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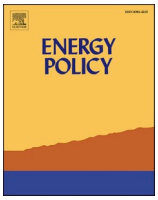

Institutions for effective climate policymaking: Lessons from the case of the United Kingdom

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ABSTRACT

The United Kingdom (UK) is home to one of the most ambitious climate policy regimes in the world, centred around the 2008 Climate Change Act (CCA), the first strategic climate legislation of its kind. Building on prior studies of the CCA while highlighting Germany as a counterfactual case study, we demonstrate the significant positive role that strategic framework legislation can play in improving climate policy integration and coherence. We further show that important new institutions can be established under the right historical conditions. Specifically, we argue that the political weakening of the UK coal sector was a necessary precursor to the adoption of strong climate policy and the emergence of a structural consensus towards accelerating climate ambition, as compared with Germany where consolidation of the coal regime has been a major factor in the country's failure to meet its emissions targets. We show how business associations and labour groups in the UK were a key supportive coalition for early climate action, while in Germany industry and organized labour have been key actors obstructing and delaying the passage of pro-climate reforms. Our study raises questions about the prospects for energy transitions that are both just *and* rapid, particularly by discussing the trade-offs between cost-effectiveness, speed, and distributional concerns.

1. Introduction

At least 18 jurisdictions worldwide are currently experiencing an absolute decoupling of territorial greenhouse gas (GHG) emissions from economic growth (Le Quéré et al., 2019). The United Kingdom stands out as one of the countries that has most reduced its GHG emissions, which is all the more significant given its historical responsibility for the climate crisis. In 2019, the UK's territorial GHG emissions were 44% below the 1990 baseline (UK Department for Business, Energy, and Industrial Strategy (BEIS), 2019), and carbon dioxide (CO_2) emissions have now reached just half of their peak level in 1970 (Hendry, 2018). In per capita terms, by 2013 CO_2 emissions had dropped below their level in 1860 (Hendry, 2020). Most of the UK's emissions reductions have been concentrated in the energy supply sector, primarily due to a 71% reduction in emissions from electricity generation between 1990 and 2019 (BEIS, 2019). This can in turn be attributed to the phase-out of coal, coupled with substantial renewable energy investment (Green and Staffell, 2021).

The UK is also home to one of the most stringent and ambitious climate policy regimes in the world. A central piece of that regime is the 2008 Climate Change Act (CCA), which was the first strategic framework legislation on climate change to be passed by any country. The CCA included a number of ground-breaking institutional innovations, including (1) legally-binding carbon budgets; (2) the formation of a nonpartisan expert panel known as the Climate Change Committee (CCC); and (3) a mandatory monitoring and reporting process. Previous studies have identified the CCA as a key contributing factor to the UK's substantial emissions reductions, notably by helping to accelerate electricity sector decarbonization (Fankhauser et al., 2018; Hendry, 2020; Averchenkova et al., 2021b). In particular, the recommendations of the CCC played a key role in shaping the Electricity Market Reform of 2013 (Grubb and Newberry, 2018), which introduced a carbon pricing scheme (the Carbon Price Floor) that catalyzed a rapid phase-out of coal-fired electricity (Wilson and Staffell, 2018). The CCA has also helped initiate an iterative process in which the government is obligated to implement strategies and regulations to meet its legally mandated

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emissions reduction targets (Gault, 2018).

Our study aims to answer the following two research questions.

1. How has the CCA transformed policymaking processes?
2. What allowed the CCA to get passed, with (as we elaborate) little opposition?

The CCA has also transformed UK climate politics more generally by increasing the salience of climate change within departmental mandates, and reducing silos, through the creation of interdepartmental coordination mechanisms. Since the CCA's passage, climate change has been elevated from being a niche concern of a single agency to the focus of a broadly cohesive, whole-of-government strategy. These changes have fostered a culture of accelerating climate ambition in the UK, and made policy retrenchment increasingly difficult (both legally and politically). This contrasts with the case of Germany, where the absence of strategic climate legislation has meant less cross-sectoral coordination, political parties less committed to ambitious climate policy, and energy-climate policies suffering from a degree of incoherence.

Given the ground-breaking nature of the CCA, we also seek to identify factors which made its enactment politically feasible. As noted by prior studies, the proximate driver of the CCA's adoption was policy entrepreneurship on the part of the NGO sector, with a grassroots mobilization led by Friends of the Earth UK. This coincided with a period of sustained international attention around the issue of climate change, with the publication of the IPCC's initial assessment report as well as the Stern Review, which had a pivotal role in convincing UK business leaders to support climate action (Stern, 2007). To broaden this analysis, we highlight some underlying historical factors which helped create an ideal window of opportunity for this NGO-led campaign. Most importantly, we discuss the secular decline of the British coal industry, accelerated by the 1990 privatization of UK electricity markets. This helped drive a 'dash for gas' throughout the 1990s, and the creation of a domestic renewable energy industry, as an unintended by-product of rules implemented to support the privatization of nuclear power. We argue that the structural decline of the British coal sector was a necessary factor in the early adoption of strong climate policy. In the German case, in contrast, the political power of the coal industry has remained a barrier to the low-carbon transition. Our analysis raises the question of whether the adoption of stringent climate policy may depend on the prior political weakening of high-emitting industries.

