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Conceptual model for corporate climate change strategy development: Empirical evidence from the energy sector

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ABSTRACT

This paper proposes a conceptual model for corporate climate change strategy development. It reflects the dynamic influence of climate change risks and stakeholder pressures on carbon management practices adopted and the performance perception of managers. We draw our model on resource dependence theory to explain how managers apply carbon management practices to reduce ecological uncertainty caused by firms' direct dependence on nature. Using institutional theory, we describe how stakeholders influence firm reactions to climate change. We test a structural equation model and run a cluster analysis of 105 Brazilian energy firms. The results show that companies undertake one of four different strategies ranging from a minimalist approach to the regulation shaper, pressure manager or greenhouse gas emission avoiders. The proposed model contributes to an understanding of the importance of embedding climate change in a business model in emerging markets.

1. Introduction

Climate change is challenging the sustainability of current production and consumption systems. The impact is global, the problem is long-term, and the harm is substantially irreversible. Companies face major uncertainties about the magnitude and timing of climate change effects and what risks they are likely to have to address (Lash and Wellington, 2007). These uncertainties make it difficult to consider an adequate strategy to reduce greenhouse gas (GHG) emissions (Lee, 2012). In this context, global CO_2 emissions are likely to increase.

The main reasons for this inertia by companies involve an unclear regulatory framework; short-termism and uncertainty avoidance behavior at individual, organizational and institutional levels; and a dearth of radical low carbon innovations (Engau and Hoffmann, 2011; Slawinski et al., 2017; Tavoni et al., 2012). Notwithstanding the necessity for firms to take action, there is limited progress in offering insights into firm adaptation mechanism to climate change (Gasbarro and Pinkse, 2016). There is also a gap in frameworks able to assess or consider the implications and consequences of carbon responses (Linnenluecke et al., 2013).

Empirical studies have been carried out to describe corporate climate change options (Weinhofer and Hoffmann, 2010; Sprengel and Busch, 2011; Weinhofer and Bush, 2013; Lee, 2012; Jeswani et al., 2008). Reviews of these models shows a need for more elements or criteria to operationalize them. Other studies have been developed to describe factors influencing corporate climate change strategy, including regulatory framework, societal demand, market positioning and technology availability. However, these studies have provided that some factors seem to be playing a role in driving responses for some firms, but not for others (Gasbarro and Pinkse, 2016; Cadez and Czerny, 2016; Jeswani et al., 2008).

To shed more light on these mixed results, we propose a conceptual model for corporate climate change strategy development to address two questions: *(1) Do climate change risks and stakeholder requirements act as driving forces of carbon management practices? and (2) What effect do carbon management practices have on performance perception of managers?* We adopt a resource dependence theory (RDT) to explain how climate change risks drive companies to implement carbon management practices and use institutional theory to explain how stakeholders influence firm reactions. If a carbon strategy is properly developed managers will perceive a better performance.

Empirical evidences confirm our structural equation model (SEM) and we make contributions to the carbon strategy literature.

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First, few studies had simultaneously included climate change risks and stakeholder pressures to impact on carbon management practices and in turn influence on performance perception of managers. And, there is a limited body of knowledge about energy firms in emerging countries and their attitudes towards climate change. Brazil is particularly interesting because about 45% of its total energy supply and 85% of its electricity is produced from renewable sources (Lucena et al., 2009).

Findings are based on survey data from a sample of 105 general managers. Firms were grouped into the four strategic orientations, the same as those established by Sprengel and Busch (2011), and labeled as "minimalist," "regulation shaper," "pressure manager" and "greenhouse gas emission avoiders." Pressure managers and emission avoiders constitute the bulk of the Brazilian energy firms surveyed. Their proactive approaches reflect the Brazilian clean energy matrix. Nevertheless, more recently the country has failed to continue a determinant role in global climate change policy.

The remainder of this article is organized as follows. First, we describe corporate climate change options and interlink the field of analysis with the RDT and institutional theory. Second, we develop hypotheses linking the four elements of our model. Then, we present the methodology and the results. To finish, we discuss the relationships established at SEM model and suggest directions for coping with climate change.

