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Regulating technological change—The strategic reactions of utility companies towards subsidy policies in the German, Spanish and UK electricity markets

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ABSTRACT

This paper focuses on how incumbent electric utilities strategically react to subsidy schemes supporting renewable energy technologies in the UK, Germany, and Spain. Firms coordinate the development of their technological capabilities and their political activities to shape their regulatory environment. Analysing the diffusion of wind power in these countries, we show that the different ways, in which firms coordinate their technological and political strategies, lead to very different market outcomes, both for the firms' market share and the size of the overall market. Although incumbents are usually seen as being resistant to change in energy systems, we show that Spanish utilities proactively drive the diffusion of wind power. We speculate about the relation between the ownership structure of the energy system and its inertia with respect to the integration of new technologies. We derive novel policy implications that explicitly take into account the strategic actions of incumbent firms shaping the technological and regulatory system.

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1. Introduction

There is an ongoing argument, both in the academic literature and among policy-makers, over the future evolution of the energy system and its long-run sustainability. This concerns at least two aspects: the issue of climate change (Stern, 2006) and the issue of security of energy supply (European Commission, 2002).

Governments have responded to this context with a variety of policy initiatives. The European Union has issued a directive on renewable energy with targets for an increased electricity production from renewable sources in each member country (European Commission, 2001). The UK government's own Energy White Paper (DTI, 2007) proposes an increase in the electricity supply from renewable energy sources to 20% in 2020. Similar initiatives have been initiated in other European countries, such as the German Renewable Energy Act or the Spanish Plan on Renewable Energy (Reiche, 2005).

However, renewable energy technologies (RETs) are characterised as being structurally 'disruptive' (Foxon et al., 2005) to conventional generation technologies, which makes the task of RET deployment a matter that goes beyond simple 'technology substitution' (Markard and Truffer, 2006).

In this context, the role of incumbent utility companies, who own large parts of the electricity supply structure in many European countries (European Commission, 2005), is of critical importance. In recent policy discussions, the market power of incumbents in European electricity markets is seen as a roadblock to further competition. Specifically, new market entry can only be fostered by technology competition between different new electricity generation options. This is seen as inhibited by "structural barriers in the market" resulting from the current industry structure (European Commission, 2005).

Although renewable energy technologies have been the fastest growing electricity generation technologies in recent years (Stenzel and Gül, 2006), their development and diffusion has often been seen as hindered by incumbent operators in European electricity markets (Jacobsson and Lauber, 2006; Johnson and Jacobsson, 2001). This follows a precedent from more established technologies such as nuclear power and combined-cycle gas turbines, which faced strong initial resistance from incumbent electric utility companies (Markard and Truffer, 2006).

However, empirical observations on the behaviour of incumbent utility companies in Europe provide a mixed picture. In some countries, they have actively attempted to block the introduction of new RETs, while in other countries they are among the leading investors in this area. Table 1 below outlines the position in Europe's two biggest markets, Germany and Spain, and in the UK in 2005.

Given the different responses of incumbent utility companies to the introduction of wind power, this paper seeks to answer two

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Table 1
Diffusion levels of wind power generation in the United Kingdom, Germany and Spain by the end of 2005

	United Kingdom	Germany	Spain
Total installed wind capacity (MW)	1337	18,428	10,028
Share of wind power in total electricity generation (%)	0.45	4.3	7.78
Total installed watts per capita	15	209	202
Largest capacity of big utility	RWE npower 395 MW	E.ON 224 MW	Iberdrola 3494 MW
Share of all utilities in wind energy (%)	81.45	1.16	58.35

Source: IEA (2006); own research.

questions: firstly, why the companies in each of the three countries ended up in such different positions with regard to their adoption of wind power technology, and secondly, to what extent their activities influenced the diffusion of wind power at the national level.