2. Design and features of the Climate Change Act

The passage of the UK's Climate Change Act in 2008 was a major event in the history of global climate policymaking. The CCA obligated the UK government to achieve economy-wide emissions reductions of 80% by 2050 relative to a 1990 baseline (Fankhauser et al., 2018). This target has since been updated to mandate a 100% emissions reduction by 2050, as recommended by the CCC and implemented by the government in 2019 (Climate Change Committee, n.d.). The CCA represented the first ever legally binding national emissions reduction target in the world, and the system of carbon budgeting that it introduced has supported escalating ambition in the UK's policy regime.

The innovativeness of the CCA derives from its role as strategic framework legislation, where its power lies not in the prescriptive setting and enforcement of policies, but rather in shaping the discursive structures and political environment within which policymakers operate. The provisions of the CCA, and the institutions it helped create, operate at a level which transcends any individual department or policy program; instead, the CCA outlines the 'skeleton' framework within which decisions are made at all levels of government at any given time (Muinzer, 2019).

There are five unique institutional features of the CCA:

1. Legally-binding, long-term mitigation targets;
2. Carbon budgets, or interim mitigation goals allotted in five year increments;
3. An independent, non-partisan expert panel known as the Climate Change Committee;
4. A regular reporting, monitoring, and verification process; and
5. A continuous planning process for adapting to climate change (Averchenkova et al., 2021b; Benson and Lorenzoni, 2014).

The carbon budgeting process has been instrumental in requiring the government to create and report on interim plans and strategies that align the UK's policy regime with its long-term targets. Each five-year carbon budget is enshrined in law at least 12 years in advance, which provides policymakers with plenty of time and foresight UK Parliament, 2019). The carbon budgeting system has obliged the UK government to iteratively address policy gaps and make continuous progress in updating its strategies to fit with each budget's requirements, which become more stringent over time (Table 1). The government is also mandated to consider the CCC's advice when adopting carbon budgets, and all six of the carbon budgets proposed by the CCC have been adopted as recommended (Benson and Lorenzoni, 2014; Nash and Steurer, 2019). This legally binding process holds the government accountable, makes it difficult to renege on its promises, and creates an incentive for escalating ambition (Fankhauser et al., 2018).

Another essential feature of the CCA is the Climate Change Committee. Inspired by the example of monetary policy (Lockwood, 2013), where independent experts are typically given the autonomy to guide policy without political interference, the CCC serves as the independent, non-partisan advisory body that is empowered to publish annual reports scrutinizing official policies to which the government is obligated to respond by October 15th of each year in a report to Parliament (BEIS, n.d.). Each annual report contains the CCC's assessment of existing policies, as well as recommendations about how to address any gaps (Dudley et al., 2021). This creates a system of accountability where the government must provide a formal written explanation any time it deviates from the CCC's recommendations (Fankhauser et al., 2018). The independence of the CCC allows it to maintain a culture of criticism, wherein all government plans are categorized according to a traffic light system communicating the relative sufficiency of the policies they contain (Harvey, 2021). The non-partisan CCC is treated with respect by members of all political parties, and its advice has been well used in public and parliamentary debates (Averchenkova et al., 2021a,b). Even in situations where the CCA permits the government some flexibility, such as the option to carry forward a surplus of emissions credits to future carbon budget periods, the government has usually opted to follow the CCC's advice and refrain from carrying forward the difference in order to keep the policy planning process as stringent and ambitious

Table 1
Statutory carbon budgets.

Carbon Budget	Date Enacted	Period	Total Budget ($MtCO_2e$)	Reduction Relative to 1990	Associated Governmental Plan
First	2009	2008–2012	3018	25%	UK Low Carbon Transition Plan (2009)
Second	2009	2013–2017	2782	31%	UK Low Carbon Transition Plan (2009)
Third	2009	2018–2022	2544	37% (by 2020)	UK Low Carbon Transition Plan (2009)
Fourth	2014	2023–2027	1950	51% (by 2025)	The Carbon Plan (2011)
Fifth	2016	2028–2032	1725	57% (by 2030)	Clean Growth Strategy (2017)
Sixth	2021	2033–2037	965	78% (by 2035)	Net Zero Strategy (2021)

as possible (Climate Change Committee, 2014).

3. Theoretical insights and methodology

This study contributes to research on institutions for effective climate governance with the broader bodies of literature on socio-technical transitions and comparative political economy concerning 'varieties of capitalism'. An emerging body of research examines climate governance frameworks and institutions (Dubash, 2021; Rüdinger et al., 2018; Finnegan, 2022), in particular investigating the pivotal role played by independent expert advisory bodies (Averchenkova and Lazaro, 2020; Dudley et al., 2021) as well as strategic climate change legislation (Nash and Steurer, 2019). Dubash (2021) finds that there are three essential factors determining the relationship between climate politics and climate policymaking institutions: existing domestic political institutions, interaction with international politics and processes, and bureaucratic patterns and practices. The first research objective of this study aims to understand how domestic political institutions in the UK and Germany shaped climate policymaking processes, and in particular influenced bureaucratic practices through the creation of interdepartmental coordination mechanisms. Dubash also notes that very little is known about the causal mechanisms of climate institutions, a gap this study addresses by outlining how the UK CCA led to further policy entrenchment that led to emissions reductions, at contrast with the German example where the absence of a legislative framework on climate change until 2019 led to a 'lost decade' of climate policy implementation (Flachsland and Levi, 2021). Using the concepts of policy integration and coherence (Howlett and Rayner, 2007; Candel and Biesbroek, 2016; Nilsson et al., 2012), this study highlights the UK as a jurisdiction where strategic framework legislation on climate change substantially improved climate policy integration and coherence over time, in contrast with Germany where the climate policy regime remains fragmented and incoherent in some key ways.

