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Martin Huth:

Variations of Corporate Behavior in an Emerging Emissions Market: The Case of the EU ETS



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Dipl. Soz. Martin Huth was research fellow at the Centre for Globalisation and Governance at the University of Hamburg. From 2006 to 2009 he worked at the research project 'Emissions Trading Study – a cross-national comparison of company behavior in the European Emissions Trading Scheme' funded by the German Research Council (DFG EN 488). Martin Huth passed away in October 2010. This paper is thus published posthumously and reflects the state of Martins work and his input to the Emissions Trading Study.

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Abstract

The European Union's Emissions Trading Scheme (EU ETS) is the first international and mandatory system of considerable size compelling companies to develop carbon-oriented business strategies. The first three years of the EU ETS (2005-2007) can be perceived as a field trial on the advancement and diffusion of innovative "green management" and provides ample material both for scholarly debates as well as for the applied management discourse. The major objective of this paper is to shed light on the means by which companies engage in the EU ETS. The paper identifies influences and external factors that are responsible for the respective action strategies. The results indicate cross-national and sectoral variations concerning the adoption of the EU ETS and support institutional arguments of socially embedded economic actors.

Keywords: EU ETS, emissions trading, carbon management, Comparative Capitalism, institutional theory

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INTRODUCTION

Over the last decades New Environmental Policy Instruments (NEPI), such as eco-taxes and Voluntary Agreements, have been introduced as major innovations in programs of climate change mitigation. In particular, tradable permits for resource consumption have been widely disseminated in the context of market-based instruments. Markets for emissions rights seem to be the method of choice in the combat against climate change. The attractiveness of this instrument is apparent in its worldwide diffusion (Reinaud & Philibert 2007). Its appeal is mainly based on the assumption that the markets' balancing potential minimizes the welfare costs of CO₂ mitigation (FIELD 2000: 4; Capros & Mantzos 2000; Dales 2002; Bailey 2007). It is expected that emissions trading will boost technological competition (European Commission 2000:8) and stimulate economic growth (Anger & Oberndorfer 2008:13), under conditions of low administrative engagement (Dales 2002: 97). In the course of the expectation that carbon markets will become dominant instruments in the combat against climate change, cap-and-trade systems are destined to become an important part of "green management" and will challenge corporate decision-makers in Europe (today) and the US (in the near future).

By taking carbon markets as an instrument for climate change mitigation seriously, I want to draw attention to the various factors enabling, fostering and/or inhibiting companies on their way to the adoption of carbon markets, as exemplified by reactions to the regime in four selected countries under the EU ETS. The main research question is thus: What institutional preconditions are necessary to enable carbon markets to result in climate change mitigation? I will argue that country-specific economic and policy-specific conditions represent an important explanation of the variation of economic actions taken within the EU ETS. Specifically, I focus on corporate reactions to and activities within carbon markets to enhance and expand upon the current scholarly exchange on "green management" in the field of carbon markets. Special attention will be paid to the Comparative Capitalism literature, which postulates that one can conceptualize very different national economic conditions in terms of

countries' respective institutional environments. These institutions shape different economic rationalities, the coordination of economic transactions, innovation processes, and even the nature of the firm in any given country. Ultimately, these varieties of national institutional environments provide different institutional competitive advantages. Seen from a macro perspective, these advantages enhance economic growth.

The World Economic Global Competitiveness Index ranks Germany (7), the United Kingdom (12), Denmark (3) and the Netherlands (8) towards the top of its list of 130 countries (Porter & Schwab 2008). Assuming that a globalizing world leads to increasingly unified conditions for economic action, this ranking suggests that these four countries have similar economic conditions, which enabled them to maintain their positions on the list. However, as I will show, the economic conditions or types of capitalism in these countries are in decisive ways different. Their particular competitiveness stems from distinct institutional sources.

The European Emissions Trading Scheme (EU ETS) is the first international and mandatory system of considerable size compelling companies to develop carbon-oriented business strategies. Aside from the general critique of the underlying assumptions regarding the regime's effectiveness (e.g. Grubb, Azar & Persson 2005), the adoption of the EU ETS certainly caused serious uncertainty for the companies it affected. Participating in a market for carbon commodities is a demanding process for any organization, and presupposes particular modes of organizational decision-making. It is not to be expected that organizations automatically develop the necessary procedures for this process, such as price-monitoring, internal reference measures and trading routines before hand. It is first through their engagement in the exchange of carbon commodities that corporations establish this market. The particular ways in which single companies reacted to this new process consequently shaped the structure of the EU ETS itself, and continue to play an important role in determining its future effectiveness – thereby also determining the potential of the EU ETS for real climate change mitigation.¹

¹ For a general market overview see Convery, Ellerman & de Perthuis (2008), Kristensen & Sabel (1997), and Capoor & Ambrosi (2007).

A broad discussion of climate change policy, corporate sustainability and emissions trading is already well established (Kolk & Levy 2001; Hoffman & Ventresca 2002; Kolk & Hoffmann 2007; Christiansen & Wettestad 2003; Skjærseth & Wettestad 2008; Levy & Kolk 2002). In this paper, I seek to expand this discussion by introducing the perspective of the Comparative Capitalism literature to focus on specific institutional preconditions on the national level. Naturally, this paper cannot fill the gap in this area currently existent in academic debates, but aims instead to stimulate a discussion of the importance of national economic conditions for carbon management and climate change mitigation.²

This paper proceeds as follows: the next section develops the research question outlined above and makes use of economic sociology and political economy approaches to develop an understanding of how companies' actions in the EU ETS can be explained. I then outline national economic conditions and country-specific environmental policy traditions in light of these approaches in the second section. The section thereafter presents the research field, the study and the respective process of data acquisition. Theoretical expectations will be compared with empirical data of market participation in the fourth section. Finally, I will discuss the results and venture to take a look at how carbon markets may possibly effect developments in the future.

EMBEDDEDNESS AND COMPARATIVE CAPITALISM

In following, I present a theoretical framework in order to enable an understanding of economic action within the framework of the EU ETS. This understanding is facilitated by the literature of new economic sociology, political economy approaches and new institutionalism in organizational theory.

Corporate action in the new market for emission permits brings with it a high degree of uncertainty. Aside from internal questions like how to monitor emissions, account for permits

² See the contributions from Engels, Knoll & Huth (2008), Engels (2006) and Bailey & Rupp (2004).

or assess market developments, companies are also challenged by two more fundamental issues: how should they understand these new regulations and what are these certificates? Two central and idealized assumptions are possible: Either the EU ETS is perceived as a market with commodities like others, providing opportunities for profit, or it is perceived as an external regulation system that companies have to comply with.

The literature on new economic sociology provides important implications for situations like this one.³ The key question motivating this literature is how social norms, networks, cognitions and institutions reduce uncertainty and facilitate economic behavior and market participation (Fligstein 2001; Swedberg 2003; White 1981).⁴ A central concept of new economic sociology is embeddedness (Granovetter 1985, 2005; Fligstein 2001; Dobbin 1994), which stands for the depth of incorporation of the social, cultural, cognitive and institutional structures that shape economic action.⁵ Embeddedness provides expectations about the actions of other market participants, thus reducing uncertainty and enabling informed decision-making, in that actors believe they know what their competitors will do. To summarize, structures in which social actors such as companies are embedded, define appropriate behavior and offer orientation in an uncertain world. "These institutions... enable actors in markets to organize themselves, to compete and cooperate, and to exchange" (Fligstein 1996: 658, see Whitley 2007: 56).⁶

One of the most important sources of orientation in the course of problem solving is country-specific embeddedness. The use of national borders as units of analysis is appropriate and beneficial in cases like these, because the institutional precondition of maintaining stable

³ See instructively Swedberg (1997), Dobbin (2004), Smelser & Swedberg (2005), and the first issue of *Current Sociology* in 2007, Vol. 55, p. 1-143.

⁴ A common critique of institutional theory points out that the interpenetration of environmental institutions is over-estimated and that organizations are conceived as being totally determined in the approach. Early works of institutional scholars however, had already addressed this criticism, accentuating the role of internal goals and the relative power of organizations (Zucker 1988). Hence, I understand institutional environment as the guardrail for organizational behavior. It enables organizations rather than determining them. Moreover, the relationship between institutions and organizations is not a one-way-ticket (see the following remarks about BP and Shell).

⁵ For a differentiated perspective of the notion see Zukin & DiMaggio (1990).

⁶ The new economic sociology is subdivided into a number of several conceptions – I refer mainly to the work of Fligstein, who identifies property rights, governance structures, conceptions of control and rules of exchange as the necessary institutional conditions of markets (Fligstein 1996: 657).

markets are developed, legitimated and stabilized by agents' use of the policies within particular states (Fligstein 1996). I argue that even within the European Union, national institutional characteristics decisively shape corporate carbon strategies. Given the prospect of a worldwide expansion of carbon markets, it is essential we understand and identify the particular national conditions under which carbon markets would operate.

