



**Assessing the Greenness Effort for European Firms: A
Resource Efficiency Perspective**

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Review

Assessing the Greenness Effort for European Firms: A Resource Efficiency Perspective

Abstract

Purpose – The purpose of the study is twofold: first, to explore whether a linkage between environmental effort and financial performance exists; second, to investigate whether firms with more environmental efforts show a more significantly positive relationship between environmental performance and financial performance than those with less green efforts.

Design/methodology/approach – The study adopts correlation analysis of a sample comprised of 51 European companies from 14 industries across 15 countries to investigate the possible relationship between firm environmental performance (includes three measures: sustainable value, sustainable value margin, and return to cost ratio) and financial performance.

Findings – The paper does not find a positive relationship between firm environmental performance and financial performance. Both the Pearson correlations and Spearman's rho are statistically insignificant for both the full sample and the carbon-intensive sectors. When the lag effect on firm financial performance is considered, the result remains the same. The result suggests that corporate good guys in Europe do not necessarily reap the rewards of their green efforts.

Research Implications – Future research may investigate the relationship between firm environmental efforts and financial performance across industries with different technologies and product life cycles, or industries with similar pollutions/emissions or usage pattern of natural resources, such as the petroleum industry and the transportation industry.

Practical Implications – Although we could not find a positive association between environmental performance and financial performance, still, being perceived as a green company may improve a company's image and reputation, thus attract more talented workers and green-conscious customers.

Originality/value – The paper provides a new perspective on the relationship between firm environmental performance and financial performance in monetary terms by taking a broader view at the environmental outcomes. While past studies only measure firm environmental performance based on damaging impacts to the environment, this research also considers the efficiency of resource use by the firm.

Keywords: Environmental performance, Financial performance, Green, Sustainable value.

Paper type: Research paper

Introduction

A recent McKinsey poll of 7,751 consumers in Brazil, Canada, China, France, Germany, India, the United Kingdom, and the United States shows 87% of the respondents are very concerned about the environmental and social impact of the products they buy (Bonini and Oppenheim, 2008). Interestingly, this survey suggests that when it comes to actually buying green goods, words and deeds often part away as no more than one third of the consumers in the survey are ready to buy green products or already done so.

A number of early studies attempted to establish the relationship between corporate social responsibility (CSR) and firm performance but found inconclusive results (Alexander and Buchholz, 1978; Shane and Spicer, 1983; Aupperle, Carroll and Hatfield, 1985; Ullmann, 1985). Moreover, many researchers have even found in their studies only a negative relationship between CSR and firm performance (Shane and Spicer, 1983; Aupperle *et al.*, 1985; Davidson and Worrel, 1988; Bromiley and Marcus, 1989; Brammer, Brooks and Pavelin, 2005; Becchetti, Ciciretti and Hasan, 2007). These results are not only discouraging but also deter firms from devoting their efforts to the development of socially responsible initiatives, such as the development of environmental sustainability. However, such discouraging results may be due to the measurements used in these studies.

A number of measures to assess corporate contributions to society have been proposed over the past, namely the reputation index, content analysis of company publications, and more recently, some published social indices. Some researchers use the reputation index (Moskowitz, 1972; Fogler and Nutt, 1975; Sturdivant and Ginter, 1977; Spicer, 1978). Other studies use content analysis to analyze the reporting in various firm publications, especially in the annual reports (Bowman, Edward H. and Haire, 1975; Ingram, 1978). More recently, several important

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4 indices, such as the Domini 400 Social Index, the FTSE4Good Index Series, and the
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6 Dow Jones Sustainability Index have been adopted (Aslaksen and Synnestvedt, 2003;
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8 Cowton, 2004; Schröder, 2007; Collison, Cobb, Power and Stevenson, 2008) in
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10 measuring firm social performance. These indices only consider firms that are
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12 committed to environmental or social actions, and thus filter out firms that are
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14 connected with some specific industries, such as the tobacco and alcohol industries.
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18 Corporate governance, stakeholder interests, social impression, and
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20 environmental protection are all facets of CSR. In this article, we focus on firm
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22 environmental performance and its relationship to firm financial performance. To
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24 this end, suitable measures of environmental performance and financial performance
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26 are needed. This study adopts several readily available commonly used measures of
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28 financial performance. As to the environmental performance measures,
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30 sustainability value (SV) by ADVANCE (2006) is used because it not only considers
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32 a firm's damage to the environment, but also how efficiently the firm creates value
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34 from natural resources. It is worth noting that companies use not only economic
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36 capital but also environmental and social resources to produce goods or provide
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38 services. Thus, the resource use efficiency of the company should be taken into
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40 account in measuring firm environmental performance. Another reason for the
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42 adoption of SV is its intuitive meaning to management and other stakeholders. The
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44 aforementioned measurements as well as other measurements used in related research
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46 all adopt nominal scale variables, which cannot capture the dynamic nature of the
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48 firm's efforts in social responsibility. The SV shows in monetary terms the value
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50 that a company creates or loses resulting from the use of a set of various resources
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52 (e.g. CO₂, NO_x, SO_x, VOC, and CH₄ emissions, waste generated, and water used).
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54 This makes it easier to determine the cost of resources in monetary terms and enables
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56 us to take the dynamic changes of firms' environmental sustainability into
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4 consideration. Thus, following Figge and Hahn (2004), this study uses sustainable
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6 value to measure the firms' dynamic effort and outcome of green management.
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9 The purposes of the present study is twofold: first, to explore whether a linkage
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11 between environmental efforts and financial performance exists; second, to
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13 investigate whether firms with more environmental efforts show a more significantly
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15 positive relationship between environmental performance and financial performance
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17 than those with less green efforts. Data from a wide variety of industries comprised
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19 of 51 European companies were collected to investigate the relationship between firm
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21 environmental performance and financial performance. The results of this study
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23 may lead to a better understanding of the relationship between firm environmental
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25 performance and financial performance, as well as provide an appropriate explanation
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27 for this relationship, if any. More specifically, this paper may be able to answer the
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29 question why some companies suffer from acting green.
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34 The remainder of this paper is organized as follows: Section two briefly
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36 reviews the previous literature on CSR, environmental performance and its tie to
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38 financial performance, and the measures adopted in related literature and this study.
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40 Section three presents an overview of our data and methodology. Section four
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42 presents empirical results and Section 5 concludes the paper.
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47 Literature review