The study then aims to situate the UK case within the existing literature on institutional carbon lock-in, 'regime destabilization', and regulatory capture (Geels, 2014; Green and Gambhir, 2020; Kuzemko et al., 2016; Finnegan, 2022; Mildenberger, 2020; Lamb and Minx, 2020; Jenkins, 2014; Tvinnereim and Mehling, 2018; Stigler, 1971; Olson, 1965). In particular, the 'varieties of capitalism' framework from Hall and Soskice (2001) is cited as a framework to understand how institutional carbon lock-in differs between liberal and coordinated market economies (Bang et al., 2022). Specifically, liberal market economies are likely to experience faster and more cost-efficient transitions than coordinated market economies, where transitions are likely to be slower, more deliberate, and comparatively expensive due to the fact that incumbents are given greater access to political processes and thus find it easier to obstruct or weaken policy. Our study builds on this research by highlighting the structural decline of coal in the UK as a necessary precursor to the adoption of ambitious climate policy, as compared to the counterfactual example of Germany where the consolidation of the coal regime led to the obstruction of key reforms.

In particular, the present study builds on the work of Mildenberger (2020) by highlighting the constitutive role played by business and labour groups in supporting or hindering climate policy development. This employs case study analysis of two jurisdictions to support Mildenberger's (2020) thesis that "double representation of carbon polluters is the single most important feature of climate policy conflict," wherein double representation is defined as a situation where "policy opponents become embedded within both left- and right-leaning political coalitions." In the United Kingdom, we argue, the structural decline of the coal sector rapidly eliminated the largest potential opponent of robust climate legislation and created a cross-party consensus towards strong climate action (Carter and Jacobs, 2014), a situation that contrasts with Germany where the coal sector continues to benefit from strong representation across all sides of the political spectrum, particularly within the SPD and the CDU (Rentier et al., 2019; Leipprand and Flachsland, 2018). By highlighting the role of coalitions in both supporting or weakening climate policy regimes, and exploring the feedback loops created by policy implementation, this case study also responds directly to the "new research agenda" on accelerating low-carbon transitions as identified by Roberts et al. (2018).

Finnegan (2022) predicts that countries like Germany, with corporatist institutions and proportional representation electoral systems, should exhibit relatively high policy stringency relative to countries with pluralist institutions and majoritarian electoral systems, such as the UK. According to Finnegan (2022), high degrees of political and electoral competition seen in pluralist/majoritarian states imply that leaders tend to impose costs on businesses rather than consumers, causing high-emitting sectors to seek to mobilize public opinion against climate laws. In corporatist/proportional states, whereas, "interest group intermediation, particularly concertation, facilitate[s] bargaining between the government and powerful economic actors over compensation for the losers of policy change, helping governments to overcome industry opposition." This study follows a different logic by arguing that, in the case of Germany, it was the corporatist institutions themselves, and the extensive interface between the government and the coal sector, which contributed to the obstruction of climate policy by increasing the number of 'veto points' available to affected stakeholders in a way that prevented regime destabilization. In the UK, by contrast, it was the government's ability to impose costs on businesses without suffering a political cost that led directly to the demise of the domestic coal sector, in a way that reduced the largest source of potential opposition to climate action and created a structural consensus in favour of strong climate policy. It is therefore not the case, as Dubash (2021) argues, that "because it is a majoritarian system with pluralist politics, the UK is an unlikely candidate for strong climate institutions." Rather, our study contends that it is this pluralist/majoritarian system, coupled with the UK's liberal market structure, which permitted the development of strong climate institutions.

Our study employs content analysis to examine the design features and history of the CCA's implementation in the UK, supplemented by counterfactual analysis of the German climate policy regime. Content analysis has been used widely to study environmental policy, such as trends in policy implementation (Hall and Steiner, 2020), comparative review of regulations (Rhodes et al., 2021) and other types of policy instruments (Liao, 2018). While content analysis can employ both qualitative and quantitative analysis of text content (Neuendorf, 2016), we utilized qualitative analysis to produce written descriptions of the UK's CCA and its sub-components and provide a rich characterization of the UK's climate policy regime in its broader historical context.

4. Climate policy regimes: Comparing policy integration and coordination

Our analysis of the British and German Climate Change Acts (CCAs) reflects Nash and Steurer's suggestion (2019) that "future research should analyse CCAs, limitations and options to address these limitations in more depth (for example through qualitative case studies)." As the UK case demonstrates, the 'Strategic Climate Institution' established under this act is a vital instrument to increase climate policy integration and coordination and create path dependence towards a low-carbon future.

The CCA has led to the creation of a strong discursive environment within UK policymaking institutions which has transformed climate change from a marginal, siloed concern overseen by a single department to a cross-cutting, multi-sector priority integrated across all departmental mandates. Where climate action was often previously viewed as a competing priority requiring substantial and costly 'trade-offs,' it is now seen by central organs of the UK policy apparatus as a core function of the state demanding nothing less than total economic transformation, driven by a cohesive, whole-of-government strategy. Although the UK's ability to use policy to deliver substantial emissions reductions in sectors

besides electricity remains largely unproven, we argue that the strong discourses and norms embedded in the Climate Change Act have put the UK on a credible path towards achieving economy-wide emissions reductions.