A broad literature on Comparative Capitalism (CC) highlights national differences in economic and social contextual settings. Basically, the CC approach distinguishes national economies according to the way in which economic action is coordinated. In doing so it makes use of the duality between contractual, short-term and market-based coordination on the one hand, and long-term and cooperation-based coordination of action on the other. For example, cooperation can be established by social networks (DiMaggio & Powell 1991), the state (Dobbin 1994), or associations (Streeck 1985). The CC literature traditionally compares liberal economies (e.g. USA, UK) with coordinated ones (e.g. continental Europe, Japan), using the following dimensions for their typology: financial systems, corporate governance patterns, industrial relations, systems of vocational training, work organizations, welfare provision, and innovation systems (Jackson & Deeg 2006). One can distinguish three general streams within the approach:

The influential work by Hall & Soskice (2001) dominates work labeled as the *Varieties of Capitalism* literature (Soskice 1999; Hall & Soskice 2001; Hall & Thelen 2009). The approach articulates two ideal-types of capitalism: the 'Liberal Market Economy' (LME) ideal-type as developed by and typical of the Anglo-Saxon countries like the United Kingdom, the USA and Australia, and the 'Coordinated Market Economies' (CME) type, which can be found in Germany, France and Japan. According to the Varieties of Capitalism perspective, both types of capitalism are structured by specific patterns of institution, particularly visible in the systems of financing, industrial relations, the education and vocational systems and patterns of inter-firm relations.

The second perspective – the *Governance Approach* – shifts the focus from rational, strategic choices within institutional settings towards the role of social norms of

appropriateness (Jackson & Deeg 2006). As one part of this perspective, the concept of “Social Systems of Production” (Hollingsworth & Boyer 1997) addresses the spatial dimension of embeddedness and the contextual and historical dependency of production schemes. The work of Crouch and Streeck (1997) consists of a range of single national case studies, which stress the singularity of each nation's course of economic development, as well as a wide range of institutional mechanisms (market, hierarchy, network and state).⁷

Thirdly, a more complex and holistic conception known as “*National Business Systems*” is developed by Whitley (Whitley 1992; Whitley & Kristensen 1996; Whitley & Kristensen 1997; Whitley 1999; Whitley 2007). He develops six Business Systems, which he defines as “distinctive patterns of economic organization that vary in their degree and mode of authoritative coordination of economic activities, and in the organization of, and interconnections between, owners, managers, experts, and other employees.” (Whitley 1999: 33)⁸ Whitley adds an understanding of power, authority, and trust to the CC literature, or in other words he adds the political dimension. The central advantage of his conception is the acceptance of diversity within national economic settings. Against assumptions of institutional isomorphism (DiMaggio & Powell 1983), and the dysfunction of heterogenic firm patterns within one type of capitalism (Aoki 1990; Hall & Soskice 2001); heterogeneity is for Whitley not dysfunctional but rather the source of change (Amable & Palombarini 2009).

Taking into account *socially constructed* Business Systems and economic actors, Whitley's work has a number of important implications. The first is that one has to connect the rationality of efficient management practices with the contexts in which they become

⁷ There are several other conceptions of CC in circulation. Amable (2003) and Amable and Palombarini (2008) for example, combines strategic action with the institutional embeddedness of organizations. They further addresses the political dimension of institutional contexts, as well as their development and impact. See also Schmidt (2002) and Esping-Andersen (1990). Ebbinghaus and Manow (2001) concentrate on the structure of welfare systems in different types of capitalism. Griffiths (2005) presents a two-dimensional conception which includes sectoral specific internal capabilities, and Aguilera and Jackson (2003) point at management ideologies and careers as important factors for understanding governance systems. All these scholars tend to constrain their work to the variation of capitalisms in Western societies. For a focus on Asia see Biggart, Hamilton & Orrù (1997) and Aoki (2001). Nevertheless, developing or non-developed countries are not widely considered in the debate.

⁸ In addition, Whitley introduces ideal-types of states and innovation systems. The latter can be understood as a connecting structure between dominant institutions, the Business System and the organizational level (Amable & Palombarini 2008), which is in turn represented by organizational capabilities (Dosi 1995; Teece 1994).

apparent (see Granovetter 1985; Fligstein 1996). Whitley considers a variety of institutional environments which contradict a single central economic rationality (Whitley 2004). As a result, efficiency cannot be seen as a *universal* economic logic, but rather a reflection of this variety. Whitley pronounces that the variety of contexts of 'doing business' are reflected by the different perceptions of efficient management structures and practices (Whitley 2004: 164). Secondly, because the particular structures of capitalism promote respective forms of economic competition (Whitley 2004: 164), market structures differ as well. The mode of economic success, of corporate goals, of organizational structuring, of coordination and control, and therefore of strategic choices are all part of specific *Business Recipes* or *Systems* (Whitley 1992; 2004), reflecting the dominant contextual institutions.

To sum up, the CC literature claims that different institutional settings and their inherent logics of appropriate and reasonable action provide opportunities for particular competitive advantages. The Anglo-Saxon model of capitalism is broadly seen as more feasible in a world of economic globalization. As a result, the literature states a general convergence towards this model. Like Whitley, I am skeptical about this assumption. History shows that there is no one single appropriate way of organizing business (see for the Danish case Campbell, Hall & Petersen 2006). The rediscovery of an interventionist state in times of financial and economic crisis, even as currently in Anglo-Saxon countries, further challenges this assumption.⁹ What nevertheless becomes apparent in the CC literature is the importance of particular institutional settings for the type and degree of competitiveness and performance on the firm and country level (Soskice 1999; Hall & Soskice 2001; Campbell, Hall & Petersen 2006). Most importantly, different types of capitalism foster different forms of innovation and therefore advance processes of adaptation to new corporate challenges (Whitley 2000).

Before continuing, I would like to draw the reader's attention to the field of carbon markets and raise the question of whether institutional comparative advantages may exist for this new arena of economic action too. In terms of carbon markets, one could speculate that the

⁹ Recently, Whitley (2009) made a similar argument with respect to the US economic model.

means of management for emissions commodities – how they are assessed and executed – is dependent on national environments, because important national institutions enable and foster specific strategic choices. I expect that due to different institutional contexts emissions trading activities will vary decisively between countries. Labor markets serve as an example: Flexible labor market structures facilitate the hiring of specialized financial markets experts, who can manage carbon commodities. In contrast, a less flexible labor market perhaps prevents companies from becoming involved in new employment commitments. The following lack of specialized knowledge might then reduce the level of market participation. I will discuss these assumptions in more detail in the next section.

WHICH TYPES OF NATIONAL ECONOMIC AND ENVIRONMENTAL POLICY PATTERNS CAN BE DETECTED?

In order to present the different institutional contexts, the next section briefly investigates the general economic institutional settings of Germany, the United Kingdom, the Netherlands, and Denmark. According to the CC literature, the role of the state is likely of importance (Schmidt 2002; Amable 2003; Whitley 2005, 2007).¹⁰ Therefore, it is possible that environmental policy structures stand out as an additional institutional influence and can be understood as a representation of the role of the state in each country's specific institutional setting. The history of the four selected countries' varying environmental and emissions trading policies are thus included in the discussion.¹¹

How different are national economic settings?

Despite the previous references to the CC literature, a complete description of either the distinct Varieties of Capitalism or of Business Systems lies beyond the scope of this paper.

¹⁰ Similar arguments are made from a institutionalistic perspective by Streeck & Philippe (1985). The influence of states is also discussed under the term "regulative pillar" of institutions (Scott 1995).

¹¹ For a detailed discussion of these national patterns of institutional learning see Engels, Knoll & Huth (2008). Bailey & Rupp (2004) and Bailey (2007) provide an intensive presentation of national environmental policy traditions.

Therefore the work here is limited to concentrating only on the most remarkable differences between the countries in the sample.

In cross-national comparison, Germany and the United Kingdom are considered to be at opposite extremes on the array of national institutional settings developed in the CC literature (Vitols 2001; Lane & Bachmann 1996). The former is often understood as the prototype for Coordinated Market Economies and the latter as a prototype for Liberal Market Economies (Hall & Soskice 2001). In Germany, the level of ownership concentration is high and corporate control is consequently intensive. German firms are highly concentrated, diversified, centralized and vertically integrated. In contrast, the ownership structure of British firms is spread over more and different shareholders, which implies weaker corporate control (Lane 1992). As a result of the ownership structure, corporate risk in Germany is pooled by means of cross-shareholding and intensive relations to suppliers, customers, and other producers, whereas in the United Kingdom risk is spread between a variety of shareholders (Lane & Bachmann 1996). Consequently, German relations between firms rely more heavily on trust and risk sharing (Bachmann 2001).

Another sharp structural difference between these two extremes concerns the role of small and medium-sized companies (SME). In Germany, smaller firms play an important role in the area of jobs, growth and inventiveness (artisan and medium-sized business). Due to competitive pressure favoring consolidation, the portion of British SME's is relatively low (Lane & Bachmann 1996). Whereas in Germany corporate financing is based mainly on credits, and is therefore oriented towards the long-term, companies in the United Kingdom raise money generally through direct capital market presence, which leads to rather short-term planning periods (Lane 1992; Schröder & Schrader 1998). Further sharp differences apply to the role of trade unions and associations. Inter-firm networks in Germany are not based on direct or personal connections, but rest on strongly institutionalized relations to business association, which exhibit intensive and proactive undertakings aimed to protect their members' interests. In the United Kingdom, the role of association is rather weak – they act more defensively (Lane 1992). The labor markets in each state represent another source

of significant contrast. The German labor system is institutionalized to a high degree and stabilized by well established routines of discourse. Industry associations and unions struggle in self-organized groups independently of state intervention (Lane 1992). In contrast to these high-level German (sectoral) agreements, collective bargaining in the United Kingdom is carried out at the level of individual plants and firms (Eurofound 2007), which ultimately means that state influence plays a much more important role in the United Kingdom (Lane 1992). One can characterize the German model as inclusive, institutionalized and influential (i.e. companies are influential) and the British system as fragmented, isolated and non-influential (i.e. companies are not influential). The most exceptional feature of the German educational system is the dual system of vocational training combining theoretical school-based and practical firm-based inputs. Education is focused on specific professional skills which are defined by national standards and monitored by industrial chambers (Thelen 2007). In the United Kingdom, education tends rather to focus on training generalists or practitioners, with social skills being more highly estimated in recruitment processes than formal qualifications (Lane 1997; see also Crouch 1999). To sum up, German companies function in a strongly institutionalized system of cooperation, this allows for a long-term orientation and risk sharing (Lane 1992). Corporate action in the United Kingdom is structured mainly by market-based contracts. This institutional environment hinders long-term thinking and cooperation (Whitley 2000). In this light then, British enterprises remain institutionally isolated and can be conceptualized as "highly atomized economic actors" (Lane 1997: 66).

