation policies across OECD and EU member states, the study opens new opportunities for comparative analysis of

industrial climate policy. Future research may build on this dataset to examine additional explanatory factors, explore policy dynamics in different economies, or investigate more directly the relationship between policy instruments and emissions outcomes in specific industrial sectors.

Looking forward, several avenues for further research stand out. First, there is a need to better specify the causal mechanisms linking ownership structures — particularly state or municipal ownership — to decarbonisation outcomes. While this dissertation conceptualises ownership as a policy instrument through which governments can influence industrial sectors, the mechanisms through which ownership affects emissions trajectories remain underexplored. Future work should examine whether the effects of public ownership arise from greater policy capacity, stronger political mandates for decarbonisation, or institutional insulation from short-term market pressures. Second, while this dissertation has focused on advanced economies, extending the analysis to emerging and developing countries is critical. These contexts often feature different state-industry relations, energy dependencies, and geopolitical constraints, and testing whether the patterns identified here hold beyond Europe and the OECD will strengthen the generalisability of the findings. Third, future research should examine how exogenous shocks — such as pandemics, financial crises, or geopolitical conflicts — reshape the political opportunity structures for industrial decarbonisation. Such crises may either reinforce carbon-intensive lock-ins or open windows for more ambitious policy interventions, yet systematic knowledge about these dynamics remains limited.

With regard to generalisability, the findings of this dissertation should be understood as both contextually grounded and analytically explorative. The empirical analyses focus on OECD and EU member states, where institutional capacities, EU-level climate governance, and relatively high levels of public climate concern create particular constraints and opportunities for industrial decarbonisation policies. Caution is therefore warranted in extending these conclusions wholesale to other settings, especially where state capacity is weaker, political contestation more volatile, or energy dependence on fossil fuels more entrenched. Nevertheless, the conceptual insights developed in this dissertation — particularly the importance of institutional coordination mechanisms, the role of partisan politics in shaping policy instruments, and the limited direct relationship between political institu-

tions and emissions outcomes — offer a framework that can be applied and tested in other contexts. In this sense, the dissertation provides not a universal template, but a set of analytical tools for understanding variation in industrial decarbonisation policies across political and institutional settings.

In sum, this dissertation shows that policies targeting the decarbonisation of EIIs vary systematically across countries and over time, and that this variation is strongly shaped by domestic institutional and political dynamics. Corporatist coordination mechanisms and partisan politics influence the scope and type of policy instruments governments adopt, while the dominance of supportive policy instruments reflects the political and economic contestation of industrial decarbonisation. At the same time, the findings suggest that policy implementation does not necessarily translate into immediate emissions reductions in energy-intensive sectors, where technological constraints and long investment cycles limit the impact of short-term political change. Understanding how governments design, coordinate, and implement policies targeting the EIIs therefore remains central to the broader challenge of achieving deep industrial decarbonisation.

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