

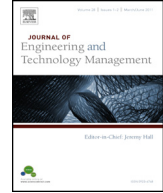


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Effects of eco-innovation typology on its performance: Empirical evidence from Chinese enterprises



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ABSTRACT

The reason for the lack of consensus on correlations between environmental performance and competitiveness may lie in scholars neglecting eco-innovation typology. To fill this gap, this study conducted regression analysis on 245 Chinese enterprises. The survey indicates the organizational eco-innovation is the most common with a ratio of 38.3%, then followed by process eco-innovation with 32.7%, product eco-innovation with 16.3% and end-of-pipe eco-innovation with 12.7%. The findings demonstrate that different types of eco-innovation do have significant influences on environmental performance and competitiveness. Firm size has differing impacts on environmental performance and competitiveness, being significantly positively associated with the former and not with the latter. Environmental regulation creates a positive effect on both firms' environmental performance and competitiveness, while the implementation of environmental regulation only significantly affects a firm's environmental performance and not its competitiveness.

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Introduction

Eco-innovation refers to “the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives” (Kemp and Foxon, 2007a, p. 4). In an effort to reduce or prevent negative environmental effects, eco-innovation has attracted significant attention among industrial practitioners, academic researchers, and government policy makers in the past several decades.

However, there is still a question mark over whether eco-innovation enhances the competitive advantage of a firm (Ambec, 2011; Wagner, 2005). In fact, there is no consensus regarding correlations between environmental performance and economic performance or competitiveness. That is to say, there is still no clear indication whether those correlations are positive, negative, or mixed, or even if these factors are correlated (Boons and Wagner, 2009). Perhaps this lack of clarity is a result of the dual nature of eco-innovation, as it can be viewed as both an innovation and an environmental measure (Rennings, 2000).

Underpinning the dual externality of eco-innovation are complex relationships between drivers, typologies and the performance of eco-innovation (Kemp and Foxon, 2007b). Researchers, such as Cleff and Rennings (1999), Rehfeld et al. (2007), Costantini and Mazzanti (2012), Rassier and Earnhart (2010) and Kesidou and Demirel (2012), have pointed out that eco-innovation features and types of environmental regulation have not been paid adequate attention, and thus the understanding of the effects these regulations have on a firm's eco-innovation performance is limited. Moreover, diverse regulatory measures add complexity to the issue (Wagner, 2006; Popp et al., 2011; Horbach et al., 2012).

Maintaining the balance between environmental and economic performance is more challenging in developing countries than in developed economies. In China, for example, eco-innovation practices are still embryonic, and most small and medium enterprises (SMEs) would perceive the costs of implementing eco-innovations to be prohibitive, and may not always have the resources to follow an optimal strategic eco-innovation strategy (Dong and Shi, 2013). Additionally, there has not been sufficient research in developing countries on eco-innovation measures and the sustainability performance of business practices (Dong and Shi, 2010).

This paper focuses on specific eco-innovation types, environmental regulations, and their impact on a firm's eco-innovation performance (including environmental performance and competitiveness). By scrutinizing empirical evidence from a sample of 245 Chinese enterprises, this paper identifies typologies of eco-innovation implemented in industrial enterprises, and then analyzes the mechanism of how those typologies affect a firm's eco-innovation performance, alongside environmental regulations and firm size.

Literature review

The typology of eco-innovation

Categorizing types of eco-innovation is a prerequisite of conducting eco-innovation research. Compared with research on general innovation, eco-innovation research acquires the new dimension of environmental management, which adds complexity. There are two ways to categorize eco-innovations.

The first way is to learn from categorization methods on general innovation (Huber, 2008). For example, Rennings (2000) assessed eco-innovation activity to categorize eco-innovations into technological, organizational, social, and institutional types. Laurentis and Cooke (2008) and Oltra and Saint (2009) differentiated eco-innovation by product innovation, process innovation, and organizational innovation types. The Measuring Eco-Innovation (MEI) project (2007) categorized eco-innovation into disruptive innovation, sustainable innovation, and system innovation according to innovation intensity. Another possibility is to categorize eco-innovation according to a firm's position in its supply chain and thus into initial product, process, end-product, and customer innovation (Huber, 2008).

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