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Environmental Efforts and Firm Performance

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Environmental Efforts and Firm Performance

ABSTRACT

In this paper, we test the prediction that environmental efforts, presenting one dimension of corporate social responsibility, are positively related to firm performance. We analyze a panel sample of non-financial firms in the Netherlands over the period 2001–2014 using two approaches: ordinary least squares regressions and two-stage least squares regressions. Our two-stage least squares regressions show that firms with higher degrees of environmental efforts have better firm performance, measured as return on assets, but have poorer firm performance, measured as return on sales. However, this relationship disappears when firm performance is measured as return on equity or stock return. Our analysis further reveals that better firm performance does not necessarily lead to a disclosure of a firm's environmental efforts. We find that larger firms are more inclined to report the environmental efforts than smaller firms. Neither prior firm performance nor variation in firm performance moderates the effect of environmental efforts on firm performance.

JEL classification: F21; F23; G31; G32

Keywords: Corporate investment; environmental performance; renewable energy; firm performance, Netherlands

1. Introduction

Corporate strategy plays an important role in providing directions and formulating strategic and operational plans at different levels of an organization. When a firm makes an

effort to be socially responsible beyond legal requirements, for example, this effort is usually described as strategic. In recent decades, there has been a growing debate on whether a firm should engage in corporate social responsibility (CSR) activities and embrace the concept of socially responsible investing (SRI) by engaging in stocks of socially responsible firms. For example, at the end of June 2016, there were 1,138 green, social and ethical funds domiciled in Europe and the total assets under management reached €158 billion. The four largest markets in terms of assets (France, the United Kingdom, Switzerland and the Netherlands) accounted for 68% of that amount. The SRI funds represented 2% of the overall European retail funds market[1].

What are the implications for firms that invest more in CSR projects or in SRI firms and for those that invest less in CSR projects? Empirical findings on the effect of CSR on firm performance are mixed. In this paper, we attempt to provide an answer to the question of whether firms showing more efforts at addressing environmental issues perform better than those showing fewer efforts on dealing with environmental issues.

We argue that focusing on a specific dimension of CSR activities is more likely to provide a cleaner analysis of the relationship between CSR and firm performance. As discussed in the literature, the examination of the effect of CSR on firm performance faces a measurement challenge, which, to a large extent, contributes to mixed results. Since CSR is a multi-dimensional construct, by using the overall index to measure a firm's CSR efforts is problematic. To address this challenge, we propose that empirical studies should focus on a certain aspect of CSR, rather than the overall index. An appropriate choice of the CSR dimension is more likely to depend on the context (e.g., at a country level). In this paper, we

[1] Available at (http://www.vigeo-eiris.com/wp-content/uploads/2016/11/161020-Green-Social-and-Ethical-funds-in-Europe-2016_Final-Compatibilit...-1.pdf- accessed 31/1/17).

focus on the environmental dimension of CSR for a sample of firms in a country where the public has paid attention to how firms deal with environmental issues.

We argue that environmental efforts are more likely to be costly in the short run due to investments in technology, for example. We expect the effect of environmental efforts on firm performance to be conditional on prior firm performance. Firms with good firm performance have more resources and capability to absorb large (initial) costs of environmental efforts than those with poor firm performance. As a result, it is more likely to observe the positive effect of environmental efforts on firm performance for firms with good prior performance. In addition, firms with riskier investments (assets-in-place) tend to be in a weaker position to absorb the costs associated with environmental efforts than do firms with less operating risk (e.g., fewer risky investment/assets-in-place). Hence, we argue that the effect of environmental efforts on firm performance is conditional on firm performance variation.

We choose to examine the effects of environmental efforts on firm performance for firms in the Netherlands for two important reasons. First, the government of the Netherlands has pursued an environmental policy that aims at, for example, reducing carbon emissions and waste streams and improving the cleanliness of rivers.[2] As a consequence, firms in the Netherlands are under pressure to comply with the government's policy. Second, firms in the Netherlands are generally multinational firms and have to comply with environmental regulations in many other countries. In addition, their global reputation becomes increasingly important to maintain their presence in international markets.

To empirically test the main prediction that environmental efforts positively affect firm performance, we primarily use two estimation techniques: (1) ordinary least squares (OLS) regressions and (2) two-stage least squares (2SLS) regressions. Based on a panel

[2] See https://www.government.nl/topics/environment for more information.

sample of 83 publicly listed firms in the Netherlands during the period 2001–2014, we find that firms with higher environmental efforts do not perform better than those with lower environmental efforts. Overall, our main findings can be briefly summarized as follows.

