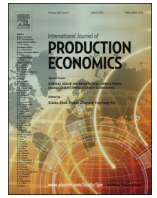




Contents lists available at ScienceDirect

Int. J. Production Economics

journal homepage: www.elsevier.com/locate/ijpe

The moderating effect of environmental dynamism on green product innovation and performance

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ARTICLE INFO

Article history:

Received 30 July 2015

Accepted 9 December 2015

Keywords:

Environmental dynamism
Green product innovation
Environmental regulations
Environmental management
Performance

ABSTRACT

Environmental management has been researched extensively in the last two decades. Pressure from environmental regulations or policies plays an important role to boost environmental management practices. Nevertheless, the relationship between such pressure and the ultimate firm performance is not very obvious. Although green product innovation has been recognized as a predictor to improve environmental performance, there is a lack of discussion in the literature to examine the mediating effect of green product innovation between the aforementioned pressure and firm performance. Additionally, most previous studies adopted a static view which ignores the implications on external dynamic factors in many empirical studies. In this connection, this study contributes to the field of knowledge by filling these two gaps. More specifically, this study: (i) examines the effect of green product innovation on the relationship between pressure of environmental regulations (or policies) and firm performance; and (ii) evaluates the moderating effect of environmental dynamism on the relationship between green product innovation and firm performance. A questionnaire survey is conducted in an emerging country, China, to verify the hypotheses.

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1. Introduction

Undoubtedly, various managerial practices are used to improve the performance of firms, such as that by better allocating their resources (e.g. Tse et al., 2012; Wu et al., 2013). This ultimately helps firms to generate profits and gain competitive advantage in the market. Specifically to the operations management domain, companies widely implement quality management strategies, like total quality management, to enhance customer satisfaction that in turn would contribute to the business performance (Jayaram et al., 2010). Environmental management is one recent concern that has received massive attention from both researchers and practitioners. Environmental management is now a widely adopted operations strategy (Gupta, 1995; Klassen and Whybark, 1999). Although with an explicit focus on addressing environmental concerns into implementing supply chain, surprisingly, only a

handful of studies can provide evidences that organizations may generate business opportunities to outperform their competitors (e.g. Vachon and Klassen, 2008; Zhu et al., 2008). Even cost efficiency, which is the traditional focus of operations management, has not been studied well in this regard (Porter van der Linde, 1995).

One main driver to the development of environmental management is the corresponding pressure from environmental regulations (Zhu et al., 2011; Tseng et al., 2013). Existing research mainly focuses on retailers' perspective to understand environmental issues by considering consumers' perception as the independent variable of environmental issues (Lee et al., 2012). One possible drawback of this approach is that the perception of consumers is somehow so subjective and difficult to measure exactly. In practice, environmental issues are usually affected by various factors, for instance, packaging and labels (Hyllegard et al., 2012). Thus, we advocate taking the perspective of suppliers to investigate environmental issues. Stated clearly, we argue that awareness to environmental related regulations or policies takes a crucial role to affect the integration of environmental issues into supply chains in companies. This is because one important, underlying driver of environmental management in organizations is the pressure from external regulations (Zhu et al., 2011). However, it is believed that

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such pressure cannot lead to good performance directly. This is explained below.

Researchers generally recognize that the success of integrating environmental issues into organization cannot be achieved easily if the concern of green innovation is not clearly addressed when developing business process for companies (Chen et al., 2006; Chen, 2008; Ziegler and Nogareda, 2009). Whether or not firms can boost their performance through environmental management would be a combination of many factors. Among them, the ability to provide green product innovation and the awareness of, hence pressure generated from, environmental regulations cannot be separated. However, this relationship has not been investigated. Therefore, it is worth studying the effect of green product innovation on the relationship between the aforementioned pressure and firm performance, which is the first research question of this work.

