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Environmental innovation practices and performance: moderating effect of resource commitment

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ABSTRACT

Based on institutional theory and resource based view, this study seeks to examine linkages among institutional pressures, environmental innovation practices and performance. Specially, we test the moderating effect of resource commitment on the consequences of environmental innovation practices. We collected data from 148 manufacturers in Pearl River Delta, China to test the theoretical model. The statistical results reveal that institutional pressures coming from government's command-and-control instrument, overseas customer pressure and competitive pressure exert significant positive impact on environmental innovation practices, while government's economic incentive instrument and domestic customer pressure do not work. We also find environmental innovation practices have significant positive impact on firms' environmental performance, while the effect on financial performance should be through the mediating role of environmental performance. The further analysis reveals that the relationship between environmental innovation practices and financial performance is moderated by the level of resource commitment. As resource commitment increases, the financial performance yielded from environmental innovation practices will be better.

1. Introduction

The global environmental crisis, such as global warming, oil crisis, rapidly growing populations, is affecting everything from food to fuel to forests, and making the earth dangerously unstable (Friedman, 2008). Following the trend, many countries are positive to advocate environmental. Under this situation, how should the selfish individual firms respond to the environmental issue? If firms do lessen the environmental impact, it may come at an additional cost to their operations. If not, they may be quit out of the competitive market. Since firms survive in the society, Evolutionary game theory provides a theoretical framework to explain the cooperative behaviors among selfish players (Perc and Szolnoki, 2010). Evolutionary processes are governed by group interactions, the strategies of players engaging in evolutionary games evolve in time, the favoring players with higher fitness (Perc and Szolnoki, 2010; Perc et al., 2013). During the coevoluationary process, the behavior of individual player (e.g. the allocation of investments) will be affected by other players (Perc et al., 2013). Therefore, to survive in a competitive market, the individual firms should increase their ability to grow and survive in a competitive environment by interacting and satisfying other players, and take environmental sustainability into another main organizational goal in addition to profit making.

In view of this, how can firms be able to invest in the environment while still remaining sufficiently profitable has become more and more important to organizations. Under this situation, environmental innovation, which consists of new or modified processes, techniques, systems and products to replace wasteful, inefficient energy practices with a strategy for clean energy, energy efficiency, and conservation, so as to avoid or reduce environmental damage (Kemp et al., 2000), has been viewed as an effective way to lead to a "win–win" situation characterized by both financial and environmental benefits in a cost-effective way (Porter and Van der Linde, 1995; Murphy, 2000; Frondel et al., 2010).

The research on the determinants of general innovation is vast, such as technology pull and demand push. However, environmental innovation is different from other innovation activities for it also improves environmental quality. Previous studies have addressed the importance of certain factors to spur environmental innovation practices. However, the results are inconsistent, especially regarding the impact of government environmental regulations (Porter and Van der Linde, 1995; Brunnermeier and Cohen, 2003; Frondel et al., 2008; Eiadat et al., 2008). Therefore, it seems to be essential to analyze the variety of measures that may provide sufficient incentives to spur environmental innovation practices.

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On the other hand, a growing literature examines the relationship between environmental practices and firms' performance by both anecdotal cases and large-scale researches, however, the results are mixed (Porter and Van der Linde, 1995; Klassen and McLaughlin, 1996; Melnyk et al., 2003; Eiadat et al., 2008). The traditional economic view suggests that any environmental improvement effort made by a firm transfers the cost previously borne by society back to the firm, so there is a trade-off between environmental responsibility and financial performance. Nevertheless, some researchers have also suggested that environmental management actually lead to lower operations costs, lower waste, and thus higher profit margins. It is clear that the debate on the relationship between environmental practices and performance continues.

This study intends to extend the discussion of antecedents and consequences of environmental innovation practices, from the perspective of institutional theory and resource-based view. Following the "Institution – practice adoption – economic and social result" framework, the large-scale survey research is performed to explore the driving forces and the effects of environmental innovation practices on performance – both financial and environmental. Drawing on DiMaggio and Powell's (1983) framework, three dimensions of institutional pressure, namely, coercive pressure, normative pressure and mimetic pressure, are examined regarding their individual influence on environmental innovation practices and performance. Moreover, response to the debate on the relationship between environmental innovation practices and performance, we introduce resource commitment based on resource-based view as a moderator to test whether resource commitment has moderating the effect on this relationship. Specifically, we wish to address the following research questions:

(1) What are the effects of institutional pressures on firms' adoption of environmental innovation practices?
(2) Can environmental innovation practices really bring benefit to firms?
(3) Would the relationship between environmental innovation practices and performance be moderated by resource commitment?