Denmark and the Netherlands, as small, open (Katzenstein 2006) and negotiated economies (Nielsen & Pedersen 1991) show elements of both types of economies. Most importantly, though, they have also developed distinctive national characteristics.

The *Danish economy* is often described as a "small holder economy" (Kristensen & Sabel 1997) where strong and close-knit local networks provide orientation and support for companies (Stokman, Ziegler & Scott 1985). Coordination in the Danish economy is based on this institutional feature rather than on dominant industrial associations or strong universal

banks (Kristensen & Sabel 1997). As a result, co-operative structures and a rural banking system (e.g. saving banks) play a remarkably important role. In the Danish vocational system, workers are typically well trained and spend more time in successive training programs than in any other EU country (reflecting the concept of 'lifelong education'). This emphasis on continuing training improves flexibility and innovation even on the shop-floor, allowing companies to incorporate new technologies quickly, and leading to a continuous improvement of the production process (Campbell & Pedersen 2007). As the World Economic Forum states, the labor market in Denmark is one of the most flexible and efficient in the world (Porter & Schwab 2008). This feature mainly stems from the market's dual structure, called "flexicurity" (Madsen 2006, Madsen 2002). The barriers to hire and fire are very low in Denmark, but social system programs absorb unemployment disadvantages rapidly and effectively, in particular by means of further vocational training schemes (Campbell & Pedersen 2007; Kristensen & Sabel 1997).

Altogether, Denmark's "negotiated economy" (Amin & Thomas 1996; Nielsen & Pedersen 1991; Pedersen 2006) entails aspects of both liberal markets and coordinated markets.¹² The cooperative aspect is based on direct corporate relations on a local level rather than on formalized associations on the national level (Jamison & Baark 1999). In the CME-LME dichotomy, Denmark can be classified as some kind of hybrid form combining CME and LME elements (Campbell & Pedersen 2007). CME practices are complemented with LME characteristics. Agents are exposed to market mechanisms, and both collective learning and decision-making are decentralized (Campbell & Pedersen 2007). Kristensen supports the observed decentralization by stating that: "[...] it becomes quite difficult to import rationalities from a major part of the social fabric in order to legitimize authority. Management strategies become less self-evident and legitimate when they cannot be prescribed by a greater social context or be legitimized through a general discourse penetrating also institutions outside the firm." (Kristensen 1996: 145) He also points to the role of communities in supporting,

¹² Campbell and Pedersen describe the Danish mode of negotiation as an "institutionalized strategic collaboration between various actors... – a discovery process... about costs and opportunities..." (Campbell & Pedersen 2007: 323).

legitimizing or interfering with entrepreneurial activities. The local level and its close networks serve as the source of economic orientation in Denmark. They compensate for what has been labeled the “naked firm” (Kristensen 1996: 152) as a typical Danish institutional feature. The Netherlands stands out as an exception due to the “polder model” (Schreuder 2001; Visser & Hemerijck 1998), which incorporates both market orientation and “prevalent management practice of consensual decision-making” (van Iterson & Olie 1992: 112). The main feature of this model is the tradition of carrying out agreements between governmental bodies and other stakeholders like companies, associations, trade unions, and NGOs. The aim of these agreements is to try and minimize state regulation through consensual action (Klaver & Ypma 2006). This convention of compromise also operates within Dutch management styles (van Iterson 1997). Interlocking directorates constitute a specific form of intermediates, enabling information sharing and stability between Dutch companies (van Iterson & Olie 1992). However, vertical and horizontal integration of corporate activities in the Netherlands are rather instable and oriented towards short-term goals (van Iterson & Olie 1992). This reflects the overall structure of the economy, where an astonishing number of very small companies provide contrast to a very small number of big multinational corporations. An elaborated SME sector like Germany’s does not exist (van Iterson 1997). Nevertheless, the World Economic Forum points out that the driver of Dutch competitiveness is mainly the ability of Dutch companies to aggressively absorb new technologies (Porter & Schwab 2008). In summary, one can identify distinctive national patterns among institutional political- economic conditions.¹³ Table one summarizes the selected countries according to these characteristics using a classification employed by several CC authors. Finally, I conclude with an assumption about the differing degrees of institutional preparedness for emissions trading in the four countries. This assumption reflects the comparative institutional advantages for firms within the countries to be studied in the context of the EU ETS.

¹³ In the last 15 years, these setting shifted clearly in the direction of a more liberal economy. Exemplarily, the flexibility of the labor market in Denmark and the Netherlands increased dramatically (Ganßmann & Haas 2001). A detailed overview of the developments can be found in Panescue & Schneider (2004). For the respective changes in German and a discussion about the hybridisation of the German capitalism see Beyer (2003).

Table 7: Type of capitalisms by country

	Germany	United Kingdom	Denmark	Netherlands	
Country labels	“Social market economy”	“Laissez-faire economy”	“Small-holder economy”	“Polder-model economy”	
Varieties of Capitalism	CME (industry-based) „Managed capitalism“	LME „Market capitalism“	Rather CME Rather „managed capitalism“	Rather LME Rather „managed capitalism“	Hall & Soskice 2001 Schmidt 2000, 2002
Business Systems	Highly coordinated	Financial conglomerate	Coordinated industrial district	Fragmented	Whitley 1992; Whitley & Kristensen 1997; Whitley 2007
Social system of production (SSP)	Diversified quality mass social system of production	Social system of standardized mass production	Social system of flexible specialization production	Diversified quality mass social system of production	Streeck 1992; Hollingsworth & Boyer 1997
Social systems of innovation and production (SSIP)	Social democratic and public SSIP	Market-based SSIP	Social democratic and meso-corporatist SSIP	Social democratic and meso-corporatist SSIP	Amable 2000, 2003
Governance systems	Corporate or joint Governance	Corporate Governance	Joint Governance	State Governance	Griffiths 2005
Institutional preparation for market-based instruments	Low	High	Medium	Considerable	

Given the distinct institutional settings between these four countries, I posit that the different institutional characteristics in each country lead to different levels of preparedness for the EU ETS, and finally to varying economic behavior in the new market for carbon commodities (see Engels, Knoll & Huth 2008). The following assumptions elaborate this presumption in detail.

Assumption (1) A strong capital-market orientation, as in the United Kingdom, fosters firms' ability to deal in price signals and manage virtual transactions. The market incentive feature of the EU ETS might also be more commonplace for them.

Assumption (2) A more flexible labor market helps British, Danish and Dutch companies to hire experts in emissions trading much more quickly than German firms, leading in turn to higher levels of participation in the market.

Assumption (3) Well-established and direct relations between firms foster the diffusion of new knowledge and management practices in the trading of emissions, and thus advance companies' EU ETS participation in Denmark and the Netherlands.

All in all, I conclude that the institutional setting in the United Kingdom matches the market-based characteristics of the EU ETS much better than the conditions in Germany. I assume that due to this explicit economic setting, German companies need more time to adapt to the EU ETS. I expect that German companies will prove to have engaged in fewer emissions trading activities than firms from the United Kingdom. Because Danish companies can rely on the special network pattern of coordination, which possibly offers alternative trading channels, I likewise expect more emissions trading activities in Denmark than Germany. For Dutch companies, a comparable assumption is plausible.

Do environmental policies differ between the four countries?

Distinct environmental policy traditions could have additional influence on participation in a CO₂-market configuration, depending on national levels of regulation.¹⁴ Bailey makes a strong argument that there is a connection between general policy traditions, carbon market legislation and respective reactions among corporations (Bailey 2007). He states that the

¹⁴ See Wurzel (2002) for an instructive overview on of policy in Germany and the United Kingdom.

consistency of carbon legislation with existing policy styles is "a major determinant of industry acceptance of market environmentalism" (Bailey 2007: 544). While the introduction of the EU ETS broke in its beginnings with the history of environmental regulation in the EU in general (Ellerman & Buchner 2007: 71), it came to affect different countries at different stages, and this variation was likely contingent upon the new policy's consistency with previous policy.