That being said, strictly static regulation and market may not necessarily result in technical efficiency (van der Vlist et al., 2007). As a matter of fact, the assumption that “external environmental is very stable” can hardly be justifiable on majority of, if not all, occasions. Like many operations management variables, environmental regulations and technology are always subject to change. In this connection, it is worth investigating the aforementioned relationship between the pressure of environmental regulations, green product innovation, and firm performance when the external environment is uncertain. Above can be explained through the lens of contingency theory because static theories or best practices for operations strategy are no longer effective (Sousa and Voss, 2008; Chavez et al., 2015). Environmental dynamism can be regarded as external uncertainty and can be defined as the rate of change or unpredictability prevalent in a firms' environment (Eroglu and Hofer, 2014). It is a possible moderating variable by taking the contingency view. This will be further explained in Section 2. In this connection, environmental dynamism is expected to have different degrees of moderating effect on the association between green innovations and firm performance. This is the second research question to be answered in this work.

To address the above-mentioned questions, this paper proposes a research framework that sets out to investigate the following research objectives:

- To examine the relationship among the pressure of environmental regulations, green product innovation, and firm performance;
- To investigate the moderating effect of environmental dynamism on the relationship between green product innovation and firm performance.

This paper therefore contributes to the environmental management research by understanding the relationship of the pressure of environmental policies and firm performance via green product innovation, and to study the moderating effect of environmental dynamism on the relationship between green product innovation and firm performance. The rest of the paper is organized as follows: Section 2 reviews existing studies, and then formulates the hypotheses accordingly. This is followed by Section 3 which outlines the research method and data collection. Section 4 presents the results. Finally, Section 5 discusses the findings and concludes this paper.

2. Literature review and hypotheses development

2.1. Pressure of environmental regulations/policies

Regulatory pressure is probably the key driver to push firms towards sustainable development, especially if the target markets include the member states of the European Union (De Brito et al., 2008). The REACH Directive (European Union, 2003) is a typical example that firms need to follow in order to control chemical substances being used in a product. Aligning firms' activities to the regulations would be a necessity. However, whether or not such alignment will eventually affect the firms performance is unclear. Firm performance is always a key concern of companies. However, to date, there is limited research investigating the relation between the pressures from the environmental regulations and business outcome. Empirical findings demonstrate that environmental regulations lead to improved environmental performance (Kagan et al., 2003). But conversion of such environmental performance to firm profitability, for example, may not be linear. For example, King and Lenox (2001) also find that there is a relationship between the environmental performance and financial gain, but which one is the cause or effect was unclear.

In China, environmental issues are notorious and hence the country also started imposing environmental regulation since 1980s, initially set by the State Environmental Protection Agency (SEPA), which is now rebranded as the Ministry of Environmental Protection (MEP) (McGuire, 2014; Bai et al., 2015). This is a reflection of the determination of the Chinese Government to tackle environmental issues. For example, MEP published the Chinese version of Waste Electrical and Electronic Equipment (WEEE) regulation in 2009 for the implementation in 2011 (Zhu et al., 2013). Such regulations definitely have exposed Chinese firms to great pressures, let alone the external pressures from other countries which require the exported products to comply with the respective regulations. In this connection, Bai et al. (2015) review the state-of-the-art in corporate sustainability development in China and the associated development of the regulatory pressures, which support the views of the authors of this article.

Therefore, we argue that the pressure of environmental regulations or policies may not directly lead to better firm performance. Hence, it is urged to gain more understanding on whether or not firms can convert the environmental performance achieved through the pressure of environmental regulations to firm performance. For instance, Rao and Holt (2005) provide empirical evidence that implementing green operations can enhance a company's competitiveness and economic performance. Moreover, there is a clear relationship between improvements in environmental performance and compliance with environmental regulations on a company's competitiveness (Bacallan, 2000). More recently, Shu et al. (2014) claimed that government support strongly mediates the effect on radical green product innovation than its effect on incremental product innovation. Therefore, the pressure of such environmental regulations, which will definitely affect the implementation of environmental practices, should also positively relate to the firm's performance. The next question is of course, what other factor(s) may be able to facilitate such process. In the next section, we will explore one such possible factor, which is green product innovation.

2.2. Green product innovation and firm performance

Green product innovation takes the environmental factors (e.g. material usage, energy consumption, etc.) into product design

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