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The Relevance of Complementarities in the Study of the Economic Consequences of Environmental Proactivity: Analysis of the Moderating Effect of Innovation Efforts☆

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ABSTRACT

In this paper, we present arguments and empirical evidence that highlights one key aspect of the study of the relationship between environmental proactivity and economic performance in firms: The effect of complementarities with other innovation-related resources. According to the literature, environmental proactivity—defined as the tendency to go beyond compliance with basic requirements established by law or institutionalized adoption of environmental practices in industry—enables firms to improve both economic and environmental outcomes. Within the framework of the resource-based view and the dynamic capabilities approach, we find that this win-win situation is far more likely when environmental proactivity is adopted in conjunction with a proactive innovation strategy. By analyzing panel data with 336 observations (42 Spanish industrial firms over an eight-year period), we demonstrate that environmental proactivity generates complementarities with technological proactivity that are sustainable and especially profitable in dynamic environments. More precisely, empirical evidence reveals that complementarities between environmental and technological proactivity are sustainable in groups of firms subject to high external pressure (such as that generated in the European Union Emissions Trading System context). Complementarities are also greater for companies during a financial crisis, a period characterized by high uncertainty and dynamism of the environment. This particularly advantageous win-win situation generated by environmental proactivity justifies its interpretation as a dynamic capability.

1. Introduction

Environmental management as a source of competitive advantage continues to be studied by many researchers from a resource-based perspective. The seminal studies by Hart (1995), Hart and Ahuja (1996), Russo and Fouts (1997), Judge and Douglas (1998), Sharma and Vredenburg (1998) and Hart and Dowell (2011) provide theoretical support for abundant empirical literature that does not always confirm the "it pays to be green" hypothesis. Indeed, studies on whether investment in environmental protection generates a positive economic performance in firms continue to feed the controversy (Wagner et al., 2002; Cainelli et al., 2013; Fujii et al., 2013; Trumpp and Guenther, 2015).

Two significant justifications can be presented to attempt to clarify this controversy. The first is related to the design of environmental strategy. Environmental strategy can be designed in different ways, and the chosen design conditions the possibility of obtaining positive economic results. Russo and Fouts (1997) were some of the first authors to underline the economic consequences of a *compliance strategy*, relative to a *go-beyond-compliance strategy*. Since then, studies by Klassen and Whybark (1999), Christmann (2000), King and Lenox (2002), Gonzalez-Benito and Gonzalez-Benito (2005), Aragón-Correa et al. (2008), Guenster et al. (2011), Sambasivan et al. (2013) or Ghisetti and Rennings (2014) provide empirical evidence that the largely *preventive* (versus *corrective*) nature and the *proactivity* of action taken (defined as the tendency to anticipate and go beyond mere regulatory compliance and normal industry standards) determines the likelihood of said action having a positive effect on economic performance.

The second argument that can justify mixed results in the study of the win-win hypothesis is related to the conditions and factors accompanying the implementation of environmental strategy. The idea that the relationship between environmental and economic performance depends on situational factors and external or internal conditions has been highlighted by many authors, such as Christmann (2000), Wagner and Schaltegger (2003), Cainelli et al. (2013), Antonioli et al. (2014), Amores-Salvadó et al. (2015) and Mazzanti et al. (2016).

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This study empirically analyzes the economic consequences of environmental protection in firms and considers how the above two factors can condition the sign of this relationship. As a first precaution, we have defined our object of study, environmental strategy, by considering whether it has been designed proactively. In fact, we have not studied the economic consequences of environmental protection in the broad sense but those of environmental proactivity. With this purpose and based on the definitions proposed by authors such as Sharma and Vredenburg (1998), Aragón-Correa and Sharma (2003), Buysse and Verbeke (2003) and Murillo et al. (2008), we interpret *environmental proactivity* as the firm's tendency to voluntarily apply environmental protection measures, largely based on prevention, to anticipate environmental protection requirements, and to go beyond regulatory compliance and the measures generally adopted in industry. Secondly, we are interested in the conditions that concur and complement or hinder the implementation of environmental proactivity and that can condition the possibility of obtaining economic results.

The objective of this study is to analyze if the economic consequences of environmental proactivity in firms are better when the firms are also proactive in technological innovation and if this additional advantage is sustainable in dynamic environments. Therefore, we investigate the possibility of positive complementarities between environmental and technological proactivity, and the stability and usefulness of these complementarities in dynamic environments.

The idea that spending resources on environmental protection generates complementarities with other resources (especially innovation and organizational change) is rooted in the literature (Wagner, 2007; Antonioli et al., 2013, 2014; Gilli et al., 2014; Mazzanti et al., 2016 for a review). The effect of these complementarities on business results has been less studied, especially regarding the economic results of firms. In addition, most of the studies of how complementarities affect economic results (Christmann, 2000; Hall and Wagner, 2012; Hottenrott et al., 2012; Antonioli et al., 2014; Amores-Salvadó et al., 2015; Rivera-Torres et al., 2015) use subjective measures based on information obtained from surveys and/or place less importance on the environmental strategy's degree of proactivity.