2. Theory and hypotheses

2.1. Corporate climate change options

There are several definitions commonly used to express the combination of climate change with the business strategy. Lee (2012) defined corporate climate change strategy as a selection of the scope and level of carbon management activity. Weinhofer and Hoffmann (2010) defined it as a pattern of activities associated with the management of direct and indirect GHG emissions. It can also be seen as a set of goals and plans aimed at reducing GHG emissions and addressing changes in processes, markets and public policy (Sprengel and Busch, 2011).

Carbon strategies types are either a continuum or typology-based models. Continuum models describe a development in time consisting of an increasing integration of environmental concerns with business policy and strategy (Abreu, 2009). On the other hand, typology-based models do not imply improvements processes but they identify some characteristics by using a conceptually derived set of interrelated principles (Lee, 2012).

Using a continuum-model, Lee (2012) developed a combination of six different levels of firm's carbon management activities that indicate its specific carbon strategy. The one suggested by Jeswani et al. (2008) clustered operational and managerial activities reported from Pakistani and the UK companies. The early typology model was developed by Levy and Kolk (2002) but addressed some elements of a continuum-model. It combined cooperation of companies to control GHG emission or not with assertiveness through public expression of regulations support or not.

Typologies based-model as those proposed by Kolk and Pinkse (2005) captured the main aim of corporate climate strategies and the degree of integration with others companies. Weinhofer and Hoffmann (2010) proposed another one combining CO_2 compensation, CO_2 reduction and/or carbon independence practices. The role of the sources of stakeholder pressures to reduce GHG emissions was used in the typology model proposed by Sprengel and Busch (2011).

More recently, Gasbarro et al. (2016) identified four corporate climate responses based on the perception of climate-induced physical changes as risks or opportunities with the prevalence of anticipated impacts on the organizational or institutional structures. Finally, Gasbarro and Pinkse (2016) proposed another typology model combining company's awareness with their vulnerability to climate-related physical change.

Key outcomes from these continuum and typology models are presented on Table 1. They improved our understanding of carbon operational and management activities, and differences among countries, industrial sectors and company's size. There are also others factors affecting carbon strategies, such as organizational characteristics, institutional pressures, and managerial perceptions of risks and opportunities.

However, these studies have explored limited dimensions of climate strategy. The complexity of the interrelationships among various facets of GHG reduction strategies requires the use of more comprehensive analytical models. It should incorporate multiple, non-linear interactions between the diverse variables that shape these strategies and their possible impacts (Boiral et al., 2012; Böttcher and Müller, 2015).

2.2. Linking resource dependence and institutional theories to corporate climate change strategy development

Different approaches have been developed to assist in understanding how firms may shape ecological strategies. Using resource dependence theory (RDT) into the natural environment, Tashman and Rivera (2015) indicate that firms should try to manage the ecological uncertainty caused by a direct dependence on critical resources. Thus, climate change poses major uncertainties that influence decision market's expectations about the future states of the nature environment (Winn et al., 2011).

RDT characterizes the corporation as an open system, dependent on contingencies in the external environment (Pfeffer and Salancik, 1978). Hillman et al. (2009) suggest that firms can cope with uncertainty by building interdependence with other organizations. This interdependence helps maintain access to critical resources that are not under the direct control of the firm. Building on the RDT, Bergmann et al. (2016) provided empirical evidence that the physical effects of extreme weather events influence financial performance.

Firm's ability to adapt to ecological uncertainty may also depend on the strength of institutional pressure (Tashman and Rivera, 2015). From an institutional perspective, organizations operate in a framework of social norms, values, and beliefs about what is considered acceptable and appropriate behavior (DiMaggio and Powell, 1991). Institutional theory could explain how firms and stakeholders reach a consensus on climate change issues and sound practices that could be developed (Lee, 2012).

A variety of institutional conditions influences corporate decisions to act in socially responsible ways. Such behavior is more likely to occur to the extent that firms are monitored by strong state regulation, collective industrial self-regulation, NGOs and other independent organizations (Hoffman, 2002). Reid and Toffel (2009) suggest that firms are more likely to agree to engage in climate change strategies if they share an institutional field with firms under threat of regulation. As governments are still highly involved, firms need to consider their carbon strategies carefully to cope with non-market forces, including their embeddedness in multiple institutional settings (Pinkse and Kolk, 2012).

2.3. Conceptual model and research hypotheses

Our conceptual model for corporate climate change strategy development incorporates the dynamic nature of these various factors which together lead firms to decide on a rational approach in light of the ecological uncertainty. The first element of our model