Why Renewables Fail: A Historical Institutionalist Analysis of Sustainable Energy Transitions in Industrialized Democracies

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Bachelor Thesis

Why Renewables Fail:
A Historical Institutionalist Analysis of
Sustainable Energy Transitions in Industrialized Democracies

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Table of Contents

1. Introduction

Climate change is becoming an increasingly pressing political issue around the world. In order to avoid catastrophic consequences for human life, it is upon policymakers to mitigate the anthropogenic impact on the natural environment as quickly as possible. The current goal is to keep the rise of the global average temperature below 1.5°C (IPCC, 2018). Governments across the globe have acknowledged their responsibility to lowering carbon emissions in international agreements like the 1998 Kyoto Protocol or its successor, the 2016 Paris Agreement.

Energy is a key target of national mitigation efforts because it accounts for a considerable part of greenhouse gas emissions, especially in industrialized economies (IPCC, 2018). A key obstacle to low-carbon energy transitions is the inherently path-dependent nature of carbon-based energy systems that impedes rapid change (Geels, 2014, p. 26). Against the backdrop of this carbon lock-in, some industrialized states have managed to accelerate the transition to renewably energy. However, most states are lagging far behind the commitments made in international agreements (Geels, 2014, p. 21). This situation posits an intriguing empirical puzzle: Why have some industrialized democracies been more successful in the deliberate acceleration of renewable energy transitions than others?

The existing research on this topic is divided but suggests that political and economic institutions may play a role. This paper adopts a historical institutionalist approach to the study of energy system transitions through the lens of Frank Geels' (2002) seminal Multi-Level Perspective on socio-technical systems. It thereby responds to recent calls for increased research attention to the possible structuration of energy transitions by institutional context factors.

The paper proceeds as follows. Acemoglu and Robinson's (2013) theories from developmental economics are used to hypothesize that more inclusive politico-economic institutions can account for greater progress in a state's energy transition. Then, the existing literature is reviewed and the research design is elaborated. The hypotheses are tested through a comparative historical analysis of the energy transition of the United Kingdom and Germany since 1990. The focus lies on electricity generation as a subset of the energy sector. The preliminary objective is to examine whether the link between a country's institutional landscape and its progress in the energy transition can be established in the cases at hand. Finally, to the extent that such a link is indeed evident, the study unpacks the underlying causal mechanisms to explain how the hypothesized structuration processes may play out.

The analysis suggests that relatively more inclusive politico-economic institutions have favourable effects for the deliberate acceleration of energy transitions, mostly because they facilitate the implementation of more disruptive renewable energy policies.

2. Theoretical Framework

2.1. The Multi-Level Perspective on Sustainability Transitions

One of the key heuristic frameworks in the field of sustainability transitions is Frank Geels's (2002) Multi-Level Perspective (MLP). The MLP explains stability and change of technology in its societal context through a formal model of three hierarchically nested spheres, called socio-technical system. As the name suggests, the MLP disaggregates a socio-technical system into a micro-, meso-, and a macro-level. The levels do not describe reality but rather serve as "heuristic concepts to understand the complex dynamics of sociotechnical change" (Geels, 2002, p. 1259). Within and between the analytical levels, structuration processes interact, align and de-align, determining continuity or transition in a socio-technical system, as depicted in figure 1.

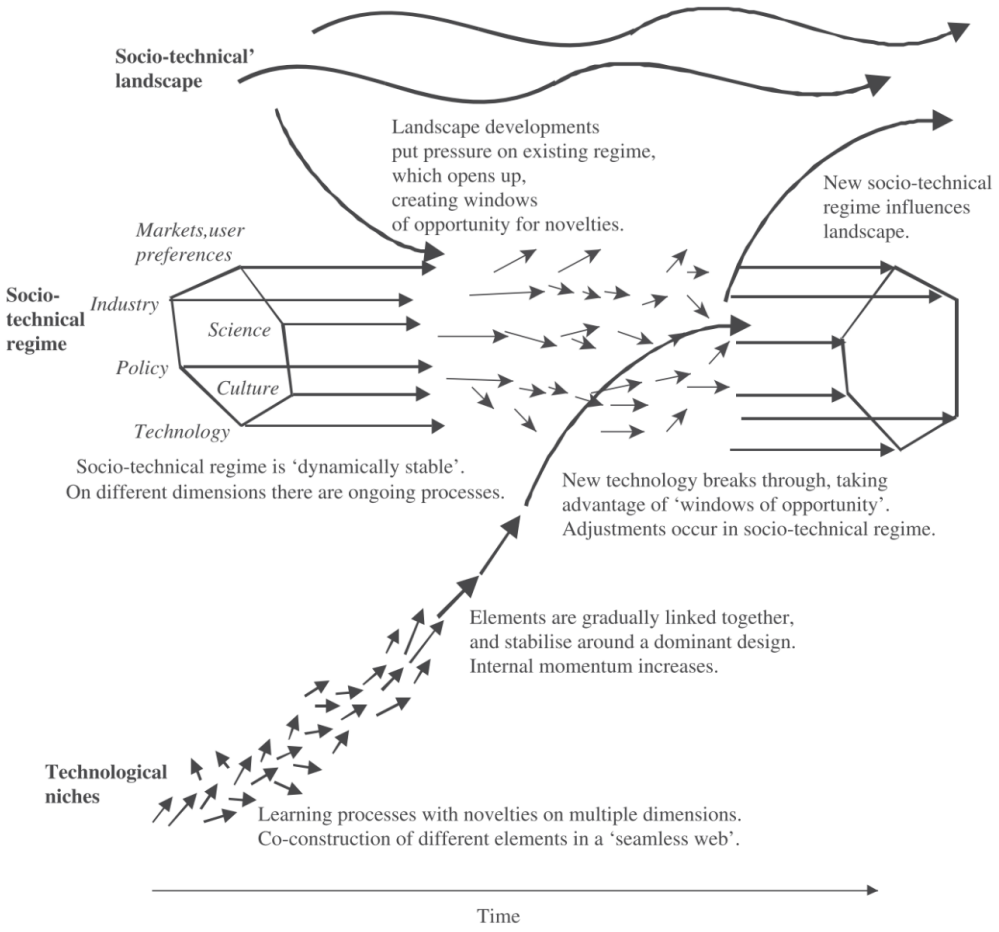

Figure 1. A Multi-level perspective on socio-technical transitions. (Geels & Kemp, 2007).

At the core of a socio-technical system is the meso-level (i.e. organizational level in new institutionalist terms), that represents the socio-technical *regime* around a firmly established technology, in this case fossil fuels. A socio-technical regime can be understood as a cluster of actors and their interactions whose alignment dynamically stabilizes the dominant position of a certain technology in society. These actors and practices typically include policy makers, scientists, industry, and the general public, as well as markets, user practices, and cultural meanings (Geels & Kemp, 2007). At the macro-level, the socio-technical *landscape* consists of exogeneous aspects that are beyond the direct influence of regime actors, such as cultural norms or politico-economic institutions. The micro-level of *niches* accounts for the incubation space around technological innovations, in this case renewable energy (Geels, 2002, p. 1261).

Technological transitions can either be triggered by tensions in the socio-technical regime, and/or by developments at the landscape level that put pressure for change on a regime, such as normative shifts. Both factors can create a window of opportunity for innovations to emerge from the niche and potentially settle as a new regime over time. Besides that, slow changing landscape factors can provide gradients that either hamper or foster the transition process (Geels, 2002, p. 1262).