In this research, we delve deeper into the study of complementarities arising from the implementation of a proactive environmental strategy. We analyze the effect of these complementarities on the company's ability to obtain medium- and long-term economic results and analyze whether such an advantage is sustainable in dynamic environments. The conclusions obtained reinforce the interpretation of environmental proactivity as a dynamic capacity.

Some of this paper's additional contributions to the previous literature on the topic are, firstly, a persuasive and objective measurement of the firm's efforts regarding both environmental protection and innovation in general, which considers the mean investment efforts made by industry firms to calculate the degree of environmental and technological proactivity. Unlike most previous studies, we particularly emphasize the proactivity concept in both environmental and technological areas. Secondly, this study is based on an objective measurement of economic results, which considers the firm's capability to generate returns in the medium and long term.

The application of panel data econometrics to the estimation of coefficients is another distinctive aspect of this study. This method enables the estimation to incorporate the specific effects of each firm (for instance, effects related to expertise, culture or resources and capabilities) that have an impact on its performance, but are not measured by the regressors in the model.

This study is divided into six sections. The second and third review the related literature and present the theoretical arguments for characterizing environmental proactivity as a dynamic capability, which enables a sustainable advantage to be taken of complementarities with other resources related to the innovation. The fourth describes the samples, the variables used and the methodology. The fifth presents the results, and the last section summarizes and discusses the main conclusions arising from this research.

2. Environmental Proactivity and Innovation as Complementary Resources: The Dynamic Capabilities Perspective

In some seminal papers that define the Porter hypothesis, Porter (1991), Porter and Van der Linde (1995a, b), Esty and Porter (1998), and others establish arguments against the traditional view that there is a trade-off between environmental and financial results and maintain that environmental regulations generate stimuli for innovation in the process of searching for less polluting and more efficient production methods capable of generating competitive advantages. Hart (1995) refers to these arguments from the natural resource-based view of the firm and argues that environmental management capabilities improve environmental performance while providing competitive advantages through cost reductions, anticipating competitors and improving stakeholder relations. These arguments were further supported and extended in multiple studies identifying the resources and capabilities related to environmental protection that help to create competitive advantages (Russo and Fouts, 1997; Sharma and Vredenburg, 1998; Bansal, 2005; Walls et al., 2008).

Twenty years after the Porter hypothesis, however, the results found in the empirical literature that has studied this win-win perspective are contradictory and suggest that the relationship between environmental and economic performance is not as clear as it would appear.[1] The possibility of complementarities between resources spent on environmental protection and other internal resources is an aspect scarcely considered in the empirical literature that can explain the lack of consensus about the relationship between environmental and economic performance (Cainelli et al., 2013; Amores-Salvadó et al., 2015). In this regard, Cainelli et al. (2013) maintain that an argument that challenges the conventional pessimistic view of a trade-off between environmental and economic performance resides in complementarities and economies of scale and scope, which might lead to situations where environmental investment generates greater positive economic results. Possibly influenced by the Porter hypothesis, most of the literature on complementarities between environmental resources and other types of resources focuses on those related to either technological or organizational innovation (such as Christmann, 2000; Hottenrott et al., 2012; Antonioli et al., 2014; Amores-Salvadó et al., 2015; Rivera-Torres et al., 2015).[2] One of the first works in this respect is by Christmann (2000), who highlights the important role of a company's existing resources and capabilities for innovation. In her research, from data collected from a sample of US chemical firms, Christmann (2000) finds evidence that capabilities for process innovation and implementation are complementary assets that moderate the relationship between process-focused environmental practices and cost advantages. Christmann (2000) focuses on pollution prevention technologies, which, unlike pollution control technologies, have to be integrated in the production process and involve significant changes in production processes and practices. Based on this argument, Christmann (2000) suggests and empirically shows that successful implementation of pollution prevention

[1] Although many studies conclude that the relationship is positive (Dowell et al., 2000; King and Lenox, 2001; Konar and Cohen, 2001; Guenster et al., 2011; Cañón-de-Francia et al., 2007; Walls et al., 2008; Bosworth and Clemens, 2011; Nakamura, 2011; Wang et al., 2014), there is also empirical evidence that supports a negative, or insignificant relationship between resources spent on environmental protection and firm performance (Filbeck and Gorman, 2004; Elsayed and Paton, 2005; Telle, 2006; Ziegler et al., 2007; Cañón-de-Francia and Garcés-Ayerbe, 2009; Wagner, 2010; Lanoie et al., 2011).

[2] Some of the internal factors shown to affect the relationship between environmental and economic performance are innovation (Christmann, 2000; Ferreira et al., 2010; Hall and Wagner, 2012; Grekova et al., 2013), technological know-how (Cañón-de-Francia et al., 2007), organizational change effort (Huang and Wu, 2010; Hottenrott et al., 2012; Antonioli et al., 2014; Rivera-Torres et al., 2015), degree of absorptive capacity (Delmas et al., 2011) or type of environmental innovation (Rexhäuser and Rammer, 2014; Ghisetti and Rennings, 2014).