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49 Corporate social responsibility was regarded as "the managerial obligation to take
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51 action to protect and improve both the welfare of society as a whole and the interest of
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53 organizations" (Davis and Blomstrom, 1975). In the last few decades, the
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55 relationship between corporate social performance (CSP) and financial performance
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57 has attracted increasing attention in academia as well as in industry. However, the
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59 link between CSP and financial performance is still ambiguous at best (Stanwick and
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4 Stanwick, 1998). Pava and Krausz (1996) reviewed 21 studies conducted between
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6 1972 and 1992 and conclude that 12 of them show a positive association between CSP
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8 and financial performance, one demonstrates negative association, and eight show that
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10 no association exists.

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13 A number of studies show a negative relationship between CSP and financial
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15 performance (Shane and Spicer, 1983; Aupperle *et al.*, 1985; Davidson and Worrel,
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17 1988; Bromiley and Marcus, 1989; Brammer *et al.*, 2005; Becchetti *et al.*, 2007). One
18
19 possible explanation is that companies acting in a socially responsible manner may
20
21 incur competitive disadvantages that may otherwise be avoided (Aupperle *et al.*,
22
23 1985). This is consistent with Friedman's (1970) view that there are few measurable
24
25 benefits to socially responsible behavior while there are numerous costs that reduce
26
27 corporate profits and shareholder wealth. On the other hand, a number of studies
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29 show that there is a positive relationship between CSP and firm financial performance
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31 (Belkaoui, 1976; Bowman, E., 1978; Preston, 1978; Wokutch and Spencer, 1987).
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33 These inconsistent empirical results lead to another possibility that there is simply no
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35 positive or negative relationship between social and financial performance. Ullmann
36
37 (1985) argues that there are many intervening variables between social and financial
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39 performance and thus one should not expect a relationship to exist. In addition, the
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41 contradicting results may be due to the method in which the social performance
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43 variables are used in those studies. Such measurement problems may have masked
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45 possible linkages, if any, between CSR and financial performance.
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53 Although attempts to establish a linkage between CSP and financial
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55 performance have yield mixed results, a number of researchers have found a positive
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57 relationship between firm environmental performance, a critical component of CSP,
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59 and financial performance (King and Lenox, 2008). According to Wood (1991), CSP
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is comprised of three major components: the level of corporate social responsibility,

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4 the processes of corporate social responsiveness, and the outcomes of corporate
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6 behavior. Based on Wood's principles of corporate social responsibility, Stanwick
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8 and Stanwick (1998) argue that the environmental performance of an organization is
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10 one of the critical components in the measurement of CSP. The environmental
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12 performance of a firm may also be regarded as the output of the firm's green effort.
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16 Various measures are adopted in prior studies that try to explore the relationship
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18 between firm environmental performance and financial performance. Tobin's q
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20 (Dowell, Hart and Yeung, 2000), return on assets (Hart and Ahuja, 1996; Russo and
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22 Fouts, 1997), return on equity (Hart and Ahuja, 1996; Russo and Fouts, 1997), and
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24 return on investment (Hart and Ahuja, 1996; Russo and Fouts, 1997) are commonly
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26 used to measure the financial performance of an organization. Capital expenditures
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28 on pollution control technology (Spicer, 1978), emissions of toxic chemicals (Hart
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30 and Ahuja, 1996), spills and other plant accidents (Karpoff, Lott and Grankine, 1998),
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32 lawsuits related to improper disposal of hazardous waste (Muoghalu, Robinson and
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34 Glascock, 1990), rewards or other recognitions for superior environmental
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36 performance (Klassen and McLaughlin, 1996), participation in environmental
37
38 management standards (Dowell *et al.*, 2000), and rankings of superior environmental
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40 performers (Russo and Fouts, 1997) are adopted as measurements of environmental
41
42 performance. It may be concluded that so far there is no consensus on measures of
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44 environmental performance. For a more complete list of financial and environmental
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46 performance measures, readers are referred to King and Lenox (2008). In this study,
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48 another measure, corporate sustainable value, is adopted for the measurement of
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50 corporate environmental performance.
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57 A number of empirical studies revealed that companies with high environmental
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59 performance tend to be more profitable (King and Lenox, 2008). A series of studies
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conducted by the Council on Economic Priorities found significant correlation