Bailey describes the general environmental policy legislation in Germany as "a legalistic, corporatist, and consensual policy culture that has historically been conservative toward NEPI experimentation" (Bailey 2007: 537). Voluntary Agreements have traditionally been the dominant instrument, establishing self-regulated regulation (Walz & Betz 2003: 3; Bailey 2007: 537). Moreover, powerful industrial lobbies and the prevailing orientation towards the Best Available Technology (BAT) stabilized Germany's command-and-control policy style (Wurzel, Jordan, Zito & Brückner 2003). With the EU ETS, domestic authorities did not take a proactive position. On the contrary, the German government rather tried to encumber its implementation (Schafhausen 2006). Nor did industrial associations prepare their members for the prospect of a European permit market (Santarius & Ott 2002). Rather, they were engaged in strong opposition to the market-scheme, and thus tried to influence the allocation rules for allowances in a favorable way. As a result of both of these factors, the regulatory tradition as well as industrial opposition, the first German Allocation Plan contained a number of special rules that led to regulatory complexity and uncertainty for the affected companies. Consequently, I anticipate the data will show the reluctant participation of German companies in the EU ETS.

In general, the environmental policy style in the *United Kingdom* can be characterized as informal, flexible and pragmatic (Bailey 2007: 534). The major innovations, such as emissions trading, maintain or even foster flexibility and pragmatism (Bailey 2007: 536). The price of this flexibility is a significant complexity within the environmental regulation mix

(Sorrell 2002; Walz & Betz 2003).¹⁵ The process of market-based instruments' implementation was strongly facilitated by industrial actors (Pulver 2007). British Petroleum (BP), for example, took a forerunner position on this topic by establishing an internal permits trading system and promoting a dialogue with policy-makers (Akhurst, Morgheim & Lewis 2003; Viktor & House 2004; Missfeldt & Requate 2001). Consistent with Whitley's arguments discussed above, the broad support for market-based instruments by industry "did not deliver on their economic interests, but... did satisfy a range of symbolic motives in specific legislative... contexts" (Nye & Owens 2008: 2). In summary, domestic policy styles can be expected to be consistent with the national implementation of the EU ETS. The traditional mode of environmental regulations in the United Kingdom led to experiences prior to the EU ETS that gave British authorities and companies a first mover advantage in comparison to countries that had not previously had such regulations. Therefore, I expect broader participation among British companies in the EU ETS, although complex interaction with other NEPI could act as a counterbalancing force.

Denmark's environmental policy has generally been deemed to be pro-active and innovative (Jamison & Baark 1999). It utilized and fostered market mechanisms and business interests to promote energy-saving technologies from early on. In addition, responsibilities were centralized in the Ministry of Environment and Energy in order to integrate policies and support cooperation with important economic actors (Jamison & Baark 1999). One instructive example is the energy market in Denmark, which is characterized by three of its main features: The expansion of Combined Heat and Power (CHP) plants, the exceptional decentralization of electricity and heat generation due to strong market liberalization (Pedersen 2000), and most importantly the dominant role of municipal actors. The generation, transmission and distribution of electricity are furthermore separated by law, as

¹⁵ The UK Climate Change Program consisted of the Climate Change Levy (CCL), the Climate Change Agreements (CCA) and the UK ETS (Nye & Owens 2008). To some extent, these mechanisms are linked to the EU ETS and obligations can be transferred between the schemes. They offer or force firms to choose between different carbon strategies.

per the Electricity Supply Bill.¹⁶ Denmark also enjoys a leading role in its CO₂-mitigation policies. In 1993, a CO₂ tax was implemented in the form of taxes on energy (Missfeldt & Requate 2001). That was followed in 2001 by a CO₂ quota bill (Pedersen 2000) which established an initial emissions trading system in 2003. Although this carbon market was not designed in line with the Kyoto Protocol, and thus in accordance with the future EU ETS, its basic structure now serves as the foundation of Denmark's EU ETS policies (Missfeldt & Requate 2001). Due to this system and the Danish tax system, environmental policy in Denmark is extremely complex (Missfeldt & Requate 2001). Given the fact that international emissions trading was promoted by the government and business sector, due to their experience with carbon markets prior to the EU ETS and because of the fundamentally supportive institutional context (Engels, Knoll & Huth 2008), one would predict a pro-active participation among Danish companies in the EU ETS.

Dutch environmental policy excels in its strong advocacy of international climate change negotiations and the domestic integration of environmental and economic interests by means of its strong involvement of economic stakeholders (Keijzers 2000, Minnesma 2003).¹⁷ This policy tradition has shown increasing flexibility, and favors market-based instruments. Since the first National Environmental Policy Plans (NEPP) recognized climate change as a threat to national and global wealth in 1989, the Netherlands has bolstered domestic and international efforts to mitigate climate change (Sijm 2005; Kanie 2003). Examples include frequent governmental involvement in Joint Implementation and Clean Development Mechanism projects and an NO_x trading scheme launched in 2005. Due to strong public support and close cooperation between social groups, government and corporations, this family of Dutch environmental policies is labeled the "green polder model" (Kanie 2003:

¹⁶ The generation is dominated by one entity but complemented by a remarkable number of small-scale decentralized CHP plants. Since 2005, the government owns 100% of the Danish high-voltage electricity transmission network as well as the domestic natural gas distribution network (Energinet.dk). Distribution companies have been under public control since 2006 and are often owned by municipalities (The Electricity Supply Bill Act no. 375 of 2 June 1999; Consolidation of the Act on Electricity Supply No. 286, 20. April 2005).

¹⁷ See Kanie (2003) for a description of the relationship between domestic environmental policy in the Netherlands and the perseverance of international negotiations.

347).¹⁸ Like BP in the United Kingdom, Royal Dutch Shell took a pro-active position in favor of market-based emissions schemes, first by establishing an internal carbon market and second by getting involved in the emissions trading policy debate (Carpenter 2001). Overall, Dutch environmental policy can be expected to endorse companies' participation in the EU ETS. Thus, it is likely that Dutch firms are active participants in the regime.

Another indicator of the institutionalized preparation of Dutch companies for the EU ETS is reflected in the national diffusion of Environmental Management Systems (EMS).¹⁹ If one of these schemes is well established in a country, one can assume that companies are used to monitoring emissions and are able to easily integrate this information into management decisions. This is essential for decisions within the EU ETS. Table two summarizes two important EMS schemes.²⁰

¹⁸ CDM (Clean Development Mechanism) and JI (Joint Implementation) refer to instruments that reduce emissions in foreign countries and ascribe value to the carbon amount domestically. Both certificates are in some extent compatible with the EU ETS (EU Directive 2004/101/EC). SenterNovem, for example, on behalf of the Dutch government purchased CDM and JI project certificates for 17.4 million tons of CO₂ equivalents (see <http://www.senternovem.nl/carboncredits>).

¹⁹ The results of 16 corporate case studies conducted by Lisa Knoll within the research project that I mentioned above in the section on methods, pointed strongly towards the importance of EMS as a preparation for the EU ETS.

²⁰ The numbers for the Netherlands are misleading. Since 2002, each company under the Dutch Benchmarking Covenant on energy efficiency reports its energy efficiency status and CO₂ measures. In light of the broad coverage of this industrial-governmental agreement, one can expect that Dutch companies have installed EMS and developed knowledge and routines which prepared them quite well for the EU ETS.

Table 8: Diffusion of Environmental Management Systems

	ISO 14001:2000		EMAS	
	Certifications per 10k enterprises		Organizations per 10k enterprises	
	1999-2004	2005-2007	1999-2004	2005-2007
Germany	11.35	17.55	8.52	5.11
United Kingdom	19.39	30.69	0.40	0.33
Denmark	29.64	45.80	7.17	5.39
Netherlands	16.36	17.40	0.46	0.25
Mean EU-22	11.08	22.05	1.53	1.32

Source: ISO Survey 2003/2005/2008, EMAS Helpdesk, Eurostat, missing values for number of enterprises interpolated with GDP-PPP increase or decrease per inhabitants, reference year 2005; ISO report membership per certification (one organisation could hold multiple certifications) and EMAS reports per organization

The ISO 14000 family of standards, and in particular the 14001 standard itself, define an environmental management system that basically seeks to minimize negative ecological effects and improve the environmental performance of organizations. The ISO 14001 standard is the most commonplace standard, exhibiting a remarkable diffusion worldwide (Albuquerque, Bronnenberg & Corbett 2007).²¹ Table 8 contains participation rates as a proxy in terms of certifications per country, year, and 10,000 enterprises.²² The data for the United Kingdom and Denmark indicates that in both countries, ISO 14001 certificates were used more often than the European average during the preparation for and in the course of the first three years of the EU ETS.²³ I conclude that environmental policy traditions in the United Kingdom and Denmark facilitated the implementation of these instruments, and that

²¹ For further information visit www.iso.org.

²² The data is presented as the means of two time periods. The first range, from 2000-2004, covers a period which can be seen as a preparatory phase for the EU ETS, and 2005-2007 was the first actual EU ETS allocation period.

²³ In other words, the annual number of ISO 14001 certificates issued each year in the two countries surpassed the average number of certificates among all EU Member States.

they can be understood as an institutionally promoted and preparatory action pattern. In contrast, results suggest that ISO 14001 is rather seldom used in Germany. This supports my German policy description above, which identifies a conservative position towards NEPIs like the ISO scheme.

The EU Eco-Management and Audit Scheme (EMAS) is a similar environmental management and certification tool.²⁴ Table 8 contains participation rates as a proxy in terms of participating organizations per country, year, and 10,000 enterprises. In general, it shows minor and decreasing participation rates in comparison with ISO 14001, which can be explained by the fact that EMAS has both a lower level of international recognition and higher implementation costs (Wätzold, Bültmann, Eames, Lulofs & Schucht 2001). The higher rates of EMAS adoption in Germany might be a result of stronger support by the authorities, who granted considerable regulatory relief to companies which implemented EMAS (Wätzold, Bültmann, Eames, Lulofs & Schucht 2001). Once again, the data indicates a distinctly higher rate of adoption among Danish companies, which points to their general above-average engagement in EMAS.