The salience of climate action as a policy priority in the UK, and its integration with other policymaking processes, has increased significantly over time. This shift can be identified with two approximate historical periods, the first being the period over which energy policy and climate policy became unified in the mandate of a single department, and the second being the period over which climate-energy policymaking became gradually united with economic and industrial policy more generally. Prior to 2008, energy policymaking had been conspicuously depoliticized under previous Conservative governments, with the disbanding of the Department of Energy in 1992 and the reassignment of the energy policy portfolio to a subdivision of the Department of Trade and Industry (DTI) (Kuzemko, 2016). Although there were attempts in the 1990s to improve coordination through a new cabinet committee and requirements for departmental environmental reporting, these efforts bore little fruit (Lockwood, 2021), and the Climate Change Programme of the Labour government in the early 2000s also failed to overcome the silos between the Department of Environment, Food, and Rural Affairs (DEFRA), and the other departments responsible for energy and transportation (Lockwood, 2021). It was only after the CCA's passage that the energy and climate policymaking portfolios were united into a single department, the Department for Energy and Climate Change, that was established in 2009. The publication of the Low Carbon Transition Plan of 2009, pursuant to the CCA's provisions, marked the first time a UK government attempted to define an integrated approach for achieving emissions reductions across the economy, highlighting the need to make significant public investments in new infrastructure, as opposed to simply viewing climate action as a matter of improving the sophistication of carbon markets (Bulkeley, 2015).

A further shift signalling greater integration began with the creation of the Department for Business, Energy, and Industrial Strategy (BEIS) in 2016 as a merger of DECC with the Department of Business, Innovation, and Skills. Although some observers were critical of this move (Vaughan, 2016), fearful that it would mark a downgrading in the importance of climate action at the department level, BEIS was created with a view towards realizing the Clean Growth Strategy adopted in 2017 as a statutory requirement of meeting the fifth carbon budget (Carrington, 2017). This plan emphasized the government's commitment to embed climate action at the heart of the UK's economic and industrial strategy. Under this expanded mandate, over just the last three years the UK government has released an astounding number of plans and strategies corresponding to the goals of the Ten Point Plan for a Green Industrial Revolution, including a new Energy White Paper, a Transport Decarbonization Plan, an Industrial Decarbonization Plan, and a flurry of sector plans related to automotives, offshore wind, nuclear energy, and hydrogen (UK Government, 2021). Although the Climate Change Committee was highly critical of the Clean Growth Strategy, highlighting its clear policy gaps (Harvey, 2021), it has since lauded the recently released Net Zero Strategy (2021) as a major step forward. Lord Deben, the Chairman of the CCC, has stated that the Strategy outlines concrete and credible policy proposals to actually achieve carbon neutrality by 2050 (Climate Change Committee, 2021). The UK is now committing to fully decarbonize its power sector by 2035, phase out diesel and petrol vehicles with a Zero-Electric Vehicle Mandate (as originally recommended by the CCC), and rapidly accelerate the adoption of heat pumps (Climate Change Committee, 2021).

Although the need to see climate action as the cornerstone of economic transformation in the UK has precedents going back to 2008, with the Low Carbon Industrial Strategy presented by Business Secretary Peter Mandelson (Pearson and Watson, 2012), it was only after 2016 that the language of industrial policy featured as a central theme of British politics, introduced by Theresa May partially as a strategy to address the concerns of voters negatively affected by deindustrialization, many of whom voted for Brexit, as well as a way to resolve economic weaknesses exposed by the 2008 financial crisis (Bailey, 2021). As a cornerstone of this strategy, in 2016 the government created an Economy and Industrial Strategy Cabinet Committee to convene the Prime Minister, Chancellor of the Exchequer, and key ministers responsible for business, energy, the environment, transportation, and local government on the project of transforming the UK's economy for a low-carbon future (UK House of Commons, 2016). This has allowed for the creation of new coordination mechanisms or even new bodies, such as the Office of Low-Emission Vehicles as a partnership of BEIS and the Department of Transportation, to tackle cross-sectoral challenges (UK Office of Low-Emission Vehicles, n.d.).

More recently, the government has established a complex architecture of intersecting bodies and working groups, sitting both within departments and at the Cabinet level, to coordinate the UK's net-zero strategy, exemplifying Candel and Biesbroek's concept of a "boundary-spanning structure or overarching authority" to oversee the problem. At Cabinet level, the government has established two central committees for overseeing climate policy: the Climate Action Strategy Committee, chaired by the Prime Minister, and a Climate Action Implementation Committee, chaired by the BEIS Secretary (UK Comptroller and Auditor General, 2020). These bodies work in tandem with the Climate Change National Strategy Implementation Group and the Net-Zero Steering Board, two other committees convening directors and director-generals from across departments that report to the central Cabinet committees and are responsible for steering the government's strategy. In addition to these bodies, each of the four main departments responsible for climate action (BEIS, DEFRA, Department for Transport, and the Ministry of Housing, Communities, and Local Government), as well as the Treasury Department, each have formed their own department-level working groups responsible for driving action in their respective sectors and coordinating with the national committees. This structure has helped reinforce a sense of collective responsibility for climate action, while ensuring that a strong degree of central leadership is coupled with detailed sectoral strategies at the departmental level (UK Comptroller and Auditor General, 2020). The government has also invested significant funds in improving the coordination function, with BEIS reporting that it has added 250 new staff members focused on energy and climate issues, with 40 staff allocated to coordination between departments, in addition to a funding increase of £50 million (UK Comptroller and Auditor General, 2020).