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4 between pollution control expenditures and financial performance among pulp and
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6 paper firms (Spicer, 1978). Russo and Fouts (1997) demonstrated a significant
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8 positive correlation between various financial returns and an environmental
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10 performance index. Clemens (2006) argued that small firms benefit from being
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12 green. Clarkson, Richardson, and Vasvari (2006) studied the four most polluting
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14 industry in the U.S. and found that firms which enjoyed better environmental
15
16 performance also enjoyed better subsequent financial performance. King and Lenox
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18 (2008) also concluded that environmental performance is positively associated with
19
20 financial performance. One possible explanation for the positive association
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22 between firm environmental and financial performance is that environmental effort
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24 provides future cost savings by increasing efficiency, reducing compliance costs, and
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26 minimizing future liabilities (Porter and van der Linde, 1995; Reinhardt, 1999).
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32 Other research focusing on the market values of green companies also found
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34 that green investment is profitable (Cohen, Fenn and Naimon, 1995; White, 1996).
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36 Dasgupta, Laplante, and Mamingi (1998) undertook an international event study
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38 involving capital markets in Argentina, Chile, Mexico and Philippines. They
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40 concluded that these four countries' financial markets reward companies having
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42 superior environmental performance. Dowell *et al.* (2000) concluded that firms that
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44 adopt a single, stringent environmental standard worldwide tend to have higher
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46 market valuations. Butz and Plattner (2000) examined 65 European securities over a
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48 two-year period. They found that the market rewarded those companies with better
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50 environmental performance. More recently, Lo and Sheu (2007) found that the
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52 Tobin's q of U.S. companies in the Dow Jones Sustainability Index are greater than
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54 those of non-Sustainable companies. Using common asset pricing models, Ziegler,
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56 Schroder, and Rennings (2007) found that European stocks are rewarded for better
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58 environmental performance.
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4 On the contrary, some recent studies presented different results. In a study
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6 using unbalanced panel data of Czech firms, Hassel, Nilsson, and Nyquist (2005)
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8 found that environmental performance actually hurts financial performance by
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10 imposing a negative impact on firm's market value. Darnall and Ytterhus (2005)
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12 suggested that no statistically significant relationship exists between environmental
13
14 and financial performance. In a study based on a panel data of Norwegian plants,
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16 Telle (2006) found that, after controlling for omitted plant heterogeneity, much of the
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18 previously observed positive relationship between better environmental and financial
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20 performance disappeared.
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26 Methodology

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28 The EU has long been regarded as the most environmentally conscious region in the
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30 world and a leader in environmental governance. Consequently, the EU has adopted
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32 the most stringent environmental policies and regulations in the world. Therefore, EU
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34 firms are selected as the subjects of this study. Our sample consists of 65 European
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36 companies included in the ADVANCE Project (2006) funded by the EU and
37
38 participating corporations. The project reports the value-based eco-ratings and
39
40 relevant data of these 65 European companies from 2001 to 2003. Considering the
41
42 lag effect on firm performance, financial performance data of these firms is collected
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44 by the authors from their annual reports from 2001 to 2007. Fourteen firms are
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46 dropped from the sample due to the unavailability of their annual reports. Table 1
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48 displays the final sample distribution. The final sample used in our analysis comprises
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50 51 European companies from 14 industries across 15 countries. A Chi-square test is
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52 performed to verify whether dropping firms from the original sample alters the sample
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54 distribution. The Chi-square statistics are 14.12 and 4.30 for the country and industry,
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56 respectively (with p-values of 0.52 and 1.00 respectively), which indicates that there
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4 is no significant difference in country distribution or industry distribution between the
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6 final sample used in this study and the sample of the ADVANCE Project.
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9 Companies from Germany, the Netherlands, Italy, and Sweden contribute more
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11 than 60% of the sample firms. Nearly 20% of the sample firms belong to the utility
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13 sector. Most of the sample companies (around 86.27%) belong to the
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15 carbon-intensive sector according to the classification of the Carbon Disclosure
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17 Project (CDP) (PrinceWaterHouseCoopers, 2008).
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28 Using data from the ADVANCE Project, three proxies, including sustainable
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30 value, sustainable value margin, and return to cost ratio are adopted to capture the
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32 green management efforts of the companies. Readers are encouraged to refer to the
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34 project source for details. From an opportunity cost perspective, sustainable value
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36 represents the value that is created or lost through the use of a set of different
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38 resources by a company. Seven environmental resources are taken into account: (1)
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40 Carbon dioxide (CO₂) emissions, (2) Nitrogen oxide (NO_x) emissions, (3) Sulphur
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42 oxide (SO_x) emissions, (4) Emissions of volatile organic compounds (VOC), (5)
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44 Methane (CH₄) emissions, (6) Waste generation, and (7) Water use. Five steps are
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46 used in calculating sustainable value:
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- 51 • How much of a resource does the company use?
 - 52 • How much return does the company create with these resources?
 - 53 • How much return would the benchmark create with these resources?
 - 54 • Which resources are used in a value-creating way by the company and
 - 55 which are not?
 - 56 • How much sustainable value does the company create?
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4 The EU15¹ is used as the benchmark. Sustainable value has been applied to
5 economic, environmental, and social resources and has been practiced in the financial
6 markets for many decades. Usually, large companies are expected to have larger
7 sustainable value figures. Therefore, considering the size effect, two indicators are
8 used: (1) sustainable value margin and (2) return to cost ratio.
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15 The sustainable value margin is calculated by dividing sustainable value by sales,
16 which is constructed similarly to the sales margin. It reflects how much sustainable
17 value is created per 100€ of sales that the company makes. The return to cost ratio
18 compares the gross value added to a company to the return the benchmark would have
19 created with the same amount of resources (opportunity costs), which is a typical
20 benefit-cost-ratio. A return to cost ratio larger (smaller) than unity indicates that the
21 company yields more (less) return per unit of resource, i.e. the company uses its
22 bundle of resources more (less) efficiently than the EU15 on average – the company
23 creates sustainable value.
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36 Four financial performance measures are used in our study. EBIT/Assets – the
37 textbook measure of profitability relative to total capital employed by the firm – is
38 used to measure firm performance, and has been commonly employed in previous
39 studies (Denis and Denis, 1995; Eberhart, Maxwell and Siddique, 2004; Huson,
40 Malatesta and Parrino, 2004). Other accounting performance measures: earnings per
41 share (EPS), returns on assets (ROA), and returns on equity (ROE) are also used in
42 the analysis.
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52 Correlation analysis (both Pearson correlation and Spearman's rho) is applied to
53 capture the possible relationship between environmental performance (e.g. sustainable
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¹ The EU15 was the number of member countries in the European Union prior to the accession of ten candidate countries on 1 May 2004. The EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