The next table, table 3, summarizes the respective environmental policy traditions. In addition, it presents some general national measures by country regarding the EU ETS.

²⁴ For further information see the official EMAS website of the European Commission http://ec.europa.eu/environment/emas/index_en.htm.

Table 9: Environmental policies

		Germany	United Kingdom	Denmark	Netherlands
Overall environmental policy style		Regulated self-regulation	Flexible and pragmatic	Pro-active	Consensual and pro-active, "green polder model"
Complexity of environmental policy		Medium	High	High	Considerable
NEPI	Taxes	„Eco tax“	CCL	Energy tax	
	ETS		UK ETS	CO ₂ quota bill	NOx ETS
	Agreements	„Selbstverpflichtung“ = Voluntary Agreements	CCA		Covenants
Degree of EMS usage		Low	Considerable	High	Considerable
Experience with CO ₂ monitoring and reporting		Low	High	High	Considerable
EU ETS	Kyoto target*	-21%	-12,5%	-6%	-21%
	Distance-to-target **	-2.8%	-5.8%	+7.9%	-0.7%
	No. of installations*	1,849	674	380	205
	ET budget per year 2005-2007*	499.0 Mt	245.4 Mt	33.5 Mt	95.3 Mt
	Allocated ET budget***	495.6 Mt	206.0 Mt	32.7 Mt	86.4 Mt
	Net position***	+5.0%	-17.4%	+7.0%	9.2%
Preparation for EU ETS by environmental policy traditions		Low	High	Considerable	Considerable

Sources: *Besser et al. 2005 **European Environment Agency 2006 (incl. Kyoto mechanism and carbon sinks). ***Kristensen 1997; mean 2005-2006; describes the net difference between allocated and verified emissions; plus means in general more allowances than emissions (surplus) and minus the opposite (demand).

I would like to draw the reader's attention to the net position of allowances, which stands for the government's willingness to cut emissions substantially via the EU ETS. The table

illustrates how the described environmental policy traditions, as an expression of the different states' roles, prepare countries for the EU ETS in various ways. I expect that Germany was the least prepared, followed by Denmark and the Netherlands. Finally, British companies should have been the best prepared. In light of these characterizations, a number of further assumptions are possible:

Assumption (4) The overall environmental policy traditions and the support of the EU ETS by companies, industry association, and other social partners promote a generally favorable attitude towards the EU ETS.

Assumption (5) The experience with EU ETS predecessors and the EMS facilitated knowledge and routines among companies within the United Kingdom, Denmark and the Netherlands. Firms can refer to this experience in making decisions within the EU ETS.

Assumption (6) The aforementioned experience also led to the implementation of infrastructure and best practices within governmental bodies. A more intense and effective collaboration between governmental bodies and firms can be assumed, given that experience, which would in turn lead to higher levels of participation in the market.

Hypotheses

Whitley argues that National Business Systems (Whitley 1992) shape economic action on a national level in a decisive manner. In line with this argument, I expect country-specific differences regarding degrees of participation on the carbon market (see Engels, Knoll & Huth 2008). In line with the theoretical arguments of different economic conditions, environmental policies and the six assumptions developed above, I deduce two hypotheses:

H1: German companies are more reluctant to trade with emissions allowances under the EU ETS than companies from the United Kingdom, Denmark, or the Netherlands.

H2: British companies more actively trade with emissions allowances in the EU ETS than companies from Germany, Denmark, or the Netherlands.

The specific sectoral embeddedness of companies could arguably constitute an auxiliary explanation of corporate behavior in the EU ETS. In the respective literature, emissions trading and the environmental strategy of organizations in general are frequently linked to industries (Kolk 2003; Pulver 2007; Lund 2007; Laurikkai & Koljonen 2006). The new institutionalism in organizational theory provides an argument for this dimension of embeddedness, especially in the works of DiMaggio and Powell, who point out that companies are embedded in specific organizational fields (DiMaggio & Powell 1983).²⁵ Companies within the same field are usually subject to comparable institutional pressures and influences. Hence, the actors in specific sectors develop a related mindset or cognitive map, which serves as a template for the analysis of new problems, the interpretation of solutions, and the making of strategic choices. Consequently, these actors can be expected to develop similar standard operating procedures and – in the case of emissions trading – might show similar rates of trading.²⁶ Due to the focus on country-specific embeddedness in this paper, however, I will discuss sectoral embeddedness only as a control variable.

THE RESEARCH FIELD, STUDY AND METHODS EMPLOYED

The EU ETS is comprised of 11,500 energy-intensive installations across all EU member states and is responsible for nearly half of Europe's CO₂ emissions. According to EU ETS regulations, installations must compensate each ton of emitted CO₂ with one emissions allowance. Emission allowances are distributed to the licensees of the installations by the member states. The decreasing general amount of allowances is supposed to lead to an

²⁵ For organizational theory's new institutionalism and its argument on the embeddedness of environmental strategy by industry, see Meyer & Rowan (1977), Scott (1991; 1995), Wooten & Hoffman (2008), and Hoffman (2001). The way I use the concept of companies' embeddedness in specific organizational fields, the term "societal sector" (Scott & Meyer 1991) or "industry system" (Hirsch 1985) appears to entail a precise description.

²⁶ This effect is described in detail by DiMaggio and Powell (1983) by differentiating between mimetic, normative and coercive isomorphism.

overall emission reduction over the course of a number of years. An exhaustive description of the EU ETS does not fall within the purview of this paper, but the program has several specific design features relevant to the arguments of this paper. First of all, this work covers only the first three years of trading under the EU ETS (2005-2007) and thus the first allocation period ('Phase 0'). For this period, installations were assigned a specific number of allowances, equally distributed over each of the three years.²⁷ After each year the allocation allowances are 'reposited', or returned to the distributing authorities in order to be verified.²⁸ Secondly – and in spite of the first point – installations were able to 'borrow' emissions rights from their allocation for the next year. This is due to the fact that the point in time at which the allowances for a specific year have to be repositied (e.g. April 2006 for the allowances for 2005) is *after* the date on which the distribution of the allowances for the next year takes place (e.g. February 2006 for the allowances of 2006). Consequently, firms with additional demand for allowances can delay their market-entry and buy further EUA until the last year of the allocation period. Finally, there is a remarkable lack of regulation on the actual manner of trading in the EU ETS. Trading with allowances becomes legally recognized when EUAs are transferred to the national registry, but the concrete mode of exchange, the mechanism for setting the price, the development of derivatives and the involvement of intermediaries like brokers are all left up to the companies participating in the transaction.

In this paper, I employ data that was originally collected for a survey about emissions trading activities in the EU ETS. A questionnaire was sent to all companies participating in the EU ETS in Germany, the United Kingdom, the Netherlands and Denmark (approximately 1,700 companies). The incorporation of all countries in the EU ETS was impossible due to financial and logistic constraints. The four cited countries were selected, because they embrace two contrasting economic environments (Germany as the prototype for CME and the United Kingdom as the prototype for LME) as well as two special and intermediary cases (Denmark and the Netherlands). Of the four, only Germany had no prior experience with market-based

²⁷ Denmark allocated a higher amount of allowances (+25%) in 2005, than in 2006 and 2007.

²⁸ This process is officially called 'surrendering of allowances'. The allowances are officially called EUA (European Union Allowance). One EUA gives the permit to emit one ton of carbon dioxide.

instruments for emissions mitigation before the introduction of the EU ETS. Contact to the companies could be established using the Community Independent Transaction Log (CITL), which is a publicly accessible register containing a list of all emitting installations covered by the regime. In the survey, the list of installations was converted into a list of companies, according to the persons responsible for emissions trading.

Companies were written three times, about their trading activities in 2005, 2006 and 2007, respectively. The questionnaire included 29 retrospective questions about trading activities, strategic choices, alternative instruments and technological responses to the EU ETS. Finally, information about the actual emissions and allowances allocation of the companies was added using the CITL database.

Two major difficulties could bias the results. First, the person in charge of emissions trading was identified using the CITL and extensive direct telephone calls. Given the risk of misidentification of these reference persons, it cannot be ruled out that this process might have had effects on the response rate. Second, the common problem of questionnaire refusal might have affected the outcomes. As presented in the following table, the data shows clear representation distortions with regard to the factor 'country'. Aside from technical reasons, the intense academic research interest on companies in the EU ETS may have resulted in an over-researched situation, and thus to higher refusal rates than usual. The outcomes presented in the following tables reflect the trading activities of the majority, and consequently relatively more medium and small-sized companies. Further sectoral biases can be theorized due to different response rates across sectors. The paper will not use any weighting procedure to mathematically eliminate these flaws, but will rather take them into account by completing a conservative discussion of the results.

Table 10: Addressed companies and respective response rates

	----- 2005 -----		----- 2006 -----		----- 2007 -----	
Country	Population	Response	Population	Response	Population	Response
<hr/>						

Germany	953	26.1%	933	25.1%	904	24.1%
United Kingdom	408	16.9%	407	16.0%	397	11.6%
Netherlands	127	22.8%	124	21.0%	120	15.0%
Denmark	216	18.5%	216	19.4%	213	16.9%
Total	1704	22.7%	1680	21.8%	1634	19.5%

The application of a level of statistical significance is problematic for the data at hand. One condition for statistical inference is a random sampling mechanism, which is obviously not present in this case. The study addressed all companies in the EU ETS in the four countries. Berk et al. call this type of complete set “apparent populations” (Berk, Western & Weiss 1995, see also Morrison & Henkel 1970 and Bollen 1995). This paper takes a pragmatic view of this issue: The level of statistical significance will be reported, but the analysis will not exclude outcomes without statistical significance.

