Journal of Environmental Management 190 (2017) 158–169

Contents lists available at ScienceDirect

Journal of Environmental Management

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

Research article

Environmental management and labour productivity: The moderating role of capital intensity

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ARTICLE INFO

Article history:
Received 13 July 2016
Received in revised form
13 November 2016
Accepted 23 November 2016
Available online 29 December 2016

Keywords:
Labour productivity
Environmental management
Capital intensity
CO_2 emissions
Firm performance

ABSTRACT

Recent years have seen firms improve their environmental practices, although the question still remains as to whether or not investing in such practices is or is not beneficial or simply a matter of image. This study focuses on labour productivity as a measure of performance, and we argue that the impact of greater environmental performance on that productivity is moderated by capital intensity. A sample of 2823 plants provides empirical evidence to support our approach. Specifically, the analyses, making use of estimates based on multiple regression models, reveal that environmental management has a positive impact on labour productivity in organisations with low capital intensity, although that impact becomes negative in cases of high capital intensity.

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1. Introduction

The relationship between a firm and its natural environment has become a controversial issue in recent years. On the one hand, there are those who believe that protecting the environment puts a brake on economic development; then there are those who view firms as the agents of environmental destruction, and more recently, there are others who maintain that adopting eco-friendly practices is not only good for the environment, but also for employees and earnings. This diversity of opinions and stances may well explain why environmental issues are now considered to be a priority line of research in the business field (Dixon-Fowler et al., 2013).

As the amount invested in reducing pollution is increasing, (Berman and Bui, 2001), the question thus arises as to whether it benefits a firm to invest in environmental management practices or whether it is a burden to be avoided (Wang and Choi, 2013). The results forthcoming accordingly are hardly conclusive and, in many cases, even contradictory (Guenther and Hoppe, 2014), which suggests that the relationship between environmental management and firm performance is of a contingent nature and depends on a series of moderating variables that need to be identified. The overriding aim of this study will therefore be to pursue this line and analyse the moderating role that capital intensity plays in that relationship.

The manner in which environmental management affects financial performance has been the subject of numerous research papers, specifically since the 1970s - a time that signalled the beginning of today's environmental movement (e.g. Nishitani et al., 2014). The first studies on corporate environmental management tended to focus on the possible repercussions environmental management had on firm performance, both positively (Porter and Van Der Linde, 1995) and negatively (Allouche and LaRoche, 2007). Works based on the resource-based approach have coincided in supporting a positive effect, explained as the outcome of the generation of a series of organizational capabilities (Christmann, 2000; Majumdar and Marcus, 2001; Russo and Fouts, 1997; Sharma and Vredenburg, 1998). Some of these capabilities explicitly refer to the values and skills developed by an organisation's human resources (Russo and Fouts, 1997), thereby suggesting that the human factor and, in particular, labour productivity, has a decisive role to play when assessing the competitive effects of the efforts made in environmental matters. With all this in mind, we have focused our study's objective on analysing the moderating effect of capital intensity on the relationship between environmental management and labour productivity. For managers and executives, this research is a source of information that helps them making decisions regarding what policies and strategies continue to counteract the negative effects of environmental management in enterprises with

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http://dx.doi.org/10.1016/j.jenvman.2016.11.051
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high capital intensity.

In step with greater globalisation and increased market competition in industrial products, labour productivity has now more than ever become a decisive factor of competitiveness in international markets. High labour productivity implies a lower unitary cost and, therefore, better global positioning in markets worldwide (Fallahi et al., 2010). In view of this, there has been growing interest in the literature on the factors that affect labour productivity. Although firm-level studies indicate that factors such as spending on R&D, Information Technology (IT), export intensity, firm size and other major aspects impact upon labour productivity (Romer, 1990; Grossman and Helpman, 1992; Lichtenberg, 1993; Brynjolfsson and Hitt, 1995; Snodgrass and Biggs, 1995; Baldwin et al., 2002; Papadogonas and Voulgaris, 2005; Van Biesebroeck, 2005; Leung et al., 2008), the effect of environmental management remains unresolved. The first investigations to address this issue considered a negative relationship, arguing that changes in environmental management (determined by changes in environmental legislation) might compromise the comparative advantage of a well-established country (Pethig, 1976; Siebert, 1977; Yohe, 1979; McGuire, 1982). Yet studies such as those by Delmas and Pekovic (2012) contradict this early research by reporting a positive relationship between environmental management and labour productivity.