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4 value) and financial performance. In considering that industry and company
5 characteristics may influence the analysis, further analyses are performed on
6 subsamples of the carbon-intensive sector, good performers in return to cost ratio and
7 bad performers in return to cost ratio, respectively.
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13 14 15 Results

16
17 Table 2 presents the descriptive statistics of environmental performance and financial
18 performance. The mean and median values of the return to cost ratio are 1.24 and
19 0.53. Comparing with the benchmark (the EU15), they are 1.24:1 and 1:1.89
20 respectively. A firm with a return to cost ratio of 1.24:1 uses its resource 1.24 times
21 more efficiently than the EU15 on average, while with a return to cost ratio of 1:1.89
22 uses its resources only about half as efficiently as the benchmark. The sustainable
23 value margin is spread widely, with substantially different values for mean and
24 median (-138.70 and -24.70) and a large standard deviation (327.50). The
25 sustainable value and EPS show similar patterns which may be due to that data being
26 collected from a wide variety of countries and industries.
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43 PLACE TABLE 2 HERE

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47 Table 3 demonstrates the correlation coefficients of green measures and
48 financial performance. Panel A shows the coefficients of both Pearson correlation
49 and Spearman's rho based on the full sample. The Pearson correlation of the
50 sustainable value and EBIT/Assets is significantly negative. However, since the
51 sustainable value does not take the firm size into account, the sustainable value
52 margin may be a more appropriate measure than sustainable value. It can be seen
53 that the correlation coefficient of sustainable value margin and EBIT/Assets is
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4 insignificant. The remaining Pearson correlations and all Spearman's rho are all
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6 insignificant. The results reveal that there is no relation between firm environmental
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8 performance and financial performance. Considering the possible lag effect on
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10 financial performance, the authors also compute one-year to four-year lag effects of
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12 environmental efforts using the financial performance data during the periods of 2002
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14 to 2004, 2003 to 2005, 2004 to 2006, and 2005 to 2007², respectively. The results
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16 are not included in Table 3 since they are similar to those without considering the lag
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18 effect.
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29 Taking the nature of industry into account, Panel B displays the correlation
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31 coefficients for carbon-intensive sectors. Not surprisingly, the result is similar to
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33 Panel A since the carbon-intensive sectors take up a large portion of the full sample.
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35 The empirical results suggest that a significant relationship between firm
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37 environmental performance and financial performance is not found within the
38
39 carbon-intensive sector.
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44 In the last panel of Table 3, the authors further investigate whether the green
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46 effort of the sample firms influences the relationship between firm environmental
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48 performance and financial performance. Firms that make progress in green measures
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50 may have found their way in green management, and thus a positive relationship
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52 between environmental performance and financial performance among those firms is
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54 expected. By definition, the return to cost ratio shows the factor by which a company
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56 uses its resources more or less efficiently than the benchmark, EU15. The return to
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² The correlation coefficient with the highest absolute value is -0.150, which is the Pearson correlation coefficient of the return to cost ratio and ROE while considering two-year lagged effect.