2. Analytical framework

Our empirical and theoretical motivation stems out of current discussions on the most efficient and effective policy framework to introduce renewable energy technologies into the market. The literature on the evolution of large technological systems (Hughes, 1983, 1987; Davies, 1996) frequently emphasises the effects of system inertia and the resulting resistance to change. In particular, incumbent utility companies in established energy systems are often characterised as hindering and obstructing the diffusion of renewable energy technologies (Jacobsson and Bergek, 2004; Jacobsson and Lauber, 2006). Yet, this framework does not account for different strategies among companies in the same industry population, leading to a "…tendency to treat regime transformation as a monolithic process dominated by rational action and neglecting important differences in context" (Smith et al., 2005, p. 1492). Hence, in order to account for the differential adoption paths of wind power in the three countries, a better understanding of the strategy-making process inside the incumbent utilities is required. The analytical framework used in this paper is informed by the strategic management literature, in particular the literature on dynamic capabilities of the firm and on corporate political activities.

The dynamic capabilities framework analyses how firm adapt their resources in environments of rapid technological change (Teece and Pisano, 1994; Teece et al., 1997). These resources and capabilities can be viewed as "bundles of tangible and intangible assets, including a firm's management skills, its organisational processes and routines, and the information and knowledge it controls" (Barney et al., 2001, p. 625). For this paper, we will focus on capabilities of firms as intangible abilities to use and combine tangible resources for the operations of the firm. Firms gain competitive advantages by controlling resources and develop capabilities that are valuable, rare, imperfectly imitable, and not substitutable (Barney et al., 2001).

Focusing on the diffusion of new technologies, we hold that firms adapt their resource base and capabilities by adopting new technologies in order to gain a competitive advantage (Geroski, 2000; Karshenas and Stoneman, 1995). A firm's current resource base, as well as its institutional environment influences its decision to adopt or not to adopt innovations (Abrahamson and Rosenkopf, 1993; Westphal et al., 1997). Consequently, firms can gain competitive advantage from actively shaping their institutional and regulatory environment to fit their resource base (Hillman et al., 2004, 1999). In effect, corporate political activity (CPA) is defined as "corporate attempts to shape government policy in ways favourable to the firm" (Baysinger, 1984). So, CPAs include all kinds of legal actions, but also lobbying towards regulators or legislators.

Table 2
A categorization of political management strategies with regard to internal adaptations of firms' resource bases and corporate political activities

		Corporate political activities	
		Influence	Compliance
Internal adaptation of resource base	Yes	Proactive strategy	Anticipatory strategy
	No	Defensive strategy	Reactive strategy

We build our analytical framework on Oliver and Holzinger's (2008) approach to integrate the dynamic capabilities framework with the literature on corporate political activities. The goal of Oliver and Holzinger's (2008) paper is to explore how and why firms drive institutional change. They categorise the multitude of different corporate political activities along the dichotomy of "compliance vs. influence". Political *compliance* strategies are defined here as firm-level actions undertaken in conformity with political requirements and expectations. Political *influence* strategies are firm-level actions undertaken for purposes of mobilising support for the firm's interests. While the above strategies are concerned with firms' behaviour towards their external environment, Oliver and Holzinger (2008) also categorise their internal strategies, asking whether a firm adapts its resource base or not.

From Oliver and Holzinger's (2008) categorisations of external and internal activities of firms, we derive four types of political management strategies: they can be defensive (external influence towards regulatory regime, no internal adaptation of resources), reactive (external compliance, no adaptation of resources) anticipatory (external compliance, internal adaptation), or proactive (external influence and internal adaptation). This is shown in Table 2 above.

Defensive political strategies are outward oriented and include lobbying to increase entry barriers to an industry or to actively advocate the status quo. Reactive strategies are focused on developments internal to the firm and include, for instance, the adoption of efficient pollution control processes to meet standards and the rapid realignment of structures. Anticipatory strategies are also internally focused. An example is to establish best practices in anticipation of public policy change. Proactive strategies are again outward oriented, examples are redefining constituents' norms or establishing standards that redefine current legislation.

In this paper, we use this framework to empirically explore firms' technology and political strategies in the wind power industry in three different institutional settings in the United Kingdom (UK), Germany and Spain. Given the importance of policy for the diffusion paths of wind power, we focus on the active role of the utilities in adopting this new technology to internally develop their resources and in influencing political processes external to the firm.

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