



Analysis

Unraveling the effects of environmental outcomes and processes on financial performance: A non-linear approach



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ABSTRACT

We examine the roles of the outcome and process dimensions of environmental performance in determining financial performance as measured by Tobin's q . Outcomes refer to the impacts of the firm on the natural environment, while processes are the firm's actions to reduce these outcomes. We focus on a specific outcome – carbon emissions – and suggest that it affects Tobin's q non-linearly. We find that firms achieve the highest financial performance when their carbon performance is neither low nor high, but intermediate. We also find that environmental processes moderate this relationship as they reinforce firms' financial performance through improved stakeholder management. This mixed picture suggests that firms do not generally internalize the costs of poor carbon performance, but those that stand out in both environmental outcomes and processes achieve net financial benefits. These findings are based on a sample of carbon-intensive firms that disclosed their greenhouse gas (GHG) emissions through the Carbon Disclosure Project from 2007 through 2013.

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1. Introduction

Despite 25 years of intense research, the link between the firm's environmental and financial performance remains a subject of intense interest and debate both in economics and management. From the early works of Porter (1991), Jaggi and Freedman (1992), and Blacconiere and Patten (1994) to the meta-analysis studies conducted by Margolis and Walsh (2003), Orlitzky et al. (2003), and more recently Horváthová (2010) and Albertini (2013), scholars have advanced theoretical arguments to support or reject the hypothesis that “it pays to be green.”

The extant research yields contradictory results, suggesting that corporate actions to offset environmental pollution are likely to pay off (e.g., Christmann, 2004; Hart and Ahuja, 1996; Konar and Cohen, 2001; Russo and Fouts, 1997; Wagner, 2010), that environmental and financial performance are negatively associated (Blacconiere and Patten, 1994; Cordeiro and Sarkis, 1997; Walley and Whitehead, 1994), that there is no significant relationship between the variables (King and Lenox, 2002), and that the causality is unclear (Margolis and Walsh, 2003). Similarly, most meta-analyses find that environmental performance is positively, but weakly, correlated with financial performance, although the variation in results across studies is significant.

The lack of conclusive results has led many scholars to reformulate the research question into *when* and *how* it “pays to be green,” and to focus on the conditions that drive this relation and allow firms to

capitalize on sustainability-oriented efforts (Ambec and Lanoie, 2008; Orsato, 2006). Moreover, some scholars highlight the necessity of clarifying the reliability and validity of the focal constructs analyzed (Walls et al., 2011).

In this paper, we build on the literature that distinguishes between the *process* and *outcome* dimensions of environmental performance (Busch and Hoffmann, 2011; Delmas et al., 2013) to study its relationship to financial performance. Environmental processes include firms' initiatives to address environmental problems (e.g., environmental management systems or cleaner technologies). Environmental outcomes capture the firm's impact on the natural environment (e.g., carbon emissions, pollution, and waste). Delmas et al. argued that “companies may excel at reporting, governance, and the utilization of environmental performance systems but still emit substantial amounts of pollution.” (2013: 263). The reasons are that firms may be ineffective in their efforts, that it may take time for investments in environmental practices to produce benefits, or even that firms act for merely symbolic purposes to influence markets without achieving substantial improvements in environmental outcomes (Bansal and Clelland, 2004).

We focus on a specific outcome, *carbon emissions*, since climate change and carbon management have become important determinants of corporate strategy and acquired the potential to impact the bottom line through regulatory and stakeholders' pressures (Howard-Grenville et al., 2014; Reid and Toffel, 2009). Compared to other outcomes or environmental performance in general, research on the impact of carbon emissions on financial performance is relatively underdeveloped, even though recent contributions have begun clarifying it (e.g., Busch and Hoffmann, 2011; Hatakeda et al., 2012; Iwata and Okada, 2011; Lioui

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and Sharma, 2012). Using a non-linear approach, we contribute to this nascent literature by hypothesizing and testing an interaction between carbon emissions and environmental processes in determining firm financial performance.

Many scholars have countered the dominant assumption of linearity in studies on the relationship between environmental and financial performance (Brammer and Millington, 2008; Marcus and Fremeth, 2009; Wagner et al., 2002). Barnett and Salomon (2012) provided evidence of a U-shaped relationship between corporate social performance and financial performance, showing that while engaging with socially and environmentally responsible practices is initially costly for firms, after a certain point, these costs are paid off and offset by the benefits from improved relations with stakeholders.

Regarding carbon emissions, Tatsuo (2010), Hatakeda et al. (2012), and Fujii et al. (2013) tested a U-shaped relationship in the context of Japanese manufacturing firms. However, these studies did not consider the interaction between outcome and process dimensions and used accounting measures of the dependent variable (such as ROA or ROS). In this paper, we measure financial performance through Tobin's q , which captures a firm's future stream of earnings, incorporating the expected long-term benefits of improved environmental outcomes and processes. Busch and Hoffmann (2011) studied the interaction between carbon emissions and environmental processes, but did not include non-linear effects. To our knowledge, Tobin's q has not yet been used to estimate a non-linear relationship between carbon emissions and financial performance.