HOW DO COMPANIES FROM DIFFERENT COUNTRIES PARTICIPATE IN THE EU ETS?

The new market for carbon allowances is constituted first of all by the participation of affected companies. To what extent and by which means firms take action will determine the current and future contribution of the EU ETS to climate change mitigation. The next section presents insights into the participation of companies in the EU ETS. I develop a multivariate analysis of market involvement focusing on the influence of country-specific embeddedness discussed in the theoretical section above.

The majority of companies did not trade any allowances in the EU ETS in the first period, from 2005 to 2007. The rate of trading increased from 34% of companies in 2005 to 49% (2006) and then 50% (2007). This robust result must amend our understanding of the EU ETS as a market. Carbon markets like the EU ETS need time to develop. More precisely, corporations covered by such a scheme will not automatically participate in a market for

carbon rights. A remarkable number of companies with a surplus of allowances did not trade at all. Fully 60% of surplus or “free” allowances in 2005 (and 16% in 2006 and 2007) were not offered on the market. This is rather astonishing, since surplus allowances constitute a chance for an easy realization of profits – so market participation would seem to be the rational and obvious action from a business perspective.²⁹

The left half of figure 1, below, presents a comparison of allowances by country and year, and two plain results. First, a majority of companies held a surplus of allowances. This curtailed any serious pressure to quickly participate in the market. Secondly, one can identify distinctive national differences in trading. Dutch companies mostly ran surpluses, while a high number of emitters in the United Kingdom were running short of allowances. Hence, trading pressures were distributed quite unequally.

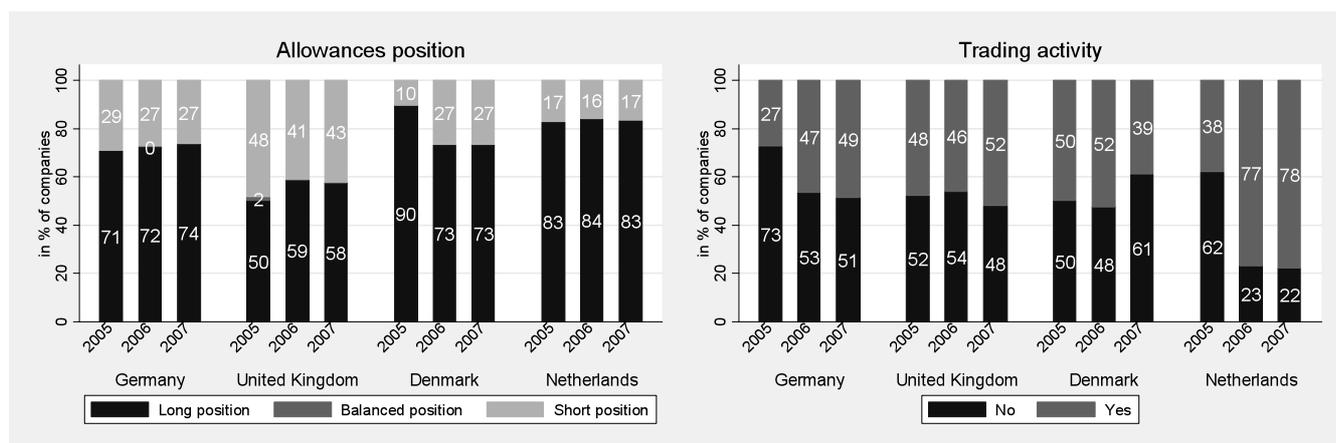


Figure 1: Predicted probabilities per country and year

The table making up the right half of figure 1 documents the market participation of companies, again differentiated by country and year. It becomes clear that a large share of companies did not take any action in the carbon market. German companies increased their activities over time, while companies from the United Kingdom and Denmark began by

²⁹ The data in this paragraph is based on the results of the questionnaires and the additional CITL-research described in the previous section.

trading more actively, but remained consistent in their market engagement over time. The results for Dutch companies are the most remarkable – though they mostly had surpluses of allowances, they nonetheless figure as the most active trading group.³⁰ Overall, the reluctance to engage in trading can presumably be traced to the general over-allocation of allowances on the market in the first period of the EU ETS.

Based on these first outcomes and in accordance with my hypotheses, one can speculate that conditions in each country, and thus specific institutional conditions, might constitute an important factor in trading with emissions allowances. The remainder of this paper will examine this possibility in more detail. In the next step, I develop a statistical analysis in order to investigate the research questions established above. Thereby, I complement the work of Engels, Knoll & Huth (2008) with a multivariate analysis of three trading years. The data level contradicts an ordinary OLS regression. Due to the available data level of the dichotomous dependent variable, the range of available models of analysis is limited. Binary logistic regression analysis appears to be the most equitable method (Hosmer & Lemeshow 1989).³¹

How is the statistical model constructed?

To present a synoptic overview of the variables in the model, details on the dependent and independent (explanatory) variables are provided. The paper investigates the participation of companies in the EU ETS. The *dependent variable* thus refers to the simple question of whether or not a company traded with allowances in the surveyed year.³²

The starting point of the analysis is an idealized instrumental-rational action oriented on a genuine rational indicator. It is modeled as the pure amount of demand or surplus of emissions allowances, which is the difference between allocated emission allowances and

³⁰ In this case, it can not be ruled out that due to some response bias the result is overestimated.

³¹ The different dimensions of embeddedness (country, sector) suggest the appropriateness of multilevel analysis (Snijders & Bosker 2003). However, in the data at hand, the conditions for a minimal number of cases per level are violated, prohibiting the method's application (Snijders 1994; Maas & Hox 2005).

³² Min=0; max=1; mean 2005=0.341; mean 2006=0.493; mean 2006=0.497.

the actual and verified CO₂ emissions. In a first step, demand and surplus are treated as equal expressions of both the chance and the necessity to trade with CO₂ permits.³³ The distribution of the difference between allocated rights and verified emissions is extremely skewed however, because of the very different amounts of emissions, which are of course dependent on the installation's type and size. Using natural logarithms, the data is transformed into an *indicator of potentially tradable EUAs*. The variable is named *EUAIn*.³⁴

$$EUAIn = \ln\left(1 + \left|EUA_{allocated} - EUA_{verified}\right|\right)$$

In line with the theoretical arguments made above concerning CC scholars' position on the effects of varying organizational environments, the companies' *country* is included. Germany, the United Kingdom, the Netherlands and Denmark are covered in the study and are operationalized as a dummy variable. As developed in the theoretical discussion and formulated in hypothesis 1, Germany should be the country with the most limited participation in the EU ETS and thus constitutes the reference category in the logistic regression analysis, which mirrors participation of all three other countries against the participation rate in Germany. The variable's names incorporate abbreviations for each country: *UK*, *NL*, and *DK*. Due to the allocation process governed by national authorities, the paper includes another variable describing an *interaction effect* between country and the potential trading volume. Variables are again named according to country: *UKxEUAIn*, *NLxEUAIn*, and *DKxEUAIn*.

Three more variables are included to complete the statistical analysis. All are used as control variables against the country argument. First, the paper makes use of a variable for the *industrial sector* of the companies. Eight industrial sectors are included. In this case, the energy sector serves as the reference category. I expect that due to the traditional involvement of this sector in energy commodity markets, energy companies were best prepared for emissions trading. Variables bear the names of the sectors *Ferro* to *Others*.

³³ Further analysis shows that a division of the variable in surplus and demand does not advance the statistical models.

³⁴ 2005: min=0; max=14.774; mean=8.566 (std. dev. 2.233); 2006: min=0; max=14.787; mean=8.674 (2.160); 2007: min=2.079; max=15.190; mean=8.889 (2.011).

Table 11: Sectoral distribution by year

Country	Included NACE (Rev 1.1) classifications	2005	2006	2007
Energy	11, 23	152	138	125
Ferro	27, 28, 29, 30, 32, 34,35	26	30	22
Mineral	26	53	55	52
Chemicals	24	43	35	27
Paper	21	25	22	28
Food	15	34	34	21
Public	75, 80, 85	38	40	30
Other	14, 17, 17, 20, 25, 31, 33, 60, 63, 64, 74, 93	16	13	13
Total		387	367	318

Secondly, in order to account for *companies' size* I combined the number of employees as adapted from the European Union Classification, with the number of emitting installations in the EU ETS.³⁵ This variable has been given the name *Size*. Third, the analysis integrates a possible *learning effect* in the market for carbon permits by operationalizing the trading activity of the prior year. It can be speculated that a company that traded in 2005 will have a greater likelihood of doing so again in 2006, for example, than a company that did not trade in 2005. This variable is called *priortrade*.³⁶

What results does the statistical analysis deliver?

This section presents the results modeled by the logistic regression in three parts. First, I successively include variables. Then, six regressions will be introduced and described

³⁵ Company size: Max=1 and min=5; 2005 mean=2.662 (1.185); 2006 mean=2.654 (1.190); 2007 mean=2.608 (1.155). The European Union It classifies small enterprise as having less than 50 employees, medium-sized companies as having between 50 and 250 and large companies as having over 250.

