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Climate change mitigation strategies in carbon-intensive firms

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ABSTRACT

This study explores corporate strategies to mitigate climate change of large CO_2 polluters. Unlike most prior studies in the area, which have attempted to identify configurations of firms pursuing similar strategies, this study appraises the relationships between nineteen carbon reduction practices and their underlying strategies. The findings are based on a sample of 158 carbon-intensive firms from three EU countries. Five main strategies in carbon-intensive firms are identified. The only relatively widely deployed strategy is emissions trading. The remaining strategies, including process emissions reduction, combustion emissions reduction, external measures, and lowering product output are not deployed extensively. Complementarity between the identified strategies is low – firms focus on a single climate change mitigation strategy rather than deploying several simultaneously.Climate policy stringency appears to have a positive effect on corporate efforts to reduce emissions.

1. Introduction

Due to the negative impact of CO_2 emissions on the environment (Karl and Trenberth, 2003) there is increasing regulatory, customer and societal pressure to reduce total CO_2 emissions (Al-Amin et al., 2015; Okereke and Russel, 2010; Reid and Toffel, 2009; Stern, 2007). The most called upon to react are carbon-intensive firms from the energy and manufacturing sectors because they are most responsible for this form of ecological degradation (Canadell et al., 2007; Huisingh et al., in press; Shrivastava, 1995). In addition to their traditional domains, managers of carbon-intensive firms are now being called on to allocate resources after also taking complex climate change issues into account (Howard-Grenville et al., 2014; Reid and Toffel, 2009). Corporate environmental management represents an integral component of business strategy (Bansal and Roth, 2000; Buysse and Verbeke, 2003), aiming to reduce a firm's ecological footprint (Delmas and Toffel, 2008).

Despite notable corporate action regarding climate change (Backman et al., 2015; Jeswani et al., 2008; Kolk and Pinkse, 2005; Sprengel and Busch, 2011; Weinhofer and Hoffmann, 2010), somewhat paradoxically, global CO_2 emissions from the energy and industry sectors continue to rise, even in many developed countries (Olivier et al., 2012). The main reason for this occurrence is the dearth of radical innovations to facilitate the transition to a low-carbon society (Blanford, 2009; Huisingh et al., in press; Tavoni et al., 2012). Despite increasing institutional and regulatory pressures, stakeholders controlling traditional carbon-based technologies are seeking to protect their rents (Neuhoff, 2005) by preserving a compromised regime (Jones and Levy, 2007). Rather than engaging in environmental innovation to prevent pollution (Berrone et al., 2013), they make marginal efficiency improvements to existing processes (Blanford, 2009; Oliver, 2008; Pinkse and Kolk, 2010) to conform to the dominant practices in their field (Delmas and Montes-Sancho, 2010).

The study herein aims to increase our understanding of corporate strategies and constituent carbon reduction practices to mitigate climate change in large CO_2 polluters. The study has three main aims: (1) to investigate the application rates of a wide range of *carbon reduction practices*, (2) to examine the relationships between underlying *climate change mitigation strategies* (are strategies used reciprocally or not), and (3) to explore the effect of three contingency factors (i.e. carbon reliance, industry sector, country) on the deployment of alternative strategies.

A 'climate change mitigation strategy' is defined in this study as a pattern of a firm's action to reduce its CO_2 emissions (Kolk and Pinkse, 2005; Weinhofer and Hoffmann, 2010). This stance is consistent with the view that a prerequisite for climate change

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mitigation is a reduction of total global GHG emissions (Ramanathan and Feng, 2008; Zhang et al., in press). The proposed conceptual framework of the climate change mitigation strategy includes three *strategic priorities*, five alternative *strategies* to pursue these priorities and 19 constituent *carbon practices*.

Findings are based on survey data for a sample of 158 European carbon-intensive firms. The EU context is particularly interesting because the EU is one of the most advanced regulatory environments in terms of climate policy (Braun, 2009). The key initiative of the European Climate Change Programme launched in 2000 was the Emissions Trading Scheme, a major policy innovation. In the first two phases from 2005 to 2012, when allowances were allocated rather than auctioned, the system was not functional yet (Fan et al., 2012). Due to the over-allocation of allowances and the financial crisis, most firms enjoyed a surplus of allowances and were thus not highly motivated to reduce their emissions (Cadez and Czerny, 2010).

This study makes several contributions to the literature. First, following calls for an inter-disciplinary integration of managerial and technical aspects of emissions management (Castelli et al., 2015; Schotter and Goodsite, 2013; Whiteman et al., 2013), it extends prior conceptual models of climate change mitigation strategies by distinguishing between the two main types of CO_2 emissions (i.e. combustion vs non-combustion) and their implications for carbon-reduction strategies. Second, it identifies climate change mitigation strategies in European carbon intensive firms. Third, unlike most earlier empirical studies in the field that attempted to identify configurations of firms pursuing similar strategies (Jeswani et al., 2008; Kolk and Pinkse, 2005; Lee, 2012; Sprengel and Busch, 2011; Weinhofer and Hoffmann, 2010) this study examines the relationships between alternative strategies and their constituent practices. Evidence is provided that alternative strategies are not used reciprocally. Fourth, the study contributes to our understanding of contingencies carrying implications for corporate climate change mitigation strategies.

