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How to reconcile environmental and economic performance to improve corporate sustainability: corporate environmental strategies in the European paper industry

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Abstract

This paper discusses the relationship between environmental and economic performance and the influence of corporate strategies with regard to sustainability and the environment. After formulating a theoretical model, results are reported from an empirical analysis of the European paper manufacturing industry. New data are used to test hypotheses derived from the theoretical model, using environmental performance indices representing different corporate environmental strategy orientations. In particular, an emissions-based index largely reflecting end-of-pipe strategies and an inputs-based index reflecting integrated pollution prevention are distinguished. For the emissions-based index, a predominantly negative relationship between environmental and economic performance is found, whereas for the inputs-based index no significant link is found. This is consistent with the theoretical model, which predicts the possibility of different relationships. The results also show that for firms with pollution prevention-oriented corporate environmental strategies, the relationship between environmental and economic performance is more positive, thus making improvements in corporate sustainability more likely. Based on this last insight, managerial implications of this are discussed with regard to strategy choices, investment decisions and operations management.
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1. Introduction: a theoretical model of the relationship of environmental and economic performance at the firm level and the influence of strategy choice

The longer-term relationship between environmental performance and economic performance (in terms of both financial/accounting ratios and market-based measures) has been studied for over a decade with a more detailed review of this body of literature provided by Günther et al. (2004), Wagner (2001). Whilst earlier studies are based on both univariate (e.g. Jaggi and Freedman, 1992; Cohen et al., 1995) as well as multivariate (e.g. Cormier et al., 1993; Cormier and Magnan, 1997) analysis, more recent studies apply multivariate techniques (e.g. Cohen et al., 1995; Konar and Cohen, 2001; Ziegler et al., 2002) up to the point

of using panel models (e.g. King and Lenox, 2001) and simultaneous equations approaches (e.g. Al-Tuwaijri et al., 2004). Next to empirical analyses with a longer-term time horizon, the short-term relationship between environmental and economic performance is analysed on the basis of so-called event studies, some of which also analyse the effect of environmental disclosure on the short-term influence of environmental performance on economic performance (e.g. Blacconiere and Patten, 1994). The study, which is reported in this paper analyses the longer-term relationship of environmental and economic performance based on multivariate regression analysis making use of (fixed and random effects) panel models. This is to overcome the deficiencies of univariate techniques and take into account the panel structure of the data.

The objective of this research is to establish the relationship between the environmental performance and economic performance at the firm level in the European Union (EU), based on an analysis of companies in one

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specific industrial sector in four EU countries. The industrial sector chosen for analysis is the pulp and paper industry.[1] The countries in which firms in this sector are analysed are Germany, Italy, the Netherlands and the United Kingdom of Great Britain.[2] The main research question this paper addresses is 'What is the relationship between the environmental and economic performance of firms in specific industrial sectors and what is the influence of corporate environmental strategies on this relationship?'. Corporate environmental strategies (CES) are distinguished here in terms of end-of-pipe and integrated pollution prevention strategies (based on actual physical environmental performance of companies) both of which can also be linked to the Environmental Shareholder Value (ESV) concept of Schaltegger and Figge (1998).

Environmental performance is characterized throughout this paper on the basis of quantitative indicators describing mass, energy and pollutant flows, and different specifications of environmental performance (linked to end-of-pipe or pollution prevention orientations, respectively) are related to the economic performance of firms in order to address the above research question and to identify a possible relationship between environmental and economic performance of firms. An important extension of prior work is that this research accounts for the possibility of a non-linear link between environmental and economic performance.

Following the argument made by Schaltegger and Synnestvedt (2002) an inversely U-shaped curve would represent the 'best' possible case for the relationship between environmental and economic performance, since it allows for the existence of win-win situations with profitable environmental performance improvement activities. Alternatively, if environmental performance improvements can only increase costs and reduce profits for an individual firm, this would not be possible. Under such conditions, the optimal level of environmental performance for a firm would be the one prescribed by environmental regulations, i.e. compliance without over-compliance (represented by the dotted line in Fig. 1 below).

Fig. 1 summarises these considerations in joining both relationships in one graphic representation. This also shows the possibility of the relationship evolving over time due to innovation, as suggested by Porter (1991). This means, that over time, for a defined level of environmental performance,
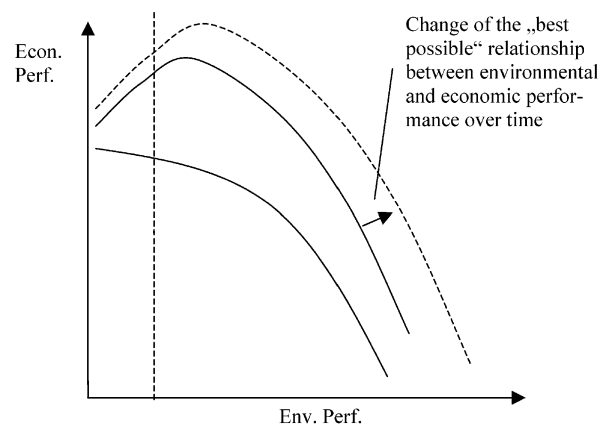

Fig. 1. The link of environmental and economic performance (based on: Lankoski, 2000; Wagner, 2000, 2003; Schaltegger and Synnestvedt, 2002).

the maximum realisable level of economic performance will increase (see Schaltegger and Synnestvedt, 2002).

The hypothesis is now that the relationship between environmental and economic performance of firms is either inversely U-shaped or negative in its functional form (as concluded in Fig. 1), and that strategy orientation with regard to sustainability and the environment (as a result of management's decision making) has some influence on the relationship as well, especially in terms of whether a firm puts its focus on end-of-pipe or pollution prevention strategies, respectively. The influence of firms choosing a particular strategy is captured here through different specifications of the environmental performance measure used in the analysis. Based on this, the following hypotheses are proposed:

H1. Environmental performance has either a uniformly negative or an inversely U-shaped relationship with economic performance, after controlling for other influences on economic performance. It is also possible that no significant relationship exists empirically, if the influence of environmental on economic performance is small compared to other factors.

H2. There is an influence of strategy orientation on the relationship between environmental and economic performance in that the choice of a strategic approach oriented towards pollution prevention results in a more positive relationship than that of an approach oriented towards end-of-pipe environmental protection.

Based on the statistical analysis of a multiple-country data set of firms in the European paper manufacturing industry, the hypothesis derived from the question stated above, that the relationship between environmental and economic performance is either inversely U-shaped or negative in its functional form, can be tested for different types of environmental performance measures reflecting different strategic orientations of a firm with regard to sustainability and the environment. This testing needs to take into account the influence of a number of important

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[1] The sector classification is based on the NACE code, i.e. NACE 21.1 (Pulp and Paper Manufacturing).

[2] Apart from the environmental relevance, the sector and the four countries have been chosen because a high number of companies produce environmental reports or site-level environmental statements under EMAS in the pulp and paper manufacturing sector in these countries. These are usually externally validated and guarantee sufficient availability of data. Additionally the paper sector produces fairly homogeneous products, which makes a comparison of physical environmental performance across firms in the sector possible.