In Germany, by contrast, a structural consensus within the government around the necessity of climate action did not emerge until the passage of the Federal Climate Change Act in 2019, and important gaps remain. Unlike in the UK, where the CCA's implementation helped solidify a high degree of cross-party unanimity, German parties are not in alignment with one another around key climate provisions, particularly the issue of the coal phase-out date, and in some cases are internally divided (Hermwille and Kiyar, 2022). Climate mitigation is only starting to be seen as a cross-cutting goal, and remains misaligned with other sector goals, reducing overall coherence (Flachsland and Levi, 2021). The Social Democratic Party, given its strong historical affiliation with coal mining unions, has frequently emphasized pro-coal policies in its energy security program despite touting environmental goals (Rentier et al., 2019; Renn and Marshall, 2016). The CDU/CSU and conservative parties in coal mining states are also stalwart coal defenders (Leipprand and Flachsland, 2018), and throughout the 2010s were frequent opponents of ambitious climate policies, including carbon taxes (Flachsland and Levi, 2021). These inconsistencies are further complicated by the fact that German federal ministries are controlled by different political parties (Hermwille and Kiyar, 2022), a situation which can prevent the federal government from adopting a uniform position on climate (Heilmann, 2018). Certain key ministries frequently headed by CDU leaders, including the transport, interior, and agriculture ministries, remain hesitant to support ambitious climate policies, as evidenced in their failure to support introducing carbon pricing in the 2019 Climate

Protection Package (Flachsland and Levi, 2021). Germany's CCA, while a step in the right direction, is still not sufficient to advance cross-sector climate governance in a way that increases coordination across departments (Flachsland and Levi, 2021). While all ministries now have formal responsibilities to reduce emissions, coordination remains infrequent (Flachsland and Levi, 2021). Following the CCA's passage, Germany's decision to merge the climate action portfolio with the BMWi to create the new Ministry of Economic Affairs and Climate Action in 2021 will hopefully lead to a greater degree of policy integration.

5. Political economy of climate governance: Removing barriers to legislative change

5.1. Regime destabilization in UK and implications for climate governance

Multiple studies have examined the proximate causes that led to the CCA's passage (Carter, 2014; Benson and Lorenzoni, 2014; Carter and Jacobs, 2014). Key factors often highlighted include the receptiveness of the Conservative Party to climate concerns, which created a situation of inter-party competition in which the main UK political parties competed to appear the most progressive on climate change (Carter and Jacobs, 2014), as well as an unprecedented civil society mobilization spearheaded by Friends of the Earth UK, which enlisted over 100,000 people to write to their legislators in support of the bill (Carter and Childs, 2018).

The agreement between civil society organizations and the business community on the necessity of climate action was another key factor in enabling the smooth passage of the CCA (Benson and Lorenzoni, 2014). What is most striking about the passage of the CCA is the overwhelming degree of support that it received from the business community, which can be contrasted markedly from other jurisdictions. This was not always the case; when Gordon Brown proposed a Climate Change Levy in 1999, he was attacked by a vociferous lobbying campaign spearheaded by the Confederation of British Industry, whose Chairman Digby Jones called the levy "industrial enemy number one" (Morgan, 2000). The prevailing winds began to shift in 2004, when Tony Blair made a prominent speech to business leaders underlining the importance of climate action, and announced his intention to place climate change high on the agenda at the 2005 G8 conference in Gleneagles (Carter and Childs, 2018). A Corporate Leaders Group was formed in 2005, comprising powerful corporations such as Tesco, Unilever, and Shell, which called on the government in 2006 to set more stringent targets under the EU ETS (Carter, 2014). The Stern Report on the economic costs of climate change, commissioned by Blair and Brown and published in October 2006 (Muinzer, 2019), had a major role in shifting the opinion of business leaders, namely by helping to cement the discourse of creating a 'low carbon economy' among major business groups, beginning with the Aldersgate Group and the UK Business Council for Sustainable Energy (Carter and Jacobs, 2014). The Confederation of British Industry subsequently came out in favour of the Climate Change Act, and did significant work to galvanize business leaders to support robust climate action through its Climate Change Task Force, which co-authored a report with McKinsey in November 2007 as a response to points brought up in the Stern Review (Confederation of British Industry, 2007).

What most accounts of the CCA's passage tend to omit is the fact that by the time of the CCA's introduction, the political and economic power of the domestic coal industry, Britain's most carbon-intensive sector, had been substantially weakened. This structural decline of coal was necessary for a surge of ambitious climate policy. In particular, the desire of Conservative leaders to dismantle the political power of the coal industry and introduce market discipline into the energy sector had the unintended side effect of restructuring the grid system to curb emissions and lead to a higher penetration of zero-carbon power sources, while also removing a potential source of vocal domestic opposition from a high-emitting industry. The privatization of the Central Electricity Generating Board (CEGB) in 1989, followed by the privatization of British Coal in 1994, helped propel a surge of coal-to-gas switching enabling generators to simultaneously reduce costs, improve productivity, and reduce emissions, which helped provide early evidence that economic growth and climate action could be achieved simultaneously.