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4 cost ratio comprises two concepts: (1) greenhouse gas emissions, waste generated,
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6 and water use efficiency and (2) the comparison with the EU15. Thus, to determine
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8 whether the firms make progress, we measure the difference in the return to cost ratio
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10 from the present year to the previous year. By doing so, 36 observations are
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12 categorized as making progress and another 42 observations as getting worse. The
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14 rest of the observations maintain the same level of the return to cost ratio.
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18 The results for good performers and bad performers in return to cost ratio are
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20 both insignificant which is consistent with the previous Panels. In other words, no
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22 matter whether the firm makes progress or regress in green measures, a relationship
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24 between its environmental performance and financial performance cannot be found.
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27 28 Conclusions

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31 The current study attempted to identify whether the good-heartedness of firms meet
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33 with recompense based on data from 51 European companies of 14 industries across
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35 15 countries. The research findings in this study suggest that corporate good guys
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37 do not necessarily reap the rewards of their green efforts. The finding applies to
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39 both the full sample and the carbon-intensive sectors. The result of this study also
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41 suggests that green efforts may not be the reason why some companies are suffering.
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43 Simply put, acting green may have nothing to do with the underperformance of these
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45 companies. There may be other issues associated with these companies that cause
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47 their underperformance.
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53 This paper uses a new measure for firm environmental performance which takes
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55 into account the efficiency of resource use by companies. In this paper, we adopt the
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57 eco-efficiency concept to construct a broader measure of environmental performance.
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59 Although the relationship between firm environmental performance and financial
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4 performance could not be found in this study, we believe that environmental
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6 performance should not be measured solely on the damage done to the environment.
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8 While a relationship between firm environmental performance and financial
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10 performance could not be found, managers and researchers may still benefit from this
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12 study.
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14 15 16 *Implications for Practitioners* 17

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20 Caution must be taken in interpreting the results of this study. Although we could not
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22 find an association between environmental performance and financial performance,
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24 previous studies suggested that environmental performance may be positively
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26 associated with other corporate performance measures, such as market value (Dowell
27
28 *et al.*, 2000). In addition, being perceived as a green company may improve a
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30 company's image and reputation, thus attract more talented workers and
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32 green-conscious customers. In this regard, firms may not only need to act green, but
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34 also want to promote their efforts in environmental issues. They may start with
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36 including environmental performance in the annual report and other filings, and be
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38 more forthcoming on environmental exposure and performance. Nevertheless, since
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40 there is no evidence that environmental investment deteriorates financial performance;
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42 firms are encouraged to take the high road toward environmental sustainability. At
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44 least, the financial impact associated with environmental risks may be reduced. Thus,
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46 identifying which environmental investment would do most in reducing their
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48 environmental risks is critical.
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56 Although the samples are taken from European companies, firms in other region
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58 of the world may still benefit from this research. Since environmental sustainability
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60 is a global issue, sooner or later, the stringent environmental regulations currently

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4 been reinforced in EU countries will be adopted or adapted in other parts of the world.
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6 The truth is that when the stringent global environmental standards are applied to
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8 most countries, firms will be able to realize the benefits resulted from their green
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10 efforts, if not earlier.
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12 13 14 *Implications for researchers*

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17 This study was a first attempt to incorporate resource efficiency into the measurement
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19 of environmental performance in studying the possible linkage between
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21 environmental performance and financial performance. Our study was constrained
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23 by data availability. Future research may build on this research and supplement the
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25 current data with more variables, such as more nature resources, firm characteristics,
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27 and a longer time series. Industry level and firm level analyzes may also be
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29 beneficial when more company data becomes available.
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35 The sustainable value adopted in this research considers only the efficiency of
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37 water use, in addition to several environmental damage measures. Other natural
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39 resources, such as forest, cropland, energy sources, may need to be taken into account
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41 to form a more comprehensive measure for natural resource efficiency. In addition,
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43 although we consider company attributes such as whether a firm belongs to the
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45 carbon-extensive sector and found no evidence to support the relationship between
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47 environmental and financial performance, possible confounding effects from other
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49 fixed firm attributes could not be ruled out. On the other hand, it may be that only
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51 firms with certain attributes can reap the benefits from acting green. Accordingly,
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53 “When does a company benefit/suffer from acting green?” may be an interesting
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55 question to explore as suggested by (King and Lenox, 2008).
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4 Future research may investigate the relationship between firm environmental
5 performance and financial performance across industries with different technologies
6 and product life cycles, or industries with similar pollutions/emissions or usage
7 pattern of natural resources, such as the petroleum industry and the transportation
8 industry. Finally, we did not consider the effect of causality since a relationship
9 between environmental performance and financial gains could not be found. Even
10 when such an association is found, which way the relationship run still need to be
11 determined. Do firms more profitable invest more in environmental efforts? Or does
12 environmental performance lead to better financial performance? These are
13 important questions that require further in-depth studies.
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27 To sum up, while firms of all types around the world are launching green
28 campaigns, the truth is that going green while keeping competitive can be quite
29 challenging (Bonini and Oppenheim, 2008). It is critical for a firm to convince that
30 corporations can reap a number of potential benefits by going green in the long run.
31 The finding of this paper may not be enough to convince the executives from the
32 perspective of financial performance. However, the spillover effect of being
33 greenness should not be neglected. In addition to the enhancement of financial
34 performance, to name a few, a firm that establishes a reputation for greenness can do
35 much more than increase its sales. The better its reputation, the more talented the
36 workers it can attract, the more loyalty it can strengthen in its customers, the more it
37 can charge for its product. How environmental efforts might change the reputation,
38 employee recruitment, and the product price remains a topic for future research.
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References