The fact is that the literature evidence is contradictory. We have found papers positing both a negative and a positive effect regarding the relationship between environmental management and labour productivity. This has triggered a debate that still remains open today, and in which authors such as Jaffe et al. (1995) have already singled out heterogeneity bias and measurement error as potential problems that may explain the diversity in empirical results. These initial ideas lead us to believe that these contradictory results may be because the majority of the studies have sought a direct relationship, ignoring sundry factors that moderate the relationship and which should be considered in order to understand it. The choice of a biased sample regarding some of these moderating factors may lead to outcomes that are completely the opposite to those of other samples biased the other way round.

Our position here, based on prior evidence linking capital intensity to labour productivity and environmental management practices (Hayes and Wheelwright, 1984), is that such intensity negatively moderates the relationship between environmental management and labour productivity. In other words, the higher that intensity is, the more negative the impact environmental management has on labour productivity. We initially adopt a neutral position, compiling arguments both in favour of a positive relationship between environmental management and labour productivity and in favour of a negative one. Regardless of what this relationship ultimately is, we argue that it will be worse (more negative or less positive) as the organisation's capital intensity is higher.

The remainder of the article is organised into five sections. Section 2 introduces the main concepts, the literature review and we formulate our working hypotheses. The methodology used in the empirical study is described in section 3, and then section 4 presents the results of the analysis made. The main implications of the evidence obtained are discussed in section 5, with section 6 providing an overview of the paper's conclusions.

2. Theory and formulation of hypotheses

2.1. *Negative relationship between environmental management and labour productivity*

Some academics concerned about the relationship between the performance of companies and the natural environment have investigated the motivations of their ecological response capacity, which suggest that firms may be ecologically responsive to complying with legislation, to building better stakeholder relationships, to acquiring economic wealth and competitive advantage, and to maintaining ecological balance (Bansal and Roth, 2000). Gollop and Mark (1983) and Christiansen and Haveman (1981) found evidence that environmental practices with a view to reducing SO_2 levels slowed growth in productivity in the US in the 1970s by 43%. Similarly, Jaffe et al. (1995) highlighted the negative impact of environmental management on productivity, arguing that new environmental regulations will create more tasks and the use of more resources in the production process. Consequently, when organisations invest millions of dollars every year to improve their environmental management (Portney and Stavins, 2000), they end up restricting their financial opportunities (Christiansen and Haveman, 1981; Conrad and Morrison, 1989). Other authors argue that industry productivity falls because the inputs of capital, labour and energy are being diverted to environmental management (e.g. Repetto, 1990; Solow, 1992; Becker, 2011), causing the environmental investments to displace more productive investments in the firms (e.g. Fujii et al., 2013). Therefore, we have classified under two headings the factors that, depending on the ability of firms to respond ecologically, can affect labour productivity: non-core activities and non-productive investments.

2.1.1. *Non-core activities*

Several studies consider the role of human resources to be crucial in the environmental management of companies (e.g. Jackson and Seo, 2010; Jackson et al., 2011; Ones and Dilchert, 2012; Renwick et al., 2011). According to Harvey et al. (2013) and Jackson et al. (2014) this is because achieving environmental objectives requires capital, human talent, energy and cooperation. But this may have an adverse effect on labour productivity, because it forces companies to devote resources and labour to environmental non-core activities (Jaffe et al., 1995; Palmer et al., 1995) such as environmental auditing, waste treatment, and litigation (Christiansen and Haveman, 1981). Becker (2011) supports these arguments with similar results: Environmental management affects labour productivity by increasing the number of tasks and deviating human resources from the production system to the management of environmental issues.

Cañón-de-Francia et al. (2007) found that compliance in environmental management implements an adaptive process in companies, which is not only expensive but also affects future profits, as it modifies the systems and methods of production. It is difficult to predict the future state of environmental regulation In consequence environmental practices must be continually adjusted to meet new circumstances (Engau and Hoffmann, 2011). Any instability arising from environmental regulations can confuse managers and policy makers (Hoffmann et al., 2009). Managers invest more resources and manpower to enforce environmental management due to this misperception (Aguilera and Ortiz, 2013). Therefore, many economists argue that environmental management hinders the growth of labour productivity because it shifts human resources to obtain an environmental quality that is not included in the standard measures of production and productivity.

2.1.2. *Non productive investments*

Stricter environmental management practices have a great influence on organisations because they reduce organizational flexibility to address environmental problems and, generally, require significant capital investments (e.g. Portney and Stavins, 2000; Aguilera and Ortiz, 2013). Companies have to modify their

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