The paper is structured as follows. First, the concept of a climate change mitigation strategy is defined and research propositions are developed. This is followed by the method and findings sections. The paper concludes with a discussion and conclusion section.

2. Climate change mitigation strategy

Since the passage of the Kyoto protocol in 1997, the interest in corporate strategies concerned with climate change is on the rise (Backman et al., 2015). Prior research concerned with climate change related strategies is diverse and falls within many streams. For example, these include theoretical conceptualizations of such strategies (Boiral, 2006; Hoffman, 2005), empirical investigations of carbon reduction and other climate change related practices in firms (Cadez and Czerny, 2010; Hashmi and Al-Habib, 2012; Jeswani et al., 2008; Kolk and Pinkse, 2005; Lee, 2012; Sprengel and Busch, 2011; Talbot and Boiral, 2014; Wahyuni and Ratnatunga, 2015; Weinhofer and Busch, 2013; Weinhofer and Hoffmann, 2010), explorations of barriers, drivers, and contingencies of such strategies (Amran et al., 2015; Backman et al., 2015; Liu, 2012; Okereke and Russel, 2010; Reid and Toffel, 2009; Rickards et al., 2014; Slawinski and Bansal, 2012; Sprengel and Busch, 2011), the implications of climate change strategies for firms' economic performance (Hsu and Wang, 2013; Matsumura et al., 2014) and implications for firms' GHG emissions performance (Doda et al., 2015).

Although the body of knowledge concerning corporate strategies related to climate change is increasing with the quantum of studies conducted, a number of important questions remain unanswered (Wahyuni and Ratnatunga, 2015). Prior research, for example, has identified that some carbon reduction practices are applied more widely than others (Hashmi and Al-Habib, 2012; Wakabayashi, 2013) yet does not provide a causal explanation for this occurrence. Next, prior research provides equivocal evidence whether alternative climate change mitigation strategies are used reciprocally or whether firms focus on one strategy only. This is an important strategic issue. While pursuit of multiple strategies implies that firms engage in a range of carbon abatement actions with different levels of expected return, pursuit of a single strategy indicates rational investments in actions where the expected return is highest (Al-Amin et al., 2015; Maxwell and Decker, 2006; Petkova et al., 2013). Further, calls are increasing in the literature for an identification of factors that affect business strategies concerned with climate change (Amran et al., 2015; Christ and Burritt, 2013). These questions and motivations provide the rationale for the study reported herein.

A strategy in a business context is typically concerned with setting long-term corporate goals, developing activities and allocating resources that will enable the firm to achieve those goals (Cadez and Guilding, 2012; Snow and Hambrick, 1980). Historically, business was reluctant to reduce pollution due to the prevailing philosophy that the costs of prevention and clean-up lead to lower competitiveness (Porter and van der Linde, 1995). CO_2-polluting firms also disputed external control of GHG emissions due to inconclusive evidence of climate change (van den Hove et al., 2002). In the circumstances of little voluntary action and no regulatory policy the Kyoto Protocol was passed in 1997 with binding reduction targets for most developed countries. After the Kyoto protocol was passed, firms gradually started altering their point of view (Jeswani et al., 2008). Growing concerns about the environment and climate change, stronger institutional pressures and increasing regulation instigated greater involvement in environmental issues, including climate change (Delmas and Toffel, 2008).

Despite increasing interest in corporate climate change strategies (Backman et al., 2015), only limited consensus exists concerning the scope of a climate change related strategy. Some authors define a climate change strategy as any corporate action concerned with climate change. However, some actions may have very little connection with emissions reduction as a prerequisite to mitigate climate change (Meinshausen et al., 2009). Such actions involve political lobbying for a more favourable policy (Delmas and Montes-Sancho, 2010; Jones and Levy, 2007; Okereke and Russel, 2010), the management of stakeholder impressions (Bansal and Clelland, 2004; Biloslavo and Trnavčevič, 2009; Talbot and Boiral, 2014), GHG data reporting (Reid and Toffel, 2009; Stanny, 2013), freeriding in cooperative strategies (Delmas and Montes-Sancho, 2010) or emissions trading (Boiral, 2006; Lee, 2012).

Some authors propose a narrower view that a corporate climate change strategy is a pattern of action over time to manage (preferably reduce) the firm's CO_2 emissions (Kolk and Pinkse, 2005; Weinhofer and Hoffmann, 2010). Other terms consistent with this definition are also present in the literature, such as carbon strategy (Lee, 2012; Wahyuni and Ratnatunga, 2015) and carbon management strategy (Cadez and Czerny, 2010; Okereke and Russel, 2010).

The term 'climate change mitigation strategy' in this study refers to the firm's action to reduce its CO_2 emissions via application of alternative carbon practices. To achieve this objective, a number of alternative paths are available that have been collapsed into three main *strategic priorities*: *internal carbon reduction*, *external carbon reduction*, and *carbon compensation* (Kolk and Pinkse, 2005; Weinhofer and Hoffmann, 2010). Internal carbon reduction refers to actions within a firm that reduce carbon emissions (so-called scope 1 emissions). External carbon reduction refers to actions outside a firm that reduce carbon emissions (so-called scope 2 and 3 emissions). Carbon compensation is action taken by a company to

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