The first policies that had an impact on reducing the UK's carbon emissions and forging a path towards the decarbonization of the British energy system were not motivated by a desire to act on climate change. The decision of the UK government beginning under Margaret Thatcher to remove all official support for the British coal sector and subject the electricity system to competitive pressures were driven primarily by the neoliberal ideology of privatization and deregulation that characterized the economic program of Thatcher's Conservative Party. The Thatcher government's defeat of the miners' strike in 1984-85 served as the decisive moment in the coal industry's political alienation and eventual decline. By this time, Conservative policymakers had become convinced that coal mining was a 'sick' industry, one that could not survive without mandatory agreements for utilities to purchase the relatively high-cost coal that was domestically produced (Turnheim and Geels, 2012). Believing a large proportion of British coal pits to be 'uneconomic,' Prime Minister Thatcher appointed a new chairman of the National Coal Board (NCB) to oversee a restructuring of the industry focused on increased competitiveness (Turnheim and Geels, 2012). In 1985, the New Strategy for Coal pushed the NCB to rapidly accelerate mine closures, with little regard for the effects on coal-dependent localities, while permitting the Central Electricity Generating Board to reduce its reliance on British coal and increase imports from abroad (Turnheim and Geels, 2012). The privatization of the British Coal Board was fully complete by 1994.

The financial doldrums of the British coal industry persisted throughout the 1990s, following the 1989 Electricity Act which divided the CEGB into four public limited companies (Newberry and Pollitt, 1997; Newberry, 1999). Where before the CEGB had operated as a vertically integrated statutory monopoly, the Electricity Act had the effect of opening British electricity markets to market pressures which incentivized generators to switch to cheaper energy sources. The introduction of a profit-maximizing imperative created an environment in which natural gas quickly became the preferred fuel type (Runci, 2000; Hadjilambrinos, 2005). A variety of factors contributed to this choice; in a competitive market where producers prioritized short-term profitability, the newly developed high-efficiency combined cycle gas turbines (CCGTs) offered a less capital-intensive alternative to coal combustion (Geels et al., 2016). As international coal and oil prices fell during the decade, so did the domestic price of gas, which made the cost differential relative to domestically produced coal even starker by contrast (Newberry and Pollitt, 1997). In a privatized and deregulated market, coal could simply not compete in Britain.

The Thatcher government's resolve to privatize the electricity system was greatly amplified after 1984-85 miners' strike, and the effect of privatization on the coal sector was immediate and pronounced (Hadjilambrinos, 2005). By the year 2000 the share of coal as a proportion of the electricity mix had nearly halved, going from 65% to 33% (Hadjilambrinos, 2005), while natural gas rose from 1% to 30% of electricity generation (Turnheim and Geels, 2012). In the decade between the miners' strike and the privatization of British Coal in 1994, the coal industry went from employing 250,000 miners to a mere 7000 (Newberry and Pollitt, 1997). The consumer group that most benefited from the savings associated with the privatization of the electricity system were large commercial and industrial consumers, who saw substantial gains from lower real energy prices (Runci, 2000), which fell by 45% per kilowatt hour of electricity (Newberry and Pollitt, 1997), as compared to the majority of customers who saw few price benefits (Domah and Pollitt, 2001). It is therefore likely that the privatization of the electricity system played a role in demonstrating to large businesses that emissions reductions, cost savings, and thus economic growth could be achieved

simultaneously, helping the 'clean growth' narrative to take off in Britain earlier than elsewhere.

Although the privatization of the electricity system was not undertaken with a view towards lowering emissions, the significant reductions achieved in a relatively short period during the 1990s went a long way towards accelerating UK climate ambition. Margaret Thatcher's Environment Minister publicly stated that reducing emissions to 1990 levels would entail significant "pain and anguish" (Wettestad and Butenschen, 2000). This hesitation was informed by the UK's own emissions projections at the time, which predicted that carbon emissions would rise 20% by 2000, and even over 40% by 2005 (Wettestad and Butenschen, 2000). Throughout the decade, these projections appeared increasingly pessimistic; by March 1995, revised predictions suggested that emissions might decrease 4–8% annually until the year 2000 (Wettestad and Butenschen, 2000). These results informed the Labour government's decision in 1997 to adopt a target to reduce emissions by 20% by the year 2010, a significant jump over previous commitments (Sustainable Prosperity, 2012). In total, by the year 2000 UK emissions were 13% below their 1990 levels in large part due to the surge of coal-to-gas switching (Gugele et al., 2002). These results aided in convincing UK policymakers that climate action could be achieved at relatively low cost, or even with significant savings, and that adopting stronger climate targets was both beneficial and politically feasible.

Policies accompanying the privatization of the UK power sector also helped pave a path towards the decarbonization of electricity in another key way. In order to continue subsidizing nuclear energy in a deregulated market, the UK government included a Non-Fossil Fuel Obligation (NFFO) in the Electricity Act of 1989, requiring electricity suppliers to source generating capacity from non-fossil fuels. Unintentionally, this helped foster the development of a domestic renewable energy industry (Hadjilambrinos, 2005). At the time of the 1989 Electricity Act, it became clear to policymakers that certain less advanced nuclear facilities would be unable to compete on open markets (Runci, 2000). To address this, the NFFO was designed to require electricity companies to buy a certain amount of nuclear power (Geels et al., 2016). From the beginning, however, it became clear that renewable projects (wind energy and waste biomass in particular) could fit into the policy design and compete with nuclear power. Over time the NFFO became used to drive the market for clean energy through a bid process that helped put a downward pressure on the cost of renewables (Hadjilambrinos, 2005). Rather than being phased out by 1998, as had been anticipated, the NFFO was first extended and then later replaced by the Renewables Obligation introduced in the Utilities Act of 2000 (Geels et al., 2016). Because the NFFO helped incubate the creation of a domestic renewable energy industry, it can also be argued that this shift helped create a policy feedback mechanism in which "a policy change creates its own constituency" (Lockwood, 2013). As explained above, the UK Business Council for Sustainable Energy proved to be an influential supportive voice at an early stage in the formation of the CCA, helping to bring the rest of the business community on board (Carter and Jacobs, 2014). The Council also played a key role in the negotiations around the Electricity Market Reform, helping cement a unanimity among major energy companies about the need for broad reforms designed to support renewable investment (Lockwood et al., 2019).

5.2. Regime resistance in Germany and implications for climate governance

The political destabilization of the coal industry and the subsequent adoption of stringent climate policy in Britain can be contrasted with the German counterexample, where the entrenched political power of the lignite coal lobby has proven to be an ongoing obstacle to the decarbonization of the power supply (Wilson and Staffell, 2018). The share of coal in Germany's electricity mix was at 28% in 2019, significantly larger than the UK's 2% share (Brauers et al., 2020). Germany has experienced a 'dash for coal' that saw an increase in investments in new coal-fired capacity (Pahle, 2010), leading to a situation in which the German coal sector is still the largest in Europe (Renn and Marshall, 2016). Lignite mining is seen as necessary to achieve energy security, and the German government subsidized coal up until the year 2014 to the tune of approximately €5–5.7 billion per year (Rentier et al., 2019; Hermwille and Kiyar, 2022). The goal of nuclear decommissioning outlined in Germany's Energiewende has led to a degree of policy incoherence, as Germany increased its reliance on lignite coal mining at the same rate that it decreased its nuclear supply, causing a "coal conundrum" and leading to a 'lost decade' of action (Renn and Marshall, 2016; Morton and Müller, 2016). The protracted negotiation of the coal phase-out in Germany was completed in 2019, and the end-date pushed to 2038, far later than would be required under Germany's Paris commitments (Hermwille and Kiyar, 2022). As the German example shows, simply expanding renewable deployment is not enough to reduce emissions from fossil fuels.

As a decentralized, federal state system with a coordinated market economy, Germany political institutions are designed to prioritize the needs of diverse stakeholders, particularly incumbent industries and affected regions (Bang et al., 2022). Unlike in the UK, politically powerful actors in Germany remained strong defenders of the coal industry, including the Christian Democratic Union (Germany's largest political party), RWE (a major utility), the IGBCE (one of the largest trade unions in the country, and the Federation of German Industries (or BDI, the main German business association) (Leipprand and Flachsland, 2018). As strong evidence of Mildenberger's (2020) thesis, the German case shows a prominent example where the coordinated power of the business associations and organized labour were able to successfully block pro-climate reforms. Unlike in the UK, incumbent electricity providers did not adapt themselves to the energy transition, but rather used their political leverage to maintain the coal regime for as long as possible (Leipprand and Flachsland, 2018). In 2015, coal industry defenders were able to defeat the German government's proposal to introduce a 'climate contribution', similar to a carbon tax, which would have shuttered old coal facilities (Brauers et al., 2020). Unlike in the UK, where a consensus emerged around the need for a Carbon Price Floor would lead to the rapid decommissioning of coal plants, unions, coal firms, and local and state governments were able to obstruct the climate contribution proposal and instead introduce the IGBCE's much weaker proposal for a "capacity reserve" mechanism, which was also backed by the BDI (Leipprand and Flachsland, 2018). The German coal industry was also able to wield its political influence to convince the German government in 2017 to lobby against changes to the EU Industrial Emissions Directive resulting in stricter air pollution rules (Brauers et al., 2020). This contrasts notably with the UK case, where it was the EU Large Combustion Plants Directive of 1990 that played a major early role in accelerating the phase-out of coal (Wilson and Staffell, 2018).

With an environment of hostile resistance from the coal lobby and a general lack of consensus on the necessity of climate action, the window of opportunity for robust climate legislation did not emerge in Germany until a decade after the UK CCA was passed. The German Climate Change Act was adopted in 2019, and was mainly implemented in response to legally binding commitments under the EU Effort Sharing legislation as well as increased public pressure created by the Fridays for Future movement started by Greta Thunberg (Flachsland and Levi, 2021). The cultural shifts created by this social movement were instrumental in shifting the public conversation; in particular, the Federation of German Industries reversed its earlier opposition and wrote a whitepaper, in partnership with the Boston Consulting Group, which argued that climate policy would not harm the German economy or its competitiveness (Flachsland and Levi, 2021). This move mirrors the move by the Confederation of British Industries to partner with McKinsey in endorsing the UK's CCA over a decade earlier, highlighting both the power of social movements to prompt discursive change during key windows of opportunity, and the role of corporate opinion leaders in generating the political will to accelerate climate action.

6. Conclusion and policy implications

The CCA, and the influential Climate Change Committee that it established, have together helped turn the United Kingdom into a global climate leader. The CCC, an impartial expert advisory body, has been the keystone of the UK climate policy architecture, helping to weather the volatility of political cycles while keeping the UK government accountable to its climate commitments, as demonstrated by the fact that every major climate strategy released in the last decade has been made in reference to the CCA's provisions. The CCA has also helped lead to a gradual ratcheting-up of ambition, and increased the salience and embeddedness of climate action as a priority across all governmental bodies, thus helping to create a discursive environment conducive to accelerating the ambitiousness of climate policymaking in the UK (objective 1). Although the implementation of the CCA's provisions has not been without its challenges, particularly evidenced by the contestation around the adoption of the fourth carbon budget in 2011–2014 (Averchenkova et al., 2021b), we argue that the statutory nature of the CCA has helped insulate climate policy from the instability of political cycles and made retrenchment more difficult. Crucially, the CCA has also encouraged more interdepartmental coordination and helping to elevate robust climate action into a whole-of-government priority. We further argue that these changes have only been possible because the structural decline of the British coal industry, which helped create the opportunity for a surge of stringent climate policy (objective 2).

Germany and the United Kingdom began their climate policy journey from a relatively similar position; they both were home to domestic coal-mining sectors, while at the same time they were both compelled to adopt ambitious climate targets and design innovative systems to incentivize renewable energy development. The key difference in either country's ability to adopt ambitious climate legislation and limit the use of fossil fuels depended, therefore, on how each nation was able to overcome institutional carbon lock-in. In the UK, the presence of a liberal market economy and relatively weak supports for coal workers or companies facilitated a rapid decline of coal, which reduced the main source of domestic opposition to stringent climate policy while also accelerating the creation of a pro-climate coalition. The subsequent passage of the 2008 CCA further solidified this process by creating greater path dependence and helping bring about key reforms (i.e., the 2013 EMR) which all but guaranteed the demise of coal. The UK case demonstrates the key role of feedback loops in climate policymaking, particularly highlighting how pro-climate reforms can serve to generate support for future, more ambitious policies. In Germany, by contrast, the coal industry was able to consolidate its political power and capitalize on generous government supports to prop up the incumbent regime. The German coal industry was able to successfully obstruct the passage of key reforms, including a carbon tax, and it was only until a global grassroots climate movement emerged in 2018 that the window of opportunity for adopting strategic climate legislation was finally opened.

This comparative case study provides a powerful elaboration of Mildenberger's (2020) thesis that business and labour groups are the core actors which decide the success or failure of climate policy initiatives. In the UK, business and labour were unanimously in favour of climate legislation, which is why the CCA was able to pass with unanimous, cross-party support. In Germany, whereas, business and labour were for many years united against robust climate policy, leading to a "lost decade" of domestic implementation (Dubash, 2021). These contrasting results also highlight one further key observation: it is not sufficient for governments simply to incentivize renewable energy deployment in order to accelerate the energy transition, but they must also feel empowered to remove supports for, and essentially dismantle, incumbent industries. These kinds of adversarial policies are only possible in contexts where leaders can be sure that they will not suffer a political cost for alienating key industries, conditions which existed in the United Kingdom but not in Germany.

This study shows that institutional carbon lock-in is possible to overcome in contexts where windows of opportunity allow for the demands of social movements to be translated into policies that entrench further climate policymaking (Bang et al., 2022). However, regime consolidation can also occur in which institutional lock-in prevents the emergence of supportive coalitions and capitalizes on political fragmentation to delay and obstruct regulation. In both the UK and German cases, the adoption of climate legislation required strong exogenous shocks in the form of powerful social movements; however, while UK policy entrepreneurs like Friends of the Earth encountered almost no organized resistance, German environmentalists have still not succeeded in accelerating the coal phase-out on a timeline aligned with the nation's climate commitments, and Germany is still on track to miss its 2030 target (Kurmayer, 2022).

Our research has several limitations. First, our content analysis relies on the review of secondary data sources. Future research could choose to collect primary data via interviews and surveys of government officials and/or relevant industry stakeholders to ground-truth our findings and add supplemental context. Second, given that our case study analysis was primarily qualitative in its nature, future studies could econometric analysis or develop quantitative performance metrics to analyse the CCA and its sub-components in relation to GHG reductions, particularly in sectors besides electricity. Thirdly, given the geopolitical consequences of the invasion of Ukraine, future research is needed to assess the effect of the energy crisis on the UK's climate policy regime and its long-term stability.

Our study also raises important questions about the possibility of low-carbon transitions that are both just *and* rapid, particularly by highlighting the very real trade-offs between cost-effectiveness and distributional considerations in the British and German examples. The UK experienced a rapid transition away in which its environmental goals might have been achieved at the expense of organized labour, while in Germany the coal regime has garnered special treatment limiting the nation's emissions reductions. An important area for future inquiry is to conceptualize how both speed and equity concerns can be feasibly integrated into climate policy regimes and supported by strategic climate legislation.

CRediT authorship contribution statement

Gareth Gransaull: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Visualization. **Ekaterina Rhodes:** Conceptualization, Methodology, Validation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Malcolm Fairbrother:** Conceptualization, Methodology, Validation, Resources, Writing – review & editing, Supervision, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

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