Analysis

Does environmental performance affect financial performance? A meta-analysis

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A B S T R A C T

What do we know about the impact of environmental regulations/performance on firm performance? After more than three decades of theoretical as well as empirical research, the results seem to remain inconclusive. Some papers suggest that regulations harm firms, while others claim that regulations may contribute positively and give an impetus to innovations. Therefore, I examine the heterogeneity in financial–environmental performance nexus, empirically carrying out a meta-regression analysis of 64 outcomes from 37 empirical studies to uncover the underlying factors, which can influence the observed variation in the empirical results. The results suggest both that the empirical method used matters for the nexus and that the likelihood of finding a negative link between environmental and financial performance significantly increases when using simple correlation coefficients instead of more advanced econometric analysis. The results also indicate that the portfolio studies tend to report a negative link between environmental and financial performance. This likely reflects the omitted factors in portfolio studies. The positive link is found more frequently in common law countries than in civil law countries. The results also point to the importance of appropriate time coverage to establish a positive link between environmental and financial performance.

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1. Introduction

How does environmental performance/regulation affect financial performance? After more than three decades of theoretical as well as empirical research, the results still seem to be inconclusive (Konar and Cohen, 2001, Wagner, 2001). Regarding the theory, researchers within the neoclassical school argue that environmental regulation imposes additional costs for firms (Palmer et al., 1995; Walley and Whitehead, 1994). Standard neoclassical theory argues that improved EP leads to an increase in costs. This view is based on the premise that pollution abatement and environmental improvements have decreasing marginal net benefits. On the other hand, Porter (1991) puts forward that environmental regulation can lead to win–win situations in which both social welfare as well as private benefits of firms increase. Similarly, Porter and van der Linde (1995a,b) argue that properly designed environmental regulation may give rise to innovations, which can partly or fully offset the cost of complying with environmental law. They claim that environmental innovations are likely to happen because pollution is a sign of economic inefficiency. However, these two views (a negative “traditionalist” vs. a positive “revisionist” relationship between EP and FP) are challenged by a third line of thought that proposes an inverse U-shaped relationship (Lankoski, 2000, Wagner, 2001). This view predicts a positive relationship between EP and FP up to the level of EP where economic benefits are maximised. In addition, McWilliams and Siegel (2001) argue for a neutral relationship between social and FP because firms that do not invest in social responsibility will have lower costs and lower prices, while firms that invest in social responsibility will have higher costs but will have customers eager to pay higher prices.

On the empirical side, King and Lenox (2001), Konar and Cohen (2001), Russo and Fouts (1997) find that it pays to be green, that is, EP contributes positively to the FP, while others find the opposite, such as Cordeiro and Sarkis (1997), Jaggi and Freedman (1992), Stanwick and Stanwick (1998) and some authors cannot reach a clear conclusion, such as Cohen et al. (1997), Earnhart and Lizard (2007a) or Wagner (2005). Nevertheless, Wagner (2001) notes that previous literature reviews indicate a moderate positive relationship between EP and FP or that no systematic relationship exists. On the other hand, Cordeiro and Sarkis (1997) note that previous empirical evidence tends to find a short-term negative relationship, while long-term impacts appear to be more promising.

The explanations for why empirical results between EP and FP are inconclusive vary as well. For example, Konar and Cohen (2001) argue that early empirical studies suffer from several problems, such as a small sample size and the lack of objective environmental criteria. Cohen et al. (1997) explain that a lack of objective criteria to evaluate EP also exists. Other problems with early studies are that they often did not account for important moderating factors such as the firm size or country location (Wagner 2001). Filbeck and Gorman (2004) suggest that the contradictory findings are influenced by the fact that environmentally efficient companies can be efficient in other production processes as well. Another considerable factor is that successful companies can spend...
more on environmentally friendly technologies. Griffin and Mahon (1997) point out to the difficulty of generalising the results of particular studies because of the absence of clear definitions of EP and FP. Another problem with empirical studies is that some studies omit certain variables that influence profitability (Elsayed and Paton, 2005). Derwall et al. (2005) and Ullman (1985) note that inconclusive research outcomes are mainly explained by both different methodologies as well as financial and environmental variables.

To my knowledge, the underlying factors behind the variation in the results on the link between EP and FP have not been studied systematically. Therefore, in this paper, I bridge this gap in the literature and empirically address the heterogeneity in the financial–environmental nexus within the meta-regression analysis of financial and environmental performance.