First, we find no evidence to suggest that environmental efforts are associated with firm performance when we use panel OLS regressions to estimate the effect of environmental efforts on firm performance. However, when we use the 2SLS approach, we find empirical evidence to suggest that environmental efforts are associated with firm performance. That is, the environmental efforts have a positive effect on return on assets (ROA) but have a negative effect on return on sales (ROS). Second, we find that larger firms, firms with large capital investments and firms with better growth opportunities are more likely to disclose their environmental efforts. However, more profitable firms are less likely to report their environmental efforts. Third, we find that prior firm performance does not moderate or strengthen the effect of environmental efforts on firm performance. Last but not least, we find that variation in performance, which represents operating risk, neither has a direct effect on firm performance nor moderates the effect of environmental efforts on firm performance.

The rest of the article is organized as follows. Section 2 begins with a brief review of the related literature, and discusses why environmental efforts might be associated with firm performance. Section 3 describes our data and empirical approach. Section 4 presents and discusses the results of the effect of environmental efforts on firm performance. Section 5 investigates firm characteristics that might affect a decision to disclose information on environmental efforts. Section 6 concludes the paper.

2. Related Literature

CSR disclosure includes the disclosure of corporate social and environmental information in annual reports (de Villiers and Alexander, 2014). The literature review on the influence of corporate social performance and environmental performance on firm performance will be discussed next, and the hypothesis development will be discussed thereafter.

2.1. The influence of corporate social performance on firm performance

Our literature review indicates that the findings on the relationship between CSR or corporate social performance (CSP) and firm performance are mixed. That is, on the one hand, some scholars such as Griffin and Mahon (1997), Dowell et al. (2000), Orlitzky et al. (2003), Luo and Bhattacharya (2006), Callan and Thomas (2009) and Wu and Shen (2013) find a positive relationship between CSP and firm performance.[3] On the other hand, some scholars, such as Lerner and Fryxell (1988), Boyle et al. (1997) and Brammer et al. (2006), show that the effect of CSP on firm performance is negative. Some studies, such as Patten (1990), Pava and Krausz (1996), Margolis and Walsh (2003) and Seifert et al. (2004), report that the relationship does not exist.

Several review articles provide evidence for the mixed results for the relationship between CSR (or CSP) and firm performance. For example, Margolis and Walsh (2003) undertake a review of 127 published studies between 1972 and 2002 and find that 109 of the 127 studies have used CSP as an independent variables. Fifty-four out of 109 papers (or 49%), 7 papers (or 6%), 28 papers (or 26%) and 20 papers (or 19%) report a positive relationship, a negative relationship, no relationship and a mixed relationship, respectively. In a more recent review article, van Beurden and Gössling (2008) examine 34 published studies

[3] See, for example, Pava and Krausz (1996), Margolis and Walsh (2003) and van Beurden and Gössling (2008) for comprehensive reviews.

between 1991 and 2007 and find that while the majority of studies (68%) document a positive relationship, several studies (about 26%) of the studies indicate that the relationship does not exist.

There are at least four major reasons for the mixed results. First, it is about the measurement issue as measuring CSP is difficult, leading to different ways of measuring it. As suggested by Igalens and Gond (2005), there are five common methods of measuring CSP: content analysis, pollution indices, questionnaire surveys, corporate reputation surveys and data produced by measurement organizations. In addition, there are some CSP indices created and provided by external companies. For example, the Kinder Lydenburg Domini (KLD) social rating takes into consideration a group of social performance indicators. To some extent, the use of different proxies in the literature contributes to the mixed results.

Second, the theoretical underpinning of the relationship between CSP and firm performance is still underdeveloped (Margolis and Walsh, 2003; Ullmann, 1985). As a result, the conditions under which CSP should affect firm performance are not well defined. Generally speaking, the stakeholder theory suggests a positive association between CSP and firm performance; that is, a firm should pay attention to not only its shareholders but also other stakeholders (see e.g., Callan and Thomas, 2009). A company is required to demonstrate an appropriate use of resources to ensure that it is acting as a contributing member of society. Companies are a part of the community, and it is expected as such that they obey the laws, minimize their negative impact on the environment and provide economic security to the community. From this stems the belief that a more noticeably responsible corporation can expect to see an increase in customer loyalty, customer sales and increased customer gains. It is argued that such CSP aids a firm in protecting its economic value in the long term by generating such intangible assets (Ducassy, 2013). Members of the board are elected to represent the best interests of the shareholders by dedicating all resources

towards increasing the