To test our hypotheses, we studied a sample of 127 global firms that operate in carbon intensive industries (energy, materials, industrial, and utilities) and reported their greenhouse gas (GHG) emissions through the Carbon Disclosure Project (CDP) between 2007 and 2013. The paper is organized as follows. In Section 2, we review the extant literature and develop our hypotheses. In Section 3, we present our data, describe our methodology, and discuss the results. We provide our conclusions in Section 4.

2. Hypotheses Development

2.1. Environmental Performance: Process Versus Outcome

Stakeholder theory (Donaldson and Preston, 1995; Freeman, 1984) is often employed to explain differences in firm's financial performance with regard to environmental issues (e.g., Delmas and Toffel, 2008; Wagner, 2011). Several scholars observed that stakeholders tend to favor relationships with companies that are more aligned to their expectations. For example, CSR practices tend to increase customers' trust (Castaldo et al., 2009); responsible consumers are willing to pay a premium price for more sustainable products (Brown and Dacin, 1997); employees are attracted and motivated by companies that are environmentally and socially conscious (Brammer et al., 2007); policy makers may reduce their regulatory, legislative, or fiscal pressures for responsible companies (Hillman and Keim, 2001); and sustainable firms can attract financial investors (Doh et al., 2010). The benefits for firms are expected to depend on the capacity to respond to and influence stakeholders (Barnett, 2007). On one hand, attention to environmental and social issues can provide important resources, offsetting the costs of initiatives (Brammer and Millington, 2008). On the other hand, for firms that lack the ability to build valuable ties with stakeholders, the costs of initiatives can be superior to the benefits, decreasing financial performance.

A further complexity is that stakeholders can react differently to different dimensions of a firm's environmental performance. Recent contributions highlighted the difference between process and outcome measures (Busch and Hoffmann, 2011; Delmas et al., 2013). These are a reaction to empirical studies that "have often blurred the lines between environmental management and environmental performance" (Walls et al., 2011: 74), for example, using pollution as a proxy for a

firm's environmental management strategy, or adopting environmental management systems as proxies of emissions. Similar studies are methodologically suspicious because, as Delmas et al. (2013) remark, "Process measures indicate the efforts a company invests in attempting to mitigate its environmental impacts. Although process measures represent a potential for improvement in outcome performance, there is no guarantee that such improvements will indeed materialize" (258).

While the theoretical distinction between process and outcome measures is well established, there is no consensus on the impacts of these dimensions on a firm's financial performance. Delmas et al. (2013) determined that corporate financial performance is positively and linearly associated with process measures but not with outcome measures. Busch and Hoffmann (2011) theorized that better environmental outcomes linearly and positively translate into superior financial performance while environmental processes moderate the relationship, such that these processes increase financial performance when outcomes are low but decrease financial performance when outcomes are high. However, their data did not support the expected moderation.

When examining environmental outcomes, it is important to consider that there may be many types such as air emissions, water emissions, waste, resource consumption, and effects on ecosystems. Each type can affect financial performance with a different sign or strength. Iwata and Okada argue that, "each environmental issue has different characteristics such as the scope of pollution (e.g., local or global), length of time until damages emerge, severity of the damages, facilities for specifying the polluters, and existence of regulations and international treaties. These various characteristics suggest that different stakeholders may place emphasis on different environmental issues" (2011: 1692).

Building on stakeholder theory, stakeholder interest in different environmental problems and the firm's ability to provide responses may affect financial performance in different ways, thus leading to mixed results. Accordingly, we isolate a single environmental outcome. Following Busch and Hoffmann (2011), we focus on a measure – carbon emissions – that reflects a firm's contribution to climate change, a broadly relevant issue for business, policy makers, and stakeholders. Climate change has become a strategic issue for companies, and carbon performance is one of the most relevant, non-financial piece of information collected by stakeholders (Eccles et al., 2011).

2.2. Environmental Performance: Non-linear Effects on Financial Performance

The view of a non-linear relationship between environmental and financial performance emerged with Wagner et al. (2001, 2002), who argued that the "environmental and economic performance of firms does not have to be unidirectional but can change from positive to negative, or vice versa" (2001: 99). They continued that "the relationship between environmental and economic performance can be represented through a bell-shaped (i.e., inverse U-shaped) curve" (2001: 99). Brammer and Millington (2008) proposed a more articulated framework of these linkages, and introduced two descriptive models based on non-linear relationships. In one, the positive financial payoffs to good social performance are subject to diminishing and eventually decreasing returns. This suggests an inverse U-shaped relationship between social and economic performance. In the other model, they associated high financial performance with either very high or very low levels of social performance, implying a U-shaped curve. Subsequently, Barnett and Salomon (2012) found evidence of a U-shaped relationship between social and financial performance. In particular, they observed that benefits vary across the range of corporate social performance, such that when the capacity to influence stakeholders accumulates, benefits are generated that balance and then exceed the costs of socially responsible initiatives.

Focusing on Japanese companies or those listed on the Tokyo Stock Exchange, recent studies on environmental and financial performance

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