- Alexander, G. J. and Buchholz, R. A. (1978), "Corporate social responsibility and stock market performance", *The Academy of Management Journal*, Vol. 21, No. 3, pp. 479-486.
- Aslaksen, J. and Synnøestvedt, T. (2003), "Ethical investment and the incentives for corporate environmental protection and responsibility", *Corporate Social Responsibility and Environmental Management*, Vol. 10, pp. 212-223.
- Aupperle, K. E., Carroll, A. B. and Hatfield, J. D. (1985), "An empirical examination of the relationship between corporate social responsibility and profitability", *The Academy of Management Journal*, Vol. 28, No. 2, pp. 446-463.
- Becchetti, L., Ciciretti, R. and Hasan, I. (2007), "Corporate social responsibility and shareholder's value: an event study analysis", available at <http://www.ssrn.com> (accessed Date, 2009, Jan 17).
- Belkaoui, A. (1976), "The impact of the disclosure of the environmental effects of organizational behavior on the market", *Financial Management*, Vol. 5, pp. 26-31.
- Bonini, S. M. and Oppenheim, J. M. (2008). *Helping Green Product Grow: The McKinsey Quarterly*, McKinsey & Company).
- Bowman, E. (1978), "Strategy, annual reports, and alchemy", *California Management Review*, Vol. 20, pp. 64-71.
- Bowman, E. H. and Haire, M. (1975), "A strategic posture toward corporate social responsibility", *California Management Review*, Vol. 18, No. 2, pp. 49-58.
- Brammer, S., Brooks, C. and Pavelin, S. (2005), "The stock performance of America's 100 best corporate citizens", available at <http://www.ssrn.com> (accessed Date, 2009, Jan 5).
- Bromiley, P. and Marcus, A. (1989), "The deterrent to dubious corporate behavior: profitability, probability, and safety recalls", *Strategic Management Journal*, Vol. 10, pp. 233-250.
- Butz, C. and Plattner, A. (2000). *Socially Responsible Investment: A Statistical Analysis of Returns: Bank Sarasin Basic Report*.
- Clarkson, P., Li, Y., Richardson, G. and Vasvari, F. (2006), "Does it really pay to be green? Determinants and consequences of proactive environmental strategies", available at <http://www.ssrn.com> (accessed Date, 2009, 15 Jan.).
- Clemens, B. (2006), "Economic incentives and small firms: Does it pay to be green?", *Journal of Business Research*, Vol. 59, pp. 492-500.
- Cohen, M., Fenn, S. and Naimon, J. (1995) *Environmental and financial performance: are they related?*, Working paper, Vanderbilt University, Nashville, TN.

- 1
2
3
4 Collison, D. J., Cobb, G., Power, D. M. and Stevenson, L. A. (2008), "The financial
5 performance of the FTSE4Good indices", *Corporate Social Responsibility and*
6 *Environmental Management*, Vol. 15, pp. 14-28.
- 7
8 Cowton, C. J. (2004), "Managing financial performance at an ethical investment
9 fund", *Accounting, Auditing & Accountability*, Vol. 17, No. 2, pp. 249-275.
- 10
11 Darnall, N. and Ytterhus, B. (2005), "Environmental and financial performance: Do
12 industrial sectors differ in their ability to derive financial benefits from
13 environmental actions?", OECD Conference, Washington, D.C.
- 14
15 Dasgupta, S., Laplante, B. and Mamingi, N. (1998), "Capital market responses to
16 environmental performance in developing countries", available at
17 <http://www.ssrn.com> (accessed Date, 2009, 10 Jan.).
- 18
19 Davidson, W. N. and Worrel, D. L. (1988), "The impact of announcements of
20 corporate illegalities on shareholder returns", *The Academy of Management*
21 *Journal*, Vol. 31, No. 1, pp. 195-200.
- 22
23 Davis, K. and Blomstrom, R. L. (1975). *Business and Society: Environment and*
24 *Responsibility*. New York: McGraw-Hill.
- 25
26 Denis, D. J. and Denis, D. K. (1995), "Firm performance changes following top
27 management dismissals", *Journal of Finance*, Vol. 50, pp. 1029-1057.
- 28
29 Dowell, G., Hart, S. and Yeung, B. (2000), "Do corporate global environmental
30 standards create or destroy market value", *Management Science*, Vol. 46, No.
31 8, pp. 1059-1074.
- 32
33 Eberhart, A. C., Maxwell, W. F. and Siddique, A. R. (2004), "An examination of
34 long-term abnormal stock returns and operating performance following R&D
35 increases", *Journal of Finance*, Vol. 59, pp. 623-650.
- 36
37 Figge, F. and Hahn, T. (2004), "Sustainable value added-measuring corporate
38 contributions to sustainability beyond eco-efficiency", *Ecological Economics*,
39 Vol. 48, No. 2, pp. 173-187.
- 40
41 Fogler, H. R. and Nutt, F. (1975), "A note on social responsibility and stock valuation",
42 *The Academy of Management Journal*, Vol. 18, No. 1, pp. 155-160.
- 43
44 Friedman, M. (1970) The social responsibility of business is to increase its profits.
45 *The New York Times Magazine*.
- 46
47 Hart, S. L. and Ahuja, G. (1996), "Does it pay to be green? an empirical examination
48 of the relationship between emission reduction and firm performance",
49 *Business Strategy and the Environment*, Vol. 5, No. 1, pp. 30-37.
- 50
51 Hassel, L., Nilsson, H. and Nyquist, S. (2005), "The value relevance of environmental
52 performance", *European Accounting Review*, Vol. 14, No. 1, pp. 41-61.
- 53
54 Huson, M. R., Malatesta, P. H. and Parrino, R. (2004), "Managerial succession and
55 firm performance", *Journal of Financial Economics*, Vol. 74, pp. 237-275.
- 56
57
58
59
60