³⁶ Min=0; max=1; 2006: mean=0.172 (0.378); 2007: mean=0.358 (0.480)

followed by an analysis of an interaction effect. Finally, I concentrate on the interaction effect alone.

The *potential emissions trading volume* (EUAln) serves as a rational anchor point for the interpretation of arguments concerning national institutional embeddedness. Hence, 'country' should improve the model's log likelihood, or in other words its explanatory power. A nested likelihood ratio test, always including the rational variable, is computed between models with and without 'country'. This latter test shows improvement due to institutional variables in each year. Consequently, integrating country arguments is beneficial to the analysis. In addition, the results of a further test support the inclusion of interaction-effects.

The next table, table 6, demonstrates the outcomes of the logistic regression. The two columns on the left show the variables described above. Columns number 1 to 6 present regression coefficients (LOGITs) for 2005 (1.2), 2006 (3.4) and 2007 (5.6) each divided both into a model with and without an interaction effect.³⁷ "Model 2005 interact" is the model with, and "Model 2005 main" is the model without an interaction term between country and potential trading amount (EUAln). All results for McFadden's R^2 , which is an approximation of the model's explanatory power, show satisfying but not exceptional values.

³⁷ LOGIT coefficients should be interpreted as follows: Positive values signify that with each increase of the independent variable (eg. size class), the odds for the dependent variable (i.e. the odds of trading) increase as well. Negative values stand for the opposite dynamic. In the case of the dummy variables (e.g. country), an increase in the value must always be understood in comparison with the reference category (in this case, Germany). Due to different units of measurement, a comparison between coefficients in the outcome is not possible. Moreover, standardization of coefficients is not useful (King 1986). The next misleading influence on coefficients is the interaction term which prevents them from being interpretable (Brambor, Clark & Goldner 2006; Ai & Norton 2003). I will focus on simple LOGIT-coefficients, predicted probabilities, and graphical analysis.

Table 12: Outcomes of the logistic regression

		Trading y/n					
VARIABLES		(1)	(2)	(3)	(4)	(5)	(6)
		Model	Model	Model	Model	Model	Model
		2005	2005	2006	2006	2007	2007
		main	interact	main	interact	main	interact
Country: Germany reference	as UK	1.613*** (0.389)	7.290*** (1.742)	0.717 (0.456)	-5.952* (3.061)	0.473 (0.491)	1.863 (2.313)
	DK	1.583*** (0.438)	6.224*** (1.911)	1.087** (0.433)	-17.83*** (6.360)	-0.115 (0.557)	-0.0823 (2.887)
	NL ³⁸	0.145 (0.466)	-1.927 (3.686)	2.168*** (0.791)	-4.699 (5.206)	1.925** (0.863)	
	EUAln	0.438*** (0.0830)	0.664*** (0.123)	0.435*** (0.0813)	0.270*** (0.0888)	0.465*** (0.0965)	0.423*** (0.117)
Interaction effect	UKxEUAln		-0.638*** (0.181)		0.744** (0.347)		-0.121 (0.247)
	DKxEUAln		-0.546*** (0.210)		2.200*** (0.743)		0.00776 (0.323)
	NLxEUAln		0.184 (0.368)		0.771 (0.623)		
Control Industrial sector: Energy reference	as Ferro	-1.432* (0.746)	-1.155 (0.788)	0.340 (0.527)	0.330 (0.536)	1.458** (0.641)	1.338** (0.649)
	Mineral	-1.353** (0.527)	-1.207** (0.539)	0.371 (0.413)	0.594 (0.423)	1.712*** (0.475)	1.711*** (0.487)
	Chemical	-0.299 (0.447)	0.198 (0.455)	0.795 (0.528)	0.862 (0.540)	0.966 (0.645)	0.668 (0.673)
	Paper	0.448 (0.502)	0.868 (0.529)	1.115* (0.575)	1.025* (0.577)	1.158* (0.594)	2.046*** (0.671)
	Food	-0.113 (0.501)	0.475 (0.518)	0.538 (0.522)	0.376 (0.548)	0.536 (0.657)	0.327 (0.692)
	Public	-0.232 (0.570)	-0.731 (0.705)	-2.265*** (0.822)	-1.417* (0.838)	-0.238 (0.651)	-0.651 (0.753)
	Other	0.726 (0.663)	1.163* (0.705)	-1.176 (0.975)	-0.541 (0.890)	1.377* (0.817)	1.350 (0.834)
	Priortrade			2.576*** (0.493)	3.190*** (0.602)	1.750*** (0.346)	1.958*** (0.370)
Size	0.214 (0.130)	0.0391 (0.133)	0.155 (0.135)	0.207 (0.142)	0.296* (0.159)	0.399** (0.171)	
	Constant	-5.512*** (0.792)	-7.396*** (1.154)	-5.056*** (0.841)	-3.742*** (0.886)	-6.335*** (1.040)	-6.307*** (1.170)
	Observations	356	356	334	335	265	258
	<i>McFadden</i> <i>R</i> ²	0.216	0.236	0.292	0.335	0.272	0.309

Table 6 reports LOGIT-coefficients: ln(odd-ratio) / standard errors in parentheses / *** p<0.01, ** p<0.05, * p<0.1
Outlier excluded by Pearsons standardized residuals -2<Obs<2

³⁸ Unfortunately, due to the process of outlier exclusion, no interaction effect for Dutch companies in 2007 can be described.

What are the main results of the statistical analysis?

The results of models 1, 3, and 5 lead to a few conclusions. First of all, they indicate that an overall country effect can be identified in the numbers. There are significant differences in the LOGIT-coefficients between the countries and the reference category, Germany. More precisely, the chances are greater that a company will engage in trade with emissions allowances in the United Kingdom than in Germany. This relation between the two countries decreases over the three years and is statistically significant only in 2005. Danish companies also were more likely than their German counterparts to trade in allowances in 2005 and 2006. In 2007, I found a minor trend in the opposite direction, but it too was insignificant. As for the Dutch case, I can conclude that the chances of companies' trading in 2005 were slightly higher than for Germany, though this result was also insignificant. In 2006 and 2007, however, the chances that Dutch companies would engage in trading allowances were significantly higher than for German companies.

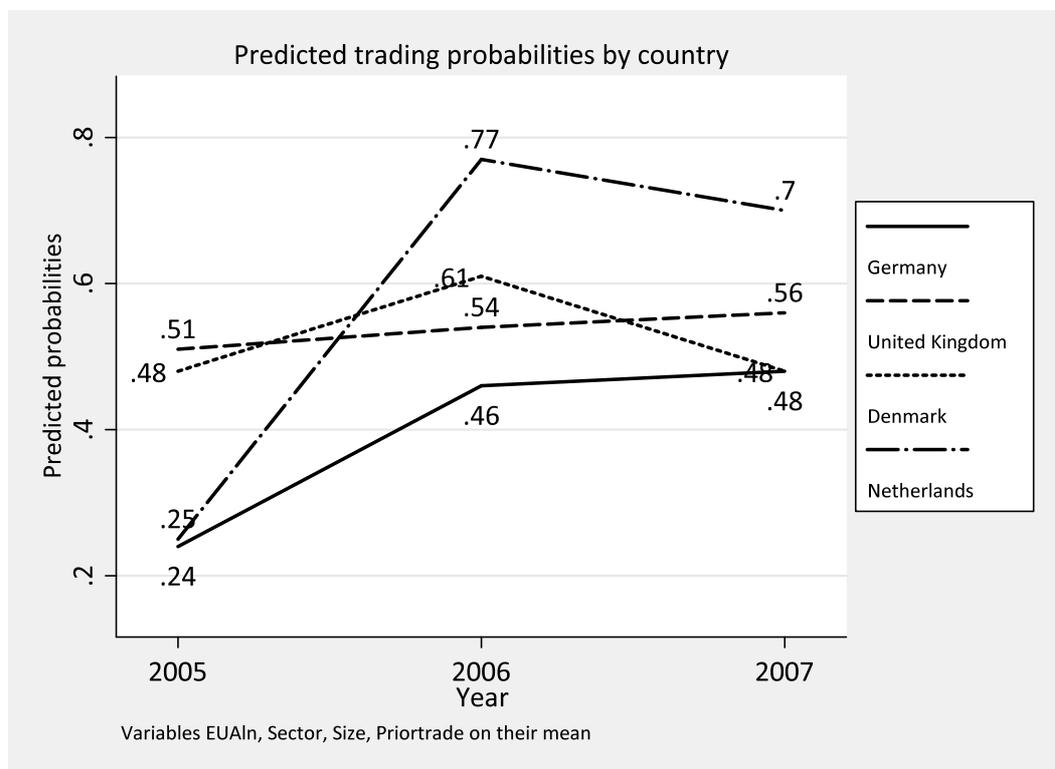
In addition to this facet the national embeddedness of corporate decision-making in the EU ETS, the variable for industrial sectors produces interesting outcomes as well. As addressed, due to questions about the sample I refuse to interpret the results as general sectoral effects. Nevertheless, there are some interesting factors found across industries. The best example is the mineral industry, where the chances for participation in the first year were lower than in the energy sector in 2005 and distinctly higher in 2007. This indicates simply that some sectors require more time to adapt to the EU ETS than energy companies do. Special cases to this conception however, are constituted by organizations in the public sector, which in our sample are mainly hospitals, universities and military compounds. They display lower chances for participation against the energy industry over all years. I speculate that because of their overall somewhat unique market position, these organizations are distinctly worse prepared for the EU ETS than other organizations.