A meta-analysis is a recently widely used method to summarise and assess the vast empirical results of research in a comprehensive manner. While it originated in the medical research, meta-analysis has also been extensively applied in economics in recent decades (Stanley, 2001; Stanley and Jarrell, 1989). In economics, meta-regression is used especially to model heterogeneity in empirical outcomes (Stanley, 2001). As a result, the outcomes of each study are explained by the characteristics of the study, such as the econometric methods, the country coverage or the type of variables employed. Meta-regression can thus shed light on the underlying reasons of study-to-study variations. For example, Florax et al. (2005) use meta-regression to investigate the variations in willingness to pay for reduced pesticide-risk exposure. Debrezion et al. (2007) use meta-analysis to evaluate the impact of railway stations on the property value. Frooman’s (1997) meta-analysis of 27 event studies finds that corporate social irresponsibility significantly decreases shareholders’ wealth. Applying meta-analysis, Cavlovic et al. (2000) find that both methodological choice and pollutant types affect the estimates of the environmental Kuznets curve. Li et al. (2007) also reach similar conclusions based on an extended sample of Cavlovic et al.’s (2000) data. Recently, Richardson and Loomis (2009) have provided a meta-analysis of economic value of threatened, endangered and rare species. An extensive overview of meta-analysis in environmental and resource economics is available in Nelson and Kennedy (2009).

In this paper, I employ a meta-analysis framework to uncover the factors underlying the heterogeneity in environmental and financial nexus observed in empirical studies. Using the meta-regression analysis, I investigate whether the methodological choice (e.g., the type of estimation method) or the data type (e.g., American vs. European studies) can influence the research outcomes. The methodological choice is represented with different estimation methods, such as correlation coefficients or panel data models. I also examine whether time coverage and the number of observations play a role in this heterogeneity. Next, I investigate both whether the relationship between EP and FP has geographical elements to shed light on the potential differences in law systems (Di Vita, 2009) as well as whether the type of environmental and financial variables used can influence the outcomes. I also control for whether the study was published in a refereed journal.

The paper is organised as follows. In Section 2, I describe the data and econometric methodology. Section 3 summarises the empirical results. Conclusions are provided in Section 4. An appendix with descriptive statistics and the details on the papers included in the meta-analysis follows.

2. Data and methodology

2.1. Data

Studies to be included in the meta-analysis were identified by the extensive literature search during the period December 2008–February 2009. Scopus, Econlit, Google Scholar, RePEc as well as extensive Internet search and cross-references were examined. The primary criterion for selection was that the paper empirically investigates the impact of EP on FP, irrespective of the particular quantitative method employed. The baseline estimates do not include studies that only approximate EP with environmental certification or the adoption of an environmental policy because the link between EP and environmental certification or the adoption of environmental policy is not necessarily correlated with better EP (see, e.g., Darnall and Sides, 2008). Nevertheless, in order to test the sensitivity of the results, an extended sample that also includes studies based on participation in an environmental program or the adoption of environmental policy is also examined. Appendix A reports the complete list of environmental variables employed in each study used. The studies published in refereed journals as well as papers presented in conferences or published as a working papers are included to compare the outcomes of published and unpublished papers. A similar approach was adopted or recommended, for example by Stanley (2001) and Woodward and Wui (2001).

In this study, I analyse the outcomes of regression analyses and portfolio studies and not event studies. This is motivated by the fact that regression and portfolio studies usually examine long-term (in months or years) relationships between EP and FP and event studies examine short-term (in days) stock-market reactions. For a meta-analysis of event studies, see Frooman (1997). Given that social responsible portfolios are set up not only on environmental criteria but also on, for example, nuclear involvement, military works, family benefits, charitable giving, and so on, the EP of the included companies is not straightforward, studies that compare returns of socially responsible portfolios and “standard” portfolios are not included as well. The final sample consists of 64 outcomes from 37 empirical studies. For comparison, the sample is thus largely comparable to other well-known meta-analyses, such as Darnall and Sides (2008), who use 9 studies, Ashenfelter et al. (1999), who employ 96 different outcomes from 27 studies and Egert and Halpern (2006), who utilise 32 research papers.

Each study was carefully examined to identify the estimated relationship between EP and FP and factors that can influence it (number of years, country coverage, variables used, etc.). Because studies generally involve more than one model specification, each study was examined for whether the results are stable across the specifications and whether some general conclusion can be determined from the study. If one paper reached different results in terms of the EP–FP nexus, then more results were included in the meta-analysis for one study. If one study identified, for example, no relationship for model specifications without a lagged EP but a positive relationship for the specifications with lagged EP, then the study was included only twice in spite of more than two model specifications in the primary study. To deal with the possible over-representation of primary studies that reach heterogeneous findings, I employed the ordered probit estimation technique with sampling weights (more on the estimation below).

The explanatory variables can be classified as either the methodological or data type. Methodologically independent variables include the estimation method: multiple regressions—cross-section or pooled estimates (30 observations), correlation coefficients (4 observations), panel data analysis (14 observations), portfolio studies (12 observations) and 3SLS (4 observations). The data-type explanatory variables characterise the data used in primary studies: the number of years and number of observations employed, information on whether the paper was published in a refereed journal, country coverage (North America vs. Europe), the type of financial variable used (accounting vs. market-based or the mixture of market-based and accounting), the type of environmental variable (qualitative or quantitative), the year of publication and the number of lagged years of the environmental variable. A dummy variable was constructed for each estimation method. All of the above-mentioned explanatory variables are dummy variables other than the number of years, the date of publication, the number of lagged years and the number of observations. Descriptive
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