- 1
2
3
4 Ingram, R. W. (1978), "An investigation of the information content of (certain) social
5 responsibility disclosures", *Journal of Accounting Research*, Vol. 16, pp.
6 270-285.
7
- 8 Karpoff, J., Lott, J. and Grankine, J. (1998), "Environmental violations, legal penalties,
9 and reputation costs", available at <http://www.ssrn.com> (accessed Date,
10 2009, Jan 23).
11
- 12 King, A. A. and Lenox, M. J. (2008), "Does it really pay to be green? an empirical
13 study of firm environmental and financial performance", *Journal of Industrial*
14 *Ecology*, Vol. 5, No. 1, pp. 105-116.
15
- 16 Klassen, R. and Mclaughlin, C. (1996), "The impact of environmental management
17 on firm performance", *Management Science*, Vol. 42, pp. 1199-1214.
18
- 19 Lo, S. F. and Sheu, H. J. (2007), "Is corporate sustainability a value-increasing
20 strategy for business?", *Corporate Governance: An International Review*, Vol.
21 15, No. 2, pp. 345-358.
22
- 23 Moskowitz, M. R. (1972), "Choosing socially responsible stocks", *Business and*
24 *Society Review*, Vol. 1, No. 1, pp. 71-75.
25
- 26 Muoghalu, M., Robinson, H. D. and Glascock, J. (1990), "Hazardous waste lawsuits,
27 stockholder returns, and deterrence", *Southern Economic Journal*, Vol. 57, pp.
28 357-370.
29
- 30 Pava, M. L. and Krausz, J. (1996), "The association between corporate social
31 responsibility and financial performance: the paradox of social cost ", *Journal*
32 *of Business Ethics*, Vol. 15, No. 3, pp. 321-357.
33
- 34 Porter, M. E. and Van Der Linde, C. (1995), "Green and competitive.", *Harvard*
35 *Business Review*, Vol. September-October, pp. 120-135.
36
- 37 Preston, L. (1978), "Analyzing corporate social performance: methods and results",
38 *Journal of Contemporary Business*, Vol. 7, pp. 135-160.
39
- 40 Princewaterhousecoopers. (2008). Carbon Disclosure Project Report 2008 - Global
41 500: PrinceWaterHouseCoopers).
42
- 43 Reinhardt, F. (1999), "Market failure and the environmental policies of firms",
44 *Journal of Industrial Ecology*, Vol. 3, No. 1, pp. 9-21.
45
- 46 Russo, M. V. and Fouts, P. A. (1997), "A resource-based perspective on corporate
47 environmental performance and profitability", *The Academy of Management*
48 *Journal*, Vol. 40, No. 3, pp. 534-559.
49
- 50 Schröder, M. (2007), "Is there a difference? The performance characteristics of SRI
51 equity indices", *Journal of Business Finance and Accounting*, Vol. 34, pp.
52 331-348.
53
54
55
56
57
58
59
60