The chances for participation in emissions trading increased significantly with the introduction of tradable allowances. This is not surprising, but it strengthens the argument that

concurrence exists between rational and institutional explanations of economic behavior. It is also plausible that former experience with trading activities in the EU ETS facilitates further chances to participate in the market again. The analysis shows highly significant and definite outcomes. One could expect that the size of a company would be a major factor in choosing to engage in emissions trading. The results both affirm and qualify that statement.

Figure 2 presents a conversion of the presented LOGIT-coefficients into predicted probabilities for each country per year. The x-axis represents the three points in time (2005, 2006, 2007) and the y-axis delineates the predicted probabilities of a company to trade with allowances on a scale between 20 and 80 percent. The lines symbolize the probabilities that firms in each country will trade allowances, and the concrete measures are reported in the graph. All other variables are held constant on their mean.

Figure 4: Predicted probabilities per country and year



The clear differences in the participation per country when other variables are controlled for are quite striking. Companies from the United Kingdom and Denmark initially traded at high rates, but lost a bit of their momentum in the course of time. Dutch companies started trading more slowly, but evolved into real leaders in traded volume. Especially for Germany and the Netherlands, the graph depicts individual learning paths.

To sum up, *hypothesis 1*, which posited that German companies would be more reluctant to engage in trading, is strongly reproduced in the results. German companies traded less with allowances in all three years than firms from any other country. In particular, the low rates in the first year can be understood as a symptom of lesser – or worse – institutional preparation, which resulted in a higher level of uncertainty with respect to engaging in the market.

Hypothesis 2, which theorized that British organizations would be the heaviest traders in the EU ETS, cannot be reproduced in the results in the same way. Although they started with a

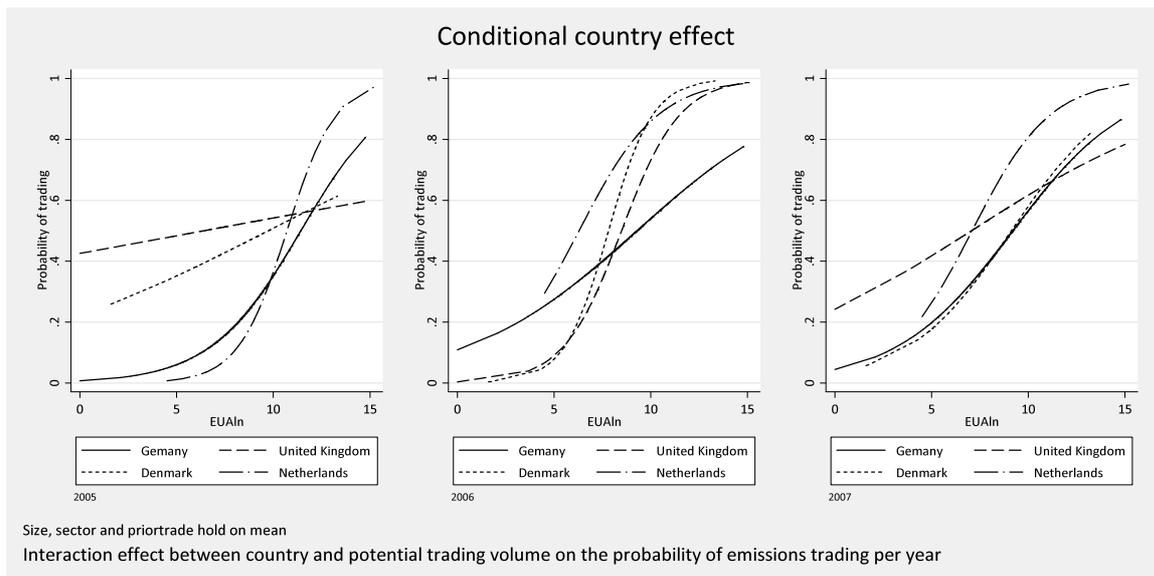
high level of market involvement, they quickly lost their lead over the Danish (in 2006) and Dutch companies within the first three years of the regime. What is clear, however, is a remarkable stability in British EU ETS participation, if at a moderate level. I conclude that institutional preconditions in the United Kingdom fostered early participation and provided for its stable continuation.

How do country and the potential trading amount of firms interact?

Before concluding, it is important to address the interaction effect between the rational indicator of potential trading volume and the country effect.³⁹ Despite the fact that the influence of the rational anchor (surplus or demand of allowances) on trading behavior differs between countries, I argue that a country effect can nonetheless be confirmed. Figure 3 presents trading potential's influence on trading probabilities, accounting for host country, over three years.

³⁹ Fehler! Verweisquelle konnte nicht gefunden werden. see models 2, 4, 6 (interact).

Figure 5: Conditional country effect



The y-axis in figure 3 depicts the probability to trade with emissions allowances, and the x-axis is the potential trading amount ($EUAln$) depending on country (graph lines). First, distinct country differences can be observed in each year. In other words, the influence of a surplus (or demand) of allowances on market participation differs between countries. Two groups of countries evolve in 2005. Whereas even a small amount of tradable allowances among British and Danish companies increased their probability to trade, Dutch and German companies needed much higher amounts of tradable allowances before an effect on the trading probability became noticeable. One can speculate that in the latter case the institutional effects were stronger than the rational anchor. In 2006, the picture changes and the curves of the graph begin to harmonize. The influence of tradable permits on the probability to trade was highest in the Netherlands and lowest in Germany. Finally in 2007, one can distinguish few clear country differences. In summary, the coefficients of interaction

effects support the argument that there are institutional influences on economic behavior, in terms of country-specific embeddedness.⁴⁰

DISCUSSION AND OUTLOOK

The first important result from this analysis is the demonstration that companies reacted quite differently to the new carbon market. I conclude that their embeddedness in national institutions played an important role in their adoption of the EU ETS. It is well worthwhile for scholars to consider Whitley's – and other author's – reasons for the explanation of economic behavior in the EU ETS; environmental policy traditions can be linked to varying adoptions of the EU ETS. This paper has shown that country-specific institutional settings foster or inhibit the market participation of companies in the EU ETS. German companies began trading rather reluctantly. I infer that institutional features inhibited early market participation in this case. In contrast, the institutional environment in the United Kingdom fostered early participation in the EU ETS. Danish companies show high and stable participation rates right from the start. Even if a significant response bias is taken into account, qualifying the next outcome somewhat, *Dutch* companies show a distinct learning and adoption process. To reiterate, I conclude that comparative advantages mediated by institutional configurations can be identified in this novel arena of economic action.

What becomes increasingly clear, when seen from a Comparative Capitalism perspective, is that several ways of institutional competitiveness coexist. The special cases of Denmark and the Netherlands show how combinations of liberal and corporatist institutional elements can foster companies' innovativeness and adaption capabilities. This contradicts core assumptions of the traditional Varieties of Capitalism approach (above all the thesis of a

⁴⁰ The author completed a Monte-Carlo Simulation of significance levels (King, Tomz & Wittenberg 2000) over the interaction effects by year and country. It shows satisfying results on a 5% error-level only for Germany.

general convergence in the direction of a 'superior' market-based or liberal model) (Campbell & Pedersen 2007).

The most significant problems with the presented analysis extend from the possible response distortions, and the generally low number of observations. However, to my knowledge no better empirical cross-national and cross-sectional empirical data is available. I would very much welcome other scholars working on this lack of data to confront my findings. One might also criticize that, on a statistical level, I cannot rigorously establish a causal relationship between the institutional settings in a country and companies' participation. To some extent, I must agree. It is however not the aim of this contribution to offer a conclusive explanation, but rather to stimulate debate and motivate further investigations in the direction sketched out above. Future research efforts could open the 'container' variables that I have employed for the country-aspect by including indicators for single institutional settings like the labor market or educational systems. My assumptions (1-6, see p. 17 and 25) can serve as starting points for such an endeavor.⁴¹ By following this lead, scholarly frameworks of institutional settings could contribute to the explanation and enhancement of corporate capacities to adopt the instruments of climate change mitigation.

Further research could focus in particular on the internal reaction of companies in order to establish a typology of organizational implementations within carbon markets. The analysis would profit from the inclusion of social studies of innovation, which emphasize the importance of knowledge and the availability of an infrastructure for consultation (see Voß 2007). I expect that intermediates and consulting organizations are of great relevance for both corporate and economic adaption, and thus the environmental success of the EU ETS.

In light of the prospect of a global carbon market, the results of this paper demonstrate the importance and implications of national differences. The implementation of emissions trading strongly interacts with existing national policy and business-making traditions. Taking differences into account in configuring a global carbon market would be beneficial both to national businesses and to those working for global climate change mitigation. The EU ETS

⁴¹ For efforts in this area, see Crouch (2005).

and the reaction of the European companies to this new arena for decision-making also provide important implications for the potential US carbon commodities market. One should not expect that a new market for emissions trading functions to its full promise, immediately after it has been set up in regulatory terms. Emissions markets are strongly dependent on how corporations interpret carbon commodities and implement appropriate strategies of carbon management. In summary, the “test” phase of the EU ETS helped companies to make sense of carbon markets. It allowed for the buildup of a ‘carbon service infrastructure’ and grants European companies a perceptible advantage in any eventual worldwide carbon market. Moreover, it demonstrates the potential and the obstacles of carbon markets to the world and fosters the further analysis of the implications of reasonable environmental protection policies.

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