In answering these questions, we provide three principal contributions to the current literature. First, we argue, and subsequently demonstrate by statistical analysis, that environmental innovation practices can be conceptualized through an institutional theory lens, thus provides new evidence and more comprehensive understanding on the determinants of environmental innovation practices. Second, though many studies have explored the value of environmental innovation practices, mixed results have been reported. Thus, the results of this study help to confirm the effects of environmental innovation practices on performance. Specially, the test of the moderating effect of resource commitment helps to provide a more comprehensive understanding on the consequences of environmental innovation practices. Third, this study uses data collected from manufacturers in China. A study with the Chinese data should validate the theoretical model developed based on western literature, and offer valuable insights to researchers and practitioners from both economic and cultural perspectives.

The remainder of the paper is organized as follows. The extant literature is reviewed and the hypotheses are developed in Section 2. The research methodology and data analyses are presented in Section 3, followed by the results and discussions in Section 4. Concluding remarks and suggestions for further research are presented in Section 5.

2. Hypotheses development

2.1. Drivers for environmental innovation practices

We explore the drivers for environmental innovation practices using an institutional theoretical framework. As Aldrich has argued, "The major factors that organizations must take into account are other organizations"(1979, pg. 265). Many researchers have recognized the importance of institutional theory in explaining firm's behaviors (e.g. Scott, 1995; Handelman and Arnold, 1999; McFarland et al., 2008; Zhu and Geng, 2013). Institutional theory proposes that how organizations can increase their ability to grow and survive in a competitive environment by satisfying their stakeholders. Here we refer to the three forms of institutional pressures identified by DiMaggio and Powell (1983), named as coercive pressure, normative pressure and mimetic pressure. Each of these three pressures suggests testable hypotheses relevant to examine the drivers of environmental innovation practices.

2.1.1. government regulations as coercive pressure

Previous literature interpreted government environmental regulations as an important coercive pressure to firms' environmental initiatives (Zhu and Sarkis, 2007; Sarkis et al., 2010). Porter and Van der Linde (1995) and Murphy and Gouldson (2000) pointed out that innovation-friendly regulations provide sufficient incentives to spur firms' environmental innovation practices. Some large-scale empirical proof, however, have found conflict results. Frondel et al. (2008) and Zhu and Geng (2013) find that regulatory pressures do not have a significant direct impact on firm's environmental behaviors. Eiadat et al. (2008) found significant negative effect of government environmental regulation on environmental innovation.

Another stream of research focus on the influences of different government policies: command-and-control instrument vs. economic incentive instrument, on environmental innovation practices. Some researchers viewed that economic incentive instrument is more effective than command-and-control instrument for it provides more flexibility for economic actors (Bernauer et al., 2006; Jaffe et al., 2004). Frondel et al. (2004) found policy stringency is more important than policy instrument choice. Others argued that the role of each instrument depends on different context, and no single best policy is suitable to all cases, thus should make the combination for different policy instruments (Kemp, 1997). Similar to Jaffe et al. (2004) study, we investigate the individual impact of command-and-control instrument (environmental regulations, emission standard, product bans) and economic incentive instrument (preferable tax, tradeable permits, subsidy) on environmental innovation practices, and propose that:

H1a. *Government command-and-control environmental regulation is positively associated with a firm's environmental innovation practices.*

H1b. *Government economic incentive instrument is positively associated with a firm's environmental innovation practices.*

2.1.2. Market demand as normative pressure

Normative pressure stems from pressure of professionalization (DiMaggio and Powell, 1983). Market demand can be a strong driver for firms' environmental initiatives (Bernauer et al., 2006) and form a core normative pressure (Zhu and Sarkis, 2007). Bansal and Roth (2000) found that the practices of corporate greening are more based on the initiatives to respond to consumers' "green consumerism". Hall (2000) also argues that many suppliers are often under great pressures from their customers. Lewis and