- 1
2
3
4 Shane, P. B. and Spicer, B. H. (1983), "Market response to environmental information
5 produced outside the firm", *The Accounting Review*, Vol. 58, No. 3, pp.
6 521-553.
7
- 8 Spicer, B. H. (1978), "Investors, corporate social performance and information
9 disclosure: an empirical study", *The Accounting Review*, Vol. 53, No. 1, pp.
10 94-111.
11
- 12 Stanwick, P. A. and Stanwick, S. D. (1998), "The relationship between corporate
13 social performance and organizational size, financial performance, and
14 environmental performance: an empirical examination", *Journal of Business
15 Ethics*, Vol. 17, No. 2, pp. 195-204.
16
- 17 Sturdivant, F. D. and Ginter, J. L. (1977), "Corporate social responsiveness:
18 management attitudes and economic performance", *California Management
19 Review*, Vol. 19, No. 3, pp. 30-39.
20
- 21 Telle, K. (2006), "'It pays to be green' - A premature conclusion?", *Environmental
22 and Resource Economics*, Vol. 35, No. 3, pp. 195-220.
23
- 24 The Advance Project. (2006). Sustainable Value of European Industry: A Value-Based
25 Analysis of the Environmental Performance of European Manufacturing
26 Companies: The ADVANCE Project, Forres and Berlin).
27
- 28 Ullmann, A. A. (1985), "Data in search of a theory: a critical examination of the
29 relationships among social performance, social disclosure, and economic
30 performance of U. S. firms", *The Academy of Management Review*, Vol. 10,
31 No. 3, pp. 540-557.
32
- 33 White, M. (1996) Corporate environmental performance and shareholder value.
34 Working paper, University of Virginia, Charlottesville, VA.
35
- 36 Wokutch, R. E. and Spencer, B. A. (1987), "Corporate saints and sinners: the effects
37 of philanthropic and illegal activity on organizational performance",
38 *California Management Review*, Vol. 29, pp. 77-88.
39
- 40 Wood, D. (1991), "Corporate social performance revisited", *The Academy of
41 Management Review*, Vol. 16, pp. 691-718.
42
- 43 Ziegler, A., Schroder, M. and Rennings, K. (2007), "The effect of environmental and
44 social performance on the stock performance of European corporations",
45 *Environmental and Resource Economics*, Vol. 37, No. 4, pp. 661-680.
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Table 1 Sample distribution – by country and industry

Panel A: By country								
Country	Germany	The Netherlands	Italy	Sweden	Finland	UK	France	Spain
Frequency	10	7	7	7	5	4	2	2
Percent	19.61	13.73	13.73	13.73	9.80	7.84	3.92	3.92
Country	Belgium	Czech Republic	Denmark	Hungary	Portugal	Slovenia	Slovak Republic	
Frequency	1	1	1	1	1	1	1	
Percent	1.96	1.96	1.96	1.96	1.96	1.96	1.96	
Panel B: By industry								
Industry	Carbon-Intensive				Frequency	Percent		
Utilities	Yes				10	19.61		
Oil & Gas	Yes				6	11.76		
Engineering & Machinery	Yes				6	11.76		
Chemicals	Yes				6	11.76		
Forestry & Paper	Yes				6	11.76		
Automobile	Yes				6	11.76		
Pharmaceuticals	Yes				4	7.84		
Media & Photography	No				1	1.96		
Household Goods	No				1	1.96		
Beverages	No				1	1.96		
Personal Care and Household Products	No				1	1.96		
Consumer Electronics	No				1	1.96		
Semiconductors	No				1	1.96		
Food	No				1	1.96		
Total	86.27%				51	100.00		

Notes: According to the Carbon Disclosure Principle, industries have been categorized into two sectors (carbon-intensive and non-carbon-intensive sectors) depending primarily on the nature of their business.

Table 2 Descriptive statistics of environmental and financial performance

	Mean	Median	25th Percentile	75th Percentile	Std. Deviation
Sustainable Value	-13,125.07	-575.78	-8,614.67	1,727.31	34,133.59
Sustainable Value Margin	-138.70	-24.70	-145.00	16.90	327.50
Return to Cost Ratio	1.24	0.53	0.16	2.10	1.30
EBIT/Assets	0.06	0.05	0.02	0.09	0.05
EPS	99.50	1.65	0.24	10.09	370.97
ROA	0.03	0.03	0.01	0.05	0.05
ROE	0.05	0.07	0.02	0.15	0.16

Notes: Sustainable value is represented in millions of Euros. EPS denotes the diluted EPS.

Table 3 Relationships between firm environmental and financial performance

	Pearson Correlation				Spearman's Rho			
	EBIT/Assets	EPS	ROA	ROE	EBIT/Assets	EPS	ROA	ROE
Panel A: Full Sample								
Sustainable Value	-0.21*	0.09	-0.08	-0.08	-0.14	0.00	-0.03	0.01
Sustainable Value Margin	0.16	0.13	0.10	0.01	-0.02	-0.03	0.02	0.01
Return to Cost Ratio	-0.14	-0.01	-0.17	-0.14	-0.12	-0.05	-0.06	-0.05
Panel B: Carbon-Intensive Sectors								
Sustainable Value	-0.24*	0.11	-0.08	-0.10	-0.13	0.19	-0.01	0.04
Sustainable Value Margin	0.17	0.17	0.12	0.00	-0.01	0.21	0.03	0.06
Return to Cost Ratio	-0.13	0.06	-0.15	-0.15	-0.09	0.20	-0.02	0.02
Panel C: Progress and Regress								
Sustainable Value	-0.24	0.18	-0.08	-0.11	-0.12	0.17	0.07	0.00
Sustainable Value Margin	0.32	0.18	0.26	0.14	0.10	0.14	0.00	-0.10
Return to Cost Ratio	-0.05	-0.04	-0.03	0.01	-0.23	-0.23	-0.31	-0.26

Notes: Panel A and B compute both Pearson correlation and Spearman's rho for full sample and carbon-intensive sectors, respectively. Panel C shows the Pearson correlation coefficients for companies performing relatively better and worse in return to cost ratio, respectively. EPS denotes the diluted EPS. The result is similar when the simple EPS is adopted. * indicates that the correlation is significant at the 0.05 level (2-tailed).