The MLP has been used to describe and explain processes of creative destruction like the shift from rail to road transport in the UK during the 20th century (Roberts & Geels, 2019). It is also being used to study the more recent socio-technical transitions in energy in response to the increasing global pressure for climate change mitigation, that has first been acknowledged in the 1992 United Nations Framework Convention on Climate Change (UNGA, 1994). It is thus useful to contextualize the relevant theory for this paper in the MLP framework.

2.2. The Analytical Purchase of Historical Institutionalism in the MLP

The Multi-Level Perspective provides a holistic understanding of socio-technical systems. However, in order to gain a closer understanding of the causal mechanisms behind technological transitions, various scholars explore specific sections of socio-technical systems in greater detail. In this vein, an emerging body of research advocates the role of institutions in energy transitions through the lens of historical institutionalism. Andrews-Speed (2016) points out a lack of research attention on the role of landscape-level institutions such as the broader political, economic, legal, and cultural attributes of a society. The author argues that elucidating the institutional context of a socio-technical regime promises to yield more effective policy-making than deliberations "purely based on technical and neo-classical economic considerations" (Andrews-Speed, 2016, pp. 222–223). Historical institutionalist theory is useful for this

purpose given that the approach "focuses on how the wider structure of the […] political economy shapes the distribution of power" (Andrews-Speed, 2016, p. 219). Lockwood et al. further point out that "historical institutionalism offers tools for the explicit analysis of institutional dynamics that are present but implicit in socio-technical systems" (2017, p. 313).

In response to Andrews-Speed (2016) and Lockwood et al. (2017), this paper combines the MLP with historical institutionalist theory by applying Acemoglu and Robinson's (2013) historical institutionalist theory from developmental economics to the study of energy transitions. Acemoglu and Robinson's *Why Nations Fail* (2013) is a landmark historical institutionalist analysis of the deep determinants of socioeconomic outcomes. The authors provide an institutionalist explanation for cross-national differences in economic development in terms of material welfare. However, their theory may also be useful to explain the varying success across industrialized democracies in the pursuit of welfare based on non-material parameters. The pursuit of a healthy natural environment can be viewed as the subsequent stage in the further socioeconomic development of an already industrialized economy. As Inglehart's (1995) post-materialism theory points out, once a state reaches a certain level of economic development, its citizens tend to focus increasingly on post-material social goods like environmentalism (as cited in Fiorino, 2011). Hence, assuming a continuum in socioeconomic development from the material to the post-material, Acemoglu and Robinson's theory (2013) can be applied to sustainability transitions in industrialized states.

At the core of Acemoglu and Robinson's (2013) theory lies the argument that some nations are more economically developed due to their inclusive economic and political institutions, while others have been held back by extractive institutions. Inclusive economic institutions, such as secure property rights and low barriers to market entry, foster development by incentivizing broad participation in the economy. Extractive economic institutions reserve that participation to a small elite, which takes away economic incentives for all other actors, thereby hampering development. The nature of economic institutions in turn is determined by political institutions, i.e. 'the rules of the game'. Inclusive political institutions are characterized by a pluralistic distribution of power under a sufficiently centralized state, which Acemoglu and Robinson (2013) see as essential for economic development.

A key explanatory mechanism behind differences in long-term development trajectories is the interaction of a country's initial institutional context with critical junctures of global scale. Acemoglu and Robinson (2013) argue, for example, that the Industrial Revolution played out differently in different countries because the presence of inclusive institutions allowed some

countries to benefit economically from technological progress, while others stayed behind as their extractive institutions set barriers to creative destruction and innovation.

Applying these insights to the post-material development of industrialized states, it can be hypothesized that variations in the inclusiveness of institutions may structure socio-technical transitions around energy. In order to apply Acemoglu and Robinson's (2013) theory to the new context, the parameters of political and economic inclusiveness need to be adjusted to the purpose of differentiating between industrialized states, instead of between developed and underdeveloped ones. In the political institutional dimension, Lijphart's (2012) seminal work on the patterns of democracy serves this purpose and Hall and Soskice's (2003) 'varieties of capitalism' framework is useful in the economic institutional dimension.

Lijphart (2012) distinguishes between a majoritarian and a consensus model of democracy. The majoritarian variant is based on majority rule, whereas the consensus model aims for rule by as many people as possible under proportional representation (PR). Consequentially, Lijphart argues, the "majoritarian model is exclusive, competitive, and adversarial, whereas the consensus model is characterized by inclusiveness, bargaining, and compromise" (2012, p. 2).

In lieu of the distinction between inclusive democratic and extractive authoritarian political institutions, this paper revolves around the more fine-grained distinction of the political inclusiveness in consensus versus majoritarian democracies. The relevant institutional pillars of state centralization and the electoral system are elaborated at a later point. For now, it suffices to point out that Lijphart postulates that the consensus model performs better at protecting the environment because it is the "gentler, kinder", i.e. more inclusive, form of democracy (2012, p. 274). Considering the acceleration of renewable energy transitions as instance of such environmental protection, the following hypothesis is drawn:

> H1: Consensus democracies show greater progress in the deliberate acceleration of renewable energy transitions than majoritarian democracies due to greater political inclusiveness.

Regarding the economic side of the institutional landscape, Hall and Soskice delineate different varieties of capitalism according to how institutions shape the coordination among economic actors (2001, p. 6). Based on the assumption "strategy follows structure", economic institutions are said to condition the strategies of economic actors without directly determining them (Ibid, p. 15). Expressed in terms of the Multi-Level Perspective, this means that landscape-level institutions structure the interactions among regime-level actors.

In ‘liberal market economies’, economic actors largely coordinate their behaviour at arms-length via market mechanisms, whereas ‘coordinated market economies’ additionally allow for strategic non-market coordination. In other words, in liberal market economies, macroeconomic outcomes are predominantly determined by the hand of free market competition. In contrast, coordinated market economies ascribe greater room for state intervention via public policy, which paves the way for the inclusion of societal preferences in the formation of macroeconomic outcomes (Lockwood et al., 2017, p. 320). Furthermore, governments in coordinated market economies grant relatively more protection to niche-level actors and their innovations. The resulting reduction of barriers to market entry can be considered as more economically inclusive. The role of institutional economic inclusiveness thus hypothesized as follows:

> H2: Coordinated market economies exhibit greater progress in the deliberate acceleration of renewable energy transitions than their liberal counterparts due to greater economic inclusiveness in the energy market.

3. Literature Review

Various studies suggest a link between institutional context factors and environmental outcomes. As the review will show, the literature is predominantly quantitative and provides some support for a correlation, but only few small-n studies explicitly aim at unpacking the underlying causal mechanisms. Therefore, there is considerable scope for further research through qualitative studies (Andrews-Speed, 2016; Lockwood et al., 2017; Schaffer & Bernauer, 2014).

The specific nexus of institutions and energy policy is generally under-researched (Andrews-Speed, 2016). However, considering that the energy issue is a subset of a political economy’s overall environmental performance, insights from broader environmental research are relevant to this paper.

The literature on political institutions provides some support for Lijphart’s theory (2012), although the link is not undisputed. PR systems are associated with better overall environmental outcomes (Scruggs, 2003b, p. 182), and are slightly more likely to implement renewable energy polices (Schaffer & Bernauer, 2014). Furthermore, governments in PR systems are more likely to issue *stricter* environmental policy when it comes to the ratification of international climate agreements and mitigating greenhouse gas emissions (Fredriksson & Millimet, 2004, p. 238). However, some studies paint a more skeptical picture. Neither in terms of

emission levels per se does the electoral systems seem to have a significant impact (Lachapelle & Paterson, 2013), nor regarding the adoption of carbon taxes (Poloni-Staudinger, 2008).

With regards to the political openness to green parties specifically, robust evidence shows that proportional representation increases the chance for typically small-sized green parties to be included in parliament (Lockwood et al., 2017; Neumayer, 2003; Poloni-Staudinger, 2008). In fact, until the early 2000s, electorally significant environmental parties could be found in PR systems only (Scruggs, 2003b, p. 176).

However, Poloni-Staudinger (2008) argues that the inclusion of green parties in consensus democracies is not a sufficient condition for relatively more ambitious environmental policies because the positive effect may be offset by the increased number of political veto players in federalist political systems. Lachapelle (2011) reaches similar conditional findings: There is evidence that the participation of a green party in a PR government is correlated with higher carbon fuel taxes. However, votes for green parties in disproportional systems appear to have a similar effect. The author argues that an interaction effect between political preferences, the type of electoral system, and the electoral incentive for winning votes can partially account for the contrasting findings in the literature (Lachapelle, 2011).

Overall, the somewhat conflicting findings in the literature can largely be explained by differences in the chosen variables, indicators and/or samples. This makes further research on the link between electoral systems and environmental outcomes worth considering. Several of the studies that do find a positive effect of consensus democracies present tentative explanations based on theoretical considerations similar to the ones made in the previous section (see e.g. Lockwood et al., 2017).

Regarding the institutional pillar of state centralization, the evidence as mixed but suggestive as well. Bivariate analyses suggest that the degree of state centralization does not have a systemic impact on environmental performance (Scruggs, 2003b, p. 179). However, multivariate analyses suggest that centralized-unitary states are more effective in environmental policy-making (Poloni-Staudinger, 2008; Scruggs, 2003b). In a centralized-unitary state, fewer veto players can obstruct the policy process so that the ambitiousness of environmental policies mostly hinges on political will (Fiorino, 2011, p. 384; Lockwood et al., 2017).

Studies with contrasting findings invoke instances in which federalism has provided room for regional experimentation with environmental policy, through which particularly progressive subnational entities emerge as a role model for policy change in an otherwise status-quo-oriented polity (Lockwood et al., 2017). This phenomenon is dubbed “California Effect”, defined as “the upward ratcheting of environmental standards in competing political

jurisdictions" (Vogel, 1997 as cited in Fiorino, 2011, p. 374). Furthermore, one large-n study suggests that federal systems overall are significantly more likely to adopt renewable energy policies (Schaffer & Bernauer, 2014).

The literature on economic institutions as embodied in Hall and Soskice's (2001) varieties of capitalism is less ambiguous. Scruggs' (2003a) distinction between corporatist and pluralist socio-economic institutions, which is comparable to the varieties of capitalism dichotomy, provides tentative insights. In corporatist settings (i.e. in coordinated market economies) "business interests […] work cooperatively with governments and other stakeholders in reconciling and integrating policy goals" (Fiorino, 2011, p. 379). This coordination is crucial for solving collective action problems that are a typical hurdle for environmental policies. Corporatist economies like Germany are therefore said to perform better environmentally than pluralist/adversarial ones like the USA (Fiorino, 2011). These findings are confirmed by a quantitative findings which suggest that corporatist economies indeed adopt stricter environmental policies than liberal pluralist ones (Liefferink, Arts, Kamstra, & Ooijevaar, 2009). Furthermore, Lachapelle and Paterson (2013) provide quantitative evidence that coordinated market economies exhibit a significantly slower expansion of greenhouse gas emissions.

The varieties of capitalism literature mostly refers to the manufacturing sector, as well as broader environmental outcomes, but it is under-researched how coordinated vs. liberal market economies impact outcomes in the energy sector specifically (Lockwood et al., 2017).

Geels et al.'s (2016) recent study of the energy transitions in the UK and Germany through the holistic MLP lens provides further tentative insights. The authors note that Germany's coordinated market economy "has a collaborative tradition for stakeholder interaction, which in various instances led the government to accommodate civil society pressure" for stricter green energy policy (Geels et al., 2016, p. 910). The UK's liberal market economy, on the other hand, maintains barriers for new market entrants. Regarding political institutions, the UK's Westminster system tends to exclude niche actors due to close-knit policy networks and the tendency for "more autocratic, top-down policy style" (Geels et al., 2016, p. 910).

In brief, the current state of the literature provides a motive for this paper. Overall, the mostly quantitative studies do not seem to have found a clear answer to questions similar to the puzzle at hand, which provides a rationale for a qualitative historical analysis. While climate policy is a broad issue, energy policy might be easier to capture (Lachapelle & Paterson, 2013), which promises to yield more palpable causal mechanisms. Therefore, this paper replicates Geels et al.'s study but with a more specific focus on the structuration between landscape-level institutions and energy transitions.

4. Research Design

The hypotheses are tested through a comparative historical analysis of the energy transitions of Germany and the UK since 1990. A historical design is appropriate for such a study because it offers the longitudinal vantage point that is required to effectively examine the long-term unfolding of an energy transition under consideration of its institutional context. In contrast to other new institutionalist approaches, historical institutionalism can account for the occurrence of unintended inter-temporal consequences of institutional design (Lockwood et al., 2017, p. 314). A small-n comparison is useful because it allows the contrasting of divergent transition pathways (Lockwood, 2015, p. 3). Apart from that, it enables in-depth analysis, as well as broader contextualization (Halperin & Heath, 2017, p. 218).

The comparative analysis is based on a most similar systems design (Seawright & Gerring, 2008) in order to isolate the hypothesized causal link, while holding constant as many other potential explanatory factors as possible. The two selected cases fulfil this requirement on a number of variables. Above all, the UK and Germany are both liberal democracies with a high level of economic development. The geographic conditions and access to technology required for renewable energy are similar as well (Geels et al., 2016, p. 901). Furthermore, both states are signatories of the same international climate agreements and have been equally subject to EU regulatory frameworks, at least until recently.

The cases do, however, vary on the independent variable in that they each represent one type of institutional landscape under examination: The UK is a majoritarian democracy and fulfils the key characteristics of a liberal market economy, while Germany is a consensus democracy with more of a coordinated market economy. Each state is considered a typical case for the political and economic institutional constellation it represents here (Lijphart, 2012; Lockwood et al., 2017). Finally, both cases are relevant to the study of renewable energy policy because they consider themselves frontrunners in the energy transition but follow noticeably different transition pathways (Geels et al., 2016, p. 901).

Political and economic institutions are difficult to disentangle, considering for example that a state's political institutions tend to shape its economic institutions (Dasgupta & Cian, 2016; Acemoglu & Robinson, 2013). A relevant example for such a convolution is the tendency that coordinated market economies often have PR electoral systems (Lockwood et al., 2017, p. 320). Given that long term policy outcomes can thus hardly be ascribed to one specific institution, this paper focuses on sets of institutions (i.e., a state's institutional landscape in terms of the Multi-Level Perspective). The two theorized politico-economic institutional landscapes are

operationalized based on Lijphart (2012) and Hall and Soskice (2001) and labelled 'majoritarian political economy' and 'consensus political economy' as shown in figure 2.

The institutional landscape's political dimension is operationalized using two of Lijphart's (2012) institutional pillars: The electoral system (incl. the party system and the cabinet structure it entails) and the degree of state centralization. Regarding the economic institutional dimension, two types of market economies are distinguished based on the extent to which they allow for government coordination in the energy market.

	'Consensus Political Economy' (GER)	'Majoritarian Political Economy' (UK)
Political Institutions	Proportional voting system	Majoritarian voting system
	Decentralized-federal state	Centralized-unitary state
Economic Institutions	Coordinated Market Economy	Liberal Market Economy

Figure 2. Overview sets of institutional landscape characteristics.

The analysis draws on secondary academic literature. The additional researcher bias that this source selection may introduce is somewhat mitigated by the fact that many of the sources draw directly on primary sources like interviews with policy makers, legislative texts or government reports. The sources are systematically reviewed and used for a macro-causal analysis based on process tracing at an aggregate analytical level. The causal mechanisms in each institutional dimension are compared to assess the validity of the hypotheses. The temporal scope for the analysis is set between 1990 and 2015, with 1990 as starting point since neither case had a significant share of renewables in their energy mix at that time (Lockwood, 2015).

5. Energy Transition Pathways in the UK and Germany since 1990

5.1. The German *Energiewende*

The starting point for the German *Energiewende* (energy transition) in 1990 was a natural monopoly in the energy market. Nine national public utilities supplied electricity to municipalities within formally demarcated territories under strict regulatory supervision (Geels et al., 2016, p. 901). Electricity prices were fully regulated by the state (Bardt, 2017). The public utility providers held a dominant political position due to their role as public service providers (Stefes, 2010, p. 152). In contrast to the UK, Germany had an Environment Ministry in place

since 1986 (Aklin & Urpelainen, 2018b, p. 148).

The first major policy initiative was the 1990 Feed-In Act (StrEG) in the wake of a significant shift in public opinion against nuclear energy after the 1986 Chernobyl incident. Co-initiated by conservative and green parliament members, the act obliged utilities to source part of their electricity from renewable energy producers at 65-90% of the final consumer price (Aklin & Urpelainen, 2018b, p. 150). Contrary to expectations, this feed-in tariff sparked rapid and sustained growth of green energy, as it made the installation of renewable energy sources, predominantly wind turbines, economically feasible (Lockwood, 2015). On the supply side, the feed-in tariff amounted to a "mass appropriation of innovation from above" (Lockwood, 2015, p. 24). The policy was indiscriminate towards technologies and was explicitly directed at a broad variety of social groups like farmers, private households, small businesses and municipalities (Lockwood, 2015, p. 24). This way, users were included as potential producers, while the incumbent utilities were essentially sidelined. By the late 1990s, more than half of all onshore wind facilities were owned by farmers or local cooperatives (Lockwood, 2015). At the same time, the renewable energy industry evolved into a significant political player throughout the 1990s (Aklin & Urpelainen, 2018b), amid the increasing professionalization of renewable energy interest associations due to support from the Green Party and the Ministry of the Environment (Laird & Stefes, 2009),

The liberalization of energy markets around Europe found its way into the Germany in 1998, which gave rise to four large private energy companies, dubbed the "Big 4" (Geels et al., 2016, p. 903).

1998 also marked the first government participation of the Green Party at the national level. The Red-Green government issued far-reaching pro-renewables policies. Most importantly, the 2000 Renewable Energy Sources Act (EEG) set the target of increasing the share of renewables in the energy mix to 60% by 2050. The Act also reinforced the 1990 StrEG by obligating grid operators to prioritize energy from renewable energy sources and, for the first time, guaranteeing renewable energy generators a fixed price for feeding-in their output at a term of 20 years. The price stabilization essentially guaranteed a market for renewable electricity, which further accelerated the decentralized deployment of renewable energy by small actors (Lockwood, 2015) and reduced the market power of traditional utilities (Stefes, 2010, p. 154).

Politically, an institutional reform in 2002 transferred the policy authority over renewable energy from the Ministry of Economic Affairs to the Ministry of Environmental Affairs under a Green Party minister (Geels et al., 2016). Throughout the 2000s, renewable energy turned into an "economic powerhouse", providing jobs and investment opportunities (Laird &

Stefes, 2009). Parallel to this expansion of renewables, however, large utility companies expanded their coal and gas-based production, rather than aligning their business models with the burgeoning energy transition (Geels et al., 2016, p. 903).

The 2011 Fukushima incident marked critical juncture in German energy policy. The public backlash against nuclear energy incentivized the then center-right government to take a U-turn in nuclear policy and announced a nuclear phase out by 2022 (Moss, Becker, & Naumann, 2015). As a consequence, renewable electricity received a considerable demand boost. In the 5 years following Fukushima, the share of renewables in gross electricity production increased from 17% to 28%. Traditional utilities, on the other hand, faced economic problems and increasingly questioned their fossil-fuel based business models (Geels et al., 2016, p. 906).

Since 2014, the EEG has been revised multiple times to accommodate the changing realities in the energy market. A skyrocketing EEG-surcharge and concerns over the stability of energy supply amid the increasingly decentralized and heterogeneous energy sector led the government to gear down support for renewables. Feed-in tariff rates were cut back and subsidies for new deployment were limited through a license tendering model. The measures were introduced to increase market competition and provide a greater incentive for large-scale projects like offshore wind parks, which are typically realized by large utilities. Recent energy policy has thus been focusing on the scalability of renewable energy (Geels et al., 2016; Kühne & Weber, 2018).

5.2. The Energy Transition in the United Kingdom

The United Kingdom has had a centralized energy system since the end of the Second World War, mirroring the country's relatively centralized political system. This institutional design left its imprint on the privatization of the country's energy sector during the neoliberal turn between the 1970s and the 1990s. As a result, the current national energy market is characterized by an oligopoly of six large energy providers, dubbed the 'Big 6' (Lockwood et al., 2017).

At the apex of privatization in the 1990s, the policy paradigm around energy governance shifted from Keynesianism to a neoliberal pro-market approach. Energy provision was intentionally de-politicized through marketization and technocratization (Kuzemko, 2016). A key aspect was is the abolishment of the national Department of Energy in 1992. Most of the policy authority over energy was transferred to the newly created Office of Gas and Electricity

Markets, short Ofgem (Geels et al., 2016). The Ofgem was designed as a politically independent, technocratic regulator with the main objective of ensuring market competition in the newly privatized energy industry (Lockwood et al., 2017). During the 1990s, there was little development towards low-carbon energy because its subsidies were mostly directed at nuclear energy and less towards renewables (Lockwood, 2015; Pollitt, 2010, p. 19).

In response to the 1997 Kyoto Protocol's sustainability commitments, a renewables obligation was introduced in 2000. The policy required large energy utilities to source a certain proportion of their energy supply from renewables based on a quota system (Lockwood, 2015, p. 12). These quotas were seldomly fulfilled, mainly due to high certificate prices and low buy-out rates (Schaffer & Bernauer, 2014, p. 24). Overall, the renewables obligation is representative of the reliance on marked-based policy instruments in the UK's energy governance (Kuzemko, Lockwood, Mitchell, & Hoggett, 2016).

The energy issue was re-politicized throughout the early 2000s amid scarce oil resources and the increase in energy prices caused by the renewables obligation (Kuzemko, 2016, p. 107; Pollitt, 2010). The energy transition gained momentum with several initiatives that more seriously challenged the fossil energy regime. In 2003, a government White Paper proclaimed climate change as a "central policy problem" and highlighted "renewable energy as the most important low-carbon strategy" (Geels, 2014, p. 24).

Most importantly, the 2008 Climate Change Act set the unprecedented, legally binding goal of reducing greenhouse gas emissions by 80% by 2050. (Kuzemko et al., 2016, p. 103). The Act furthermore reinstituted the Department of Energy and Climate Change, thereby returning some of the policy authority back to cabinet level (Kern, Kuzemko, & Mitchell, 2014, p. 521). However, the British government is currently still far behind on delivering on the Act's objectives (Kuzemko, 2016, p. 108).

Nevertheless, the Climate Change Act marked a shift in renewable energy policy. In 2010, the renewables obligation was expanded to set more incentives for deploying renewable energy. In addition, a feed-in tariff similar to the German one was introduced, which was also directed at small-scale producers (Schaffer & Bernauer, 2014). The feed-in tariff led to explosive growth in the deployment of solar energy, and rates were quickly leveled down again (Lockwood, 2015, p. 12). Furthermore, the UK has become a global frontrunner in the installation of offshore wind, mainly led by large energy utilities (Kern, Smith, Shaw, Raven, & Verhees, 2014, p. 638). In spite of the strong impact of the policy shift, the UK's renewable ratio of 11% in 2012 was still less than half of Germany's (Aklin & Urpelainen, 2018a; Lockwood, 2015, p. 12).

In recent years, the expansion of renewables slowed down slightly. Support was scaled back as part of austerity measures that have been implemented by the conservative-liberal government in response to the 2008 financial crisis (Geels et al., 2016; Kuzemko et al., 2016).

6. Politico-Economic institutions and energy transition pathways

Comparing the two energy transition pathways, Germany has overall progressed further than the UK. In Germany, the development of renewables started to gain momentum in the mid-1990s, whereas the UK only experienced significant renewables deployment from the mid-2000s onwards. Even though the UK has since been catching up at remarkable pace, the initial lag has not yet been overcome: In terms of the UN Sustainable Development Goal 7.2 – increasing the share of renewables in final energy consumption – the UK registered a share of 8.7%, while Germany recorded 14.2% in 2015 (Our World in Data, n.d.).

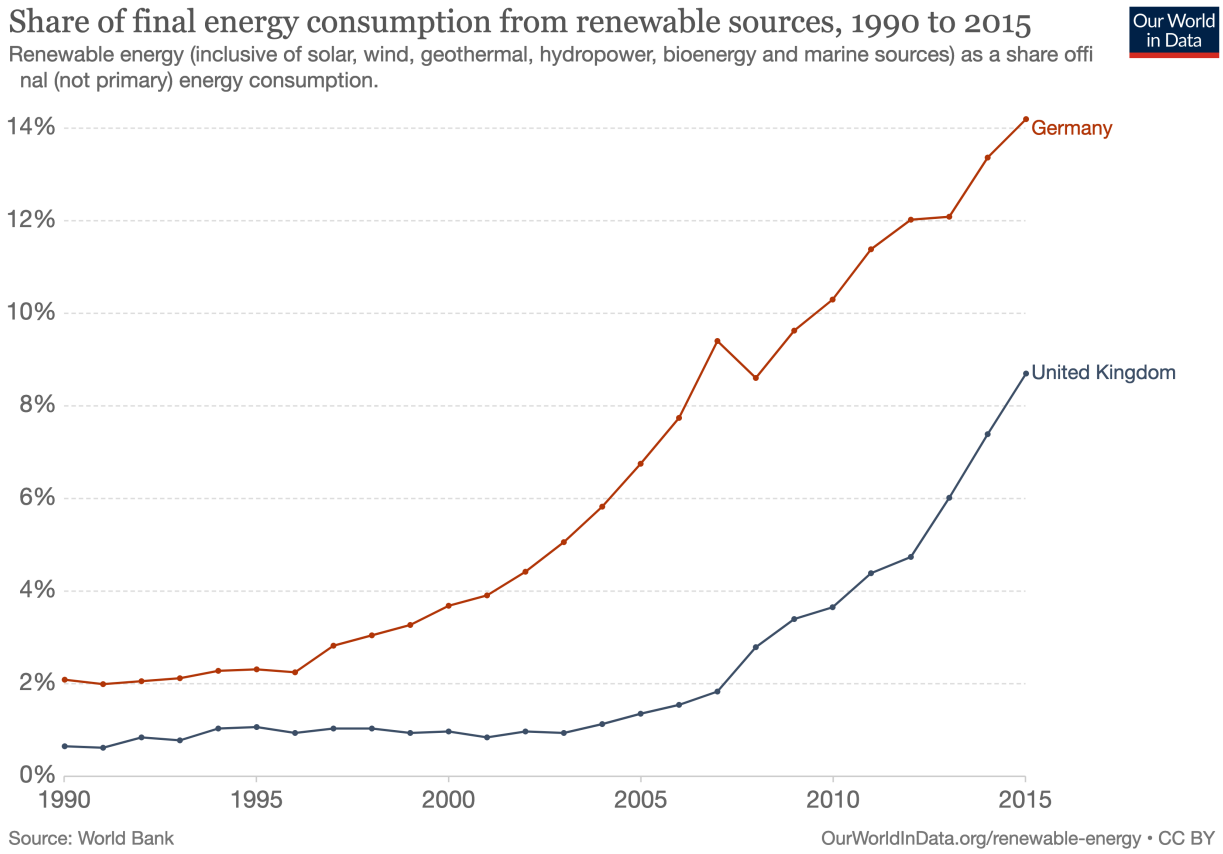

Figure 3. Renewable energy consumption in the UK and Germany. (Our World in data, n.d.).

This discrepancy can be explained by the different policies that have been implemented to accelerate the transition in each case. Overall, the UK mostly relied on working with the

incumbent energy corporations through market-based policies like the the renewables obligation. Germany relied on the more interventionist and socially broad feed-in tariff that deliberately seeks to foster new entrants in the energy market. Under the lens of the Multi-Level Perspective, the British approach can be classified as a *transformation* pathway, as it seeks to integrate new technologies into the existing socio-technical regime. The German case instead qualifies as a *substitution* pathway, as it is focuses on creating an entirely new socio-technical regime to compete with the present one (Geels et al., 2016).

The empirical comparison of these pathways suggests that the latter approach has been more effective in accelerating the a low-carbon energy transition. To what extent the different institutional landscape characteristics can account for these different policy approaches is assessed in the following. Each institutional pillar is examined separately to ensure a systematic analysis. However, it is important to keep in mind that these pillars are interrelated parts of a country's institutional landscape as a whole.

6.1. Political Systems

The first political institutional dimension under analysis is the political system. Germany has an electoral system of mixed-member proportional representation. It combines simple majority voting and PR, in which half of the legislature is elected from single-member districts through a first-past-the-post mechanism, and the other half through list PR. Even though the German electoral system slightly deviates from the prototypical consensus democracy, its proportional secondary vote makes the end result proportional. As a consequence, Germany exhibits a multi-party parliament and a tendency towards coalition governments (Lijphart, 2012).

The German case confirms the theoretical expectation that a consensus democracy allows for greater salience of smaller green parties like the Bündnis 90/Die Grüne, henceforth Green Party (Evrard, 2012, p. 278). This institutional feature has had major implications for renewable energy policies. The Green Party has been a vocal advocate for the energy transition, both in and out of government. It is credited with introducing and upholding the more disruptive and more inclusive feed-in tariff as main policy instrument (Laird & Stefes, 2009, p. 2620).

The 1990 Feed-in Act (StrEG) was co-initiated by an MP from the conservative Christian Social Union interested in the profitability of Bavarian hydropower plants, and a Green Party MP motivated at least partly by environmentalist conviction (Aklin & Urpelainen, 2018b, p. 150). This is a first indicator that the inclusion of a green party via PR contributes to more environmentally ambitious energy policy.

The first government participation of the Green Party in 1998 in the coalition with the Social Democrats (SPD) is considered a milestone for renewable energy in Germany (Stefes, 2010). After the StrEG had been vastly underestimated at its onset, anti-renewables interests vehemently challenged the policy in the political and judicial arena throughout the 1990s (Stefes, 2010; Toke & Lauber, 2007). However, renewable energy was reinvigorated after the 1998 government turnover (Laird & Stefes, 2009, p. 2624; Stefes, 2010, p. 158).

The participation of the Green Party in the 1998 coalition government arguably cemented the budding positive policy feedback around renewable energy. First, the Green Party was willing to make concessions in the coalition agreement to espouse the 2000 EEG that reinforced the 1990 StrEG (Evrard, 2012, p. 288). This suggests that the "institutionalized public opinion – in the form of the Green Party – influenced [the EEG's] introduction" (Hughes & Urpelainen, 2015, p. 59). Furthermore, after the 2002 re-election of the Green-Red government, the authority over renewable energy policy was reassigned from the Ministry for the Economy to the Ministry for the Environment under Green Party leadership. Not only did that reframe renewable energy as matter of environmental necessity, but it also strengthened the pro-renewables position in the executive by counterbalancing the pro-incumbent Ministry for the Economy (Hager, 2015, p. 11). Finally, the Green party served as a critical access point for renewable energy interest groups to the highest government level. Before, energy policy-making took place in closed networks between the Ministry for the Economy, the Big 4, and industry associations. However, by the late 2000s, policy-making was considerably more transparent and accessible to pro-renewables associations (Laird & Stefes, 2009, p. 2628). Large financial contributions from renewable energy companies to the SPD and the Green Party are one indicator for the increased ability of the pro-renewables camp to exert political influence through the Green Party (Aklin & Urpelainen, 2018b, p. 154). The strengthened renewables-associations in turn "flanked the feed-in tariff against counteractions from utility interests" during the 1990s and early 2000s, showing that the transition was not an immediately self-reinforcing path-dependent process but needed active maintenance by pro-renewables interests and the Green Party (Stefes, 2010, p. 161).

Under consideration of these aspects, it can overall be argued that the presence of the Green Party in the political arena was a necessary condition for the implementation of the relatively more disruptive renewable energy policy in Germany. It seems that the PR electoral system opened the door for the feed-in tariff, as it did for other environmental policies such as carbon taxation (see e.g. Lachapelle, 2011).

However, it needs to be acknowledged that the PR political system is not a sufficient

condition. An important aspect that activated the positive effect of PR is the strong environmentalist attitude among the German public. First, the vocal movement against coal and nuclear energy of the 1970s and 80s has been a key demand-side factor for the establishment of the Green party as a formally organized actor in the political arena (Aklin & Urpelainen, 2018b, p. 148). Second, the 1986 Chernobyl incident turned the previously divided public opinion against nuclear energy (Jacobsson & Lauber, 2006, p. 263), which opened up a window of opportunity for the Green policy entrepreneurs behind the StrEG (Stefes, 2010, p. 149). Finally, the critical public sentiment made nuclear energy an overall politically infeasible low-carbon energy alternative. This increased the political attractiveness of renewables, especially after the Fukushima incident in 2011 (Moss et al., 2015).

All in all, the public preference for environmental sustainability has certainly been stronger in Germany than the UK but its effective articulation into policy required the emergence of the Green Party through the PR electoral system. The German case thus shows how a static landscape-level institution can amplify the impact of a landscape-level normative shift on the socio-technical regime. In other words, the turn of public opinion against nuclear energy opened up an early window of opportunity for renewable energy, but the access of the Green Party to the political arena via PR crucially enabled and perpetuated the political articulation of that normative shift at regime level.

The UK's political system, on the other hand, is classified as parliamentary majoritarianism. Following the principle of majority rule, its electoral system is based on first-past-the-post voting in single-member districts. The result is a single party cabinet and a party system with only two electorally relevant parties (Lijphart, 2012). While the UK does have the oldest green party of western Europe, the Green Party of England and Wales, it has fallen short of gaining any parliament seats until 2010 (BBC, n.d.) due to the disproportional seat allocation of the majoritarian voting system (Birch, 2008, p. 55).

The UK, therefore, exhibits the exclusionary effect of majoritarianism on small parties theorized by Lijphart (2012). This does not amount to a normative argument against majoritarianism per se, but provides a plausible institutional explanation for the comparatively lower salience and efficacy of renewable energy policies in the UK. In the early 1990s, energy policy in both countries was technocratic and negotiated in close-knit networks between ministries of economics and incumbent utilities (Geels, 2014; Kuzemko et al., 2016; Laird & Stefes, 2009). The political forces around the Green Party that disrupted these structures in Germany were absent in the majoritarian UK so that British energy policy was determined by the Conservative Party's approach of working with the incumbents and giving preference to cost-efficiency until

1997 (Mitchell, 2014).

In brief, the differences in political systems between Germany and the UK partially account for the respective continuation or disruption of the socio-technical system around carbon-based energy. As an unintended consequence of the more inclusive electoral system, German energy policy during the 1990s and early 2000s was rather shaped by the Green Party's "counterexperts" that came out of the environmental protests of the previous decades (Hager, 2015, p. 9). In contrast, British policy-making was mainly informed by conservative technocrats and the incumbent oligopoly until the end of the 1990s.

6.2. State Centralization

Turning to the second political institutional pillar under analysis, the German state is organized as a decentralized federation. Subnational governments are designed as relatively autonomous local councils with significant authority for policy-making. The underlying principle of local self-government that has been constitutionalized after World War II formally enables municipalities to levy taxes and control public services, including the local energy provision (Eckersley, 2017, pp. 157–158). Accordingly, many municipalities own local energy supply and generation businesses which enables them to influence the local rollout of national energy policy (Lockwood, 2015; Moss et al., 2015, p. 1547). The German constitution furthermore emphasizes extensive federal cooperation in the implementation of national policies, including financial resource-sharing across tiers of government as a means to ensuring equal living standards in all regions. With regards to the energy transition, municipalities have generally received financial support from other state bodies for the implementation of the national low-carbon energy agenda (Eckersley, 2017, p. 161). Occasionally, municipal administrations have used their regulatory autonomy to advance local renewable energy projects beyond the national agenda (Moss et al., 2015, p. 1550). These can be interpreted as occurrences of the 'California Effect'.

The privatization of the energy market in 1998 diversified its former natural monopoly, including the ownership over municipal and regional utilities. Some remained public, many of which increased their focus on renewables, while others were dissolved and acquired by the Big 4 (Bardt, 2017; Geels et al., 2016). However, since the 2000s there have been occasional efforts of re-municipalization that aim at reintroducing community participation in energy, for example in Berlin (Moss et al., 2015, p. 1552).

In contrast, the UK's unitary state apparatus centralizes the authority over policy-

making at the national level and grants subnational administrative units only limited influence in energy policy-making. Since the establishing of municipal and local political entities shortly after the industrial revolution, they have essentially served as "politically expedient agents" for the implementation of national policy (Eckersley, 2017, p. 153). Municipalities' powers and geographical boundaries are not entrenched in the constitution but are at the disposition of the government. For energy policy this implies a top-down policy framework, in which municipalities function as agents of the center with little autonomy (Eckersley, 2017, p. 161). This constellation arguably bears little potential for a transition-accelerating California Effect.

In Germany, the municipal control over local energy utilities furthermore provides local constituencies with an avenue for democratic influence on local energy provision. Case studies suggest that German local officials are more sensitive to their constituencies' energy policy preferences than their British counterparts (Eckersley, 2017, p. 162). The greater degree of democratic accountability synchronizes the pace of the transition with the preferences of the average local voter. This is likely to decrease the risk of public backlash against policy initiatives which in turn contributes to the long-term political sustainability of energy policies.

The policy autonomy of municipalities increases the number of veto players in the German energy system, which in theory makes it more susceptible to policy inertia (Stefes, 2010). However, the German cooperative variant of federalism instead ensures effectiveness through coordination and resource-sharing across different tiers of government.

In the centralized UK, municipalities offer less inclusion of local preferences in energy policy by institutional design (Eckersley, 2017, p. 162). In the British top-down approach to energy policy, decision-making is removed from the average voter (Geels, 2014; Mitchell, 2014). This leads to passivity on the energy issue among the electorate (Mitchell, 2014, p. 28), which likely contributes to maintaining the status quo energy regime.

Based on these considerations, the federalist system's relatively greater political inclusiveness partially explains the political sustainability of the *Energiewende* and the resulting progress of the German energy transition. In contrast, the UK's unitary state design implies top-down policy-making, which can be considered as relatively less transparent or inclusive.

It is important to point out that the relatively slower energy transition in Great Britain cannot fully be attributed to the centralized state apparatus. It was further hampered by the historical depoliticization of energy. Westminster devolved energy policy to "less obviously politicized arenas such as quasi-public or independent bodies" amid the energy sector's liberalization (Kuzemko, 2016, p. 112). The main regulator, the Office of Gas and Electricity Markets (Ofgem), was designed as a politically independent and technocratic agency for the sake

of long-term policy continuity, comparable to a central bank's role in monetary policy. Importantly, this technocratic depoliticization constitutes a de jure reduction of cabinet capacity for steering energy policy and accounts for some of the regulatory inertia in the British energy system (Lockwood, 2015; Mitchell, 2014). A key example for this is Ofgem's resistance to government demands for greater attention to sustainability when decarbonization gained political salience during the 2000s (Lockwood et al., 2017, p. 317). This stands in stark contrast with the German federal state, where regulatory power was not only retained in the national government, but even shifted to the more environmentally ambitious Ministry of the Environment. At the local level, German municipal administrations carry relatively greater political capacity to act as additional democratically accountable counterweights to corporate power in the energy regime.

Considering these aspects, the explanatory power of variations in state centralization depends in part on the historically contingent variations in state capacity for policy-making. The decentralization of energy under German federalism had a politically inclusive effect which fostered the challenge of the status quo, but the German administrative bodies also retained the political power necessary to accelerate the energy transition. The British centralized is somewhat less politically inclusive, but a great deal of policy inertia is attributable to the devolution of political capacity to Ofgem up until 2008. The 2008 Climate Change Act "promoted energy back up to Cabinet level" (Kern, Kuzemko, et al., 2014, p. 521) by reinstalling the Department of Energy and Climate Change with the mandate to deliver on the Act's specific energy goals. This re-politicization of energy correlates with an increase in the deployment of renewable energy, undergirding the relevance of state capacity next to state centralization.

6.3. Market Structure & Economic Paradigm

The different market structures that are embodied in Hall and Soskice's varieties of capitalism (2001) affect socio-technical systems because they co-determine the range of appropriate policy options available to accelerate socio-technical transitions, also known as policy paradigms (Lockwood, 2015, p. 29).

6.3.1. The accelerated energy transition under economic inclusiveness in Germany.

The German coordinated market economy generally allows for more active government intervention in the market (Lockwood, 2015, p. 21). In spite of the energy market's

liberalization in 1998, the German state has considerable weight in the energy sector (Evrard, 2012, p. 281). The more interventionist paradigm impacts the energy sector in various ways. First, the state can counterweight the oligopolistic market power of the Big 4. Second, the active coordination between industry and state allows for green industrial policy. Third, the German welfare state mitigates the public backlash against the social cost of the energy transition by cushioning the financial impact that renewable energy surcharges have on customers (Toke & Lauber, 2007). The above-mentioned feed-in tariff echoes the interventionist policy paradigm of a coordinated market economy.

The privatization of energy in 1998 shifted the German energy market a notch in the direction of a liberal market economy which gave rise to the Big 4, which today are among the largest energy companies in the world (Toke & Lauber, 2007, p. 683). Like the UK's utility oligopoly, these corporations control vast assets of power generation, transmission and marketing, which makes their lobby a strong veto player in the energy system (Stefes, 2010, p. 148). Due to their fixed assets in fossil energy and the initially low returns on investments in renewables, at first the Big 4 showed little interest in developing renewables. Instead, they countered the renewables niche's challenge through legal, political and commercial means throughout the 1990s and early 2000s (Laird & Stefes, 2009).

In spite of their counterefforts, the German incumbent oligopoly has been less successful in maintaining the fossil fuel regime than their British counterpart, which can mainly be attributed to the parallel emergence of a decentralized renewable electricity market. Even prior to privatization, the feed-in tariff fostered the entrance of large numbers of small-scale electricity producers into the market (Aklin & Urpelainen, 2018b, p. 155), thereby accelerating innovation in the energy sector. The knowledge and capital introduced by the newcomers is considered central to the German transformation process (Jacobsson & Lauber, 2006, p. 259).

In addition to municipal ownership of local energy utilities, the feed-in tariff has further diversified the ownership structure in the German energy production. Among the small-scale energy producers were mainly private actors such as "farmers supplying biomass or sites for wind farms, […] 'prosumers' operating their own solar systems, [and] cooperatives of residents interested in drawing local benefits from the *Energiewende*" (Moss et al., 2015, p. 1550). By the early 2000s, 340,000 Germans had invested around €12 billion in renewables (Sawin, 2012, p. 25). In spite of the increasing industrialization of renewable energy production, small-scale ownership has remained prevalent in renewably energy. In 2012, 46% of renewable energy sites were owned by noncorporate actors (Aklin & Urpelainen, 2018b, p. 155), whereas the Big 4 have developed rather few renewable energy facilities (Buchan, 2012, p. 10).

Small-scale decentralized ownership serves as an alternative vessel for renewable energy to develop an economic momentum, but it also has political benefits. Local opposition against onshore wind parks, for example, has widely been mitigated by turning potential opponents into stakeholders through community ownership (Aklin & Urpelainen, 2018b, p. 155), which links back to the issue of local participation in energy issues through municipalization discussed earlier. Overall, the inclusion of small-scale energy producers in Germany via the feed-in tariff seems to have considerably contributed to the acceleration of the transition process (Moss et al., 2015).

6.3.2. Economic exclusiveness and the maintenance of incumbent power in the UK.

Since the shift from the Keynesian to the neoliberal economic paradigm, the UK has been a prototypical liberal market economy, which is reflected in its laissez-fare approach to energy governance until the late 2000s. The liberalization of energy has had a much greater impact in the UK than in Germany. The scope for government regulation of energy was significantly curtailed in the 1990s. While the cabinet determined the broad direction of energy policy, its implementation was left to the Ofgem.

Ofgem, in turn, granted considerable freedom of action to the incumbent market actors (Kuzemko, 2016, p. 110). This delegation of energy governance to the market reduced civil service expertise and made the Ofgem and the government dependent on the technological know-how of private companies. As a consequence, regulatory processes were open to capture by corporate actors (Lockwood et al., 2017, p. 319; Mitchell, 2014, p. 27). The marketized depoliticization of energy constitutes a de facto reduction of government regulatory capacity, in addition to the de jure reduction through the technocratic depoliticization discussed earlier. As a consequence, the government's ability to deliberately accelerate the energy transition was significantly curtailed.

In theory, liberal market economies are perfectly economically inclusive due to the absence of entry barriers to the market. In the reality of the British energy market, however, incumbents have been upholding various entry barriers at the expense of new entrants.

Above all, the playing field is skewed by the oligopolistic market dominance of the Big 6 as a path dependent consequence of the original design of the industry at privatization (Kuzemko et al., 2016, p. 104; Mitchell, 2014, p. 5). Until the early 2010s, the Big 6 accounted for 98% of British energy supply (Mitchell, 2014, p. 5). The ownership structures are thus far more homogeneous than in the German energy system. Secondly, the close-knit and largely

informal networks between policy makers and incumbent utilities have also had economically exclusive effects on new actors trying to access the market (Geels, 2014; Kuzemko et al., 2016). Thirdly, imperfect information among consumers makes demand for fossil fuel-based electricity relatively inelastic. For example, the Big 6 are not required to disaggregate electricity bills to indicate different energy sources. This reduces the chances of new (renewables-based) suppliers to compete with incumbents over customers (Mitchell, 2014, p. 8).

The largest entry barrier, however, is the incumbents' quasi-regulatory power vested in their de-facto control over the British Energy Industry Code system (Codes). These Codes are "detailed multilateral agreements that define the terms under which participants can access [electricity] networks and operate in markets" (Mitchell, 2014, p. 14). They are designed to ensure stability in technology and investment, as well as economic efficiency in the market (Lockwood, Mitchell, Hoggett, & Kuzemko, 2015, p. 4). Since the introduction of the Codes at the privatization of the energy sector, the regulation of energy commerce has essentially been placed in the hands of the energy industry itself: The panels that govern Codes are dominated by the Big 6 because active engagement in them requires extensive technical expertise, resources and administrative capacity, which smaller new entrants lack (Lockwood et al., 2015, p. 12). Therefore, the incumbents are essentially free to "maintain their preferred rules" (Mitchell, 2014, p. 14), and prevent the emergence of competing technologies or actors (Lockwood et al., 2015, p. 9).

In spite of various reforms, a 2014 Ofgem report points out that the Code system limits innovation by excluding newcomers, and provides little incentive for change from within the energy regime (Lockwood et al., 2015, p. 15). A key example for the Codes' rigidity is the lack in legal representation of prosumers and small independent generators which stands in contrast with the German legal framework which accommodates different ownership structures more readily (Mitchell, 2014, p. 13; Yildiz, 2014, p. 678).

In brief, the governance of British energy has been largely "locked into a top-down, non-transparent system which favors incumbents and the status quo" by emphasizing economic exclusiveness (Mitchell, 2014, p. 16). This has arguably had detrimental effects on the creative destruction processes that carry a technological transition.

The "Thatcherite" paradigm in public service administration has informed the market-based design of the UK's main energy policy instrument, the 2003 Renewables Obligation (Kern, Kuzemko, et al., 2014; Toke, Breukers, & Wolsink, 2008). In contrast to the German protectionist feed-in tariff, the renewables obligation does not guarantee a fixed price for renewable energy, thereby increasing the risk associated with investing in renewable energy. On

the supply side, this financial risk allowed only large utilities with sufficient corporate assets to invest in renewables. However, they were unwilling to do so at scale amid their vested interest in maintaining the fossil-fuel regime. Furthermore, producers below a volume of 50 kW were excluded from the scheme (Toke & Lauber, 2007). Subsidies were thus exclusively accessible to large-scale utilities (Lockwood, 2015; Mitchell, 2008). Incumbent corporations without a link to the local society thus own 98% of onshore wind turbines (Lockwood et al., 2015, p. 12), which significantly reduced the acceptance of wind parks among local communities (Pollitt, 2010, p. 38; Szarka, 2006, p. 3056). Amid the low social acceptance of renewable energy, the 2010 conservative government has scaled back support for onshore wind (Aklin & Urpelainen, 2018a; Ćetković, Buzogány, & Schreurs, 2017). The exclusionary renewables obligation therefore caused negative policy feedback against renewable energy which stands in stark contrast to the positive policy feedback of the inclusionary feed-in tariff in Germany (Lockwood, 2015, p. 14).

The paradigm shift in British renewable energy policy after the 2008 Climate Change Act undergirds this point further. The Act's adjustments in the regime-level political institutions established a "strategic role for government" in the energy sector (Geels et al., 2016; Kern, Kuzemko, et al., 2014). The newly founded Department of Energy and Climate Change ramped up renewable energy subsidies and introduced a feed-in tariff for small-scale independent producers, which caused a boom in the deployment of solar-PV installations (Aklin & Urpelainen, 2018a; Kern, Kuzemko, et al., 2014). Between 2008 and 2012, the UK furthermore became the global frontrunner in the deployment of offshore wind capacities (Kern, Smith, et al., 2014, p. 638). Despite the austerity measures of more recent administrations, the overall shift away from market-based instruments towards interventionism can thus explain in large parts why the UK is increasingly catching up in in the energy transition since the late 2000s.

In light of these aspects, the pro-market policy paradigm of the British liberal market economy has had an indirect suspending effect on the acceleration of the energy transition until the late 2000s by informing the choice for the less economically inclusive and thereby less effective renewables obligation as the main policy instrument. Furthermore, the British energy market has maintained structural entry barriers against new (renewable) energy producers.

7. Conclusion

The analysis shows that the energy transition has progressed further in Germany than in the UK in part because more effective policies had been implemented at an earlier point in time.

The relatively more inclusive institutions of the German 'consensus political economy', helped facilitate this transition, thus lending support to both hypotheses.

First, PR political systems catalyze the manifestation of environmentalist preferences in the political arena through the inclusion of smaller green parties, which increases the political pressure for more disruptive renewable energy policies. Second, federalist state systems tend to be more inclusive of local socio-economic preferences than centralized state forms, which can foster positive policy feedback behind renewable energy initiatives. Third, compared with liberal market economies, energy markets in coordinated market economies are less prone to be captured by incumbent utility oligopolies and allow for a more active reduction of entry barriers through the government. Coordinated energy markets can thus be categorized as more economically inclusive, which facilitates the creative destruction processes that carry socio-technical transitions. In brief, inclusive institutions tend to yield better environmental outcomes in energy by (1) granting greater political access to green parties, (2) enhancing local participation in energy policy, and (3) reducing market entry barriers for new renewable energy producers.

These conclusions bear some important caveats. The positive effect of a PR political system in Germany is somewhat amplified by the widespread public support for environmentalist policies. Furthermore, the German cooperative variant of federalism mitigates the risk of policy inertia that is inherent to federal systems as a result of additional vertical veto players. In the UK, on the other hand, the de jure and de facto reduction of state capacity through technocratization and marketization of energy arguably exacerbated policy inertia as an additional obstacle besides the negative effects of the system's relatively lower responsiveness to local preferences.

These considerations imply that it would go too far to argue that more inclusive politico-economies institutions are a *sufficient condition* for faster energy transitions. However, the findings do indicate that institutional context factors work as *foundational mechanisms* that may facilitate or hamper the deliberate acceleration of energy transitions, as hypothesized by Lockwood et al (2017, p. 321).

The research design of this paper bears a few limitations. Above all, the reliance on secondary academic sources induces additional researcher bias. While this is not expected to significantly impair the quality of the results of this paper, the use of primary resources is recommended for future studies.

This study leaves some promising avenues for further research. The dichotomy of coordinated vs. liberal market economies is criticized for lacking differentiation (e.g. Ebbinghaus,

2016, p. 613). Therefore, the application of a more nuanced categorization of varieties of capitalism may contribute to a better understanding of the issue. Furthermore, other landscape-level institutions should be examined as well, such as the judicial branch of government.

For academia, the findings indicate that theories of political and economic inclusiveness are relevant not only to the study of underdevelopment, but also to sustainability transitions in industrialized states. Furthermore, this paper underscores the complementary value of historical institutionalist analysis to the Multi-Level Perspective in the study of technological transitions. Finally, the findings imply that there are significant variations in the political and economic inclusiveness within Acemoglu and Robinson's (2013) "inclusive" institutional setups to which both cases at hand belong in their view. This provides an avenue for further theory building towards a more nuanced understanding of institutional landscapes.

For policymakers, this study yields the recommendation that greater attention to a polity's wider institutional context may lead to more effective environmental policy making. As Meadowcroft (2011, p. 73) puts it: "behind policy there is always politics, and getting the politics right appears to be a prerequisite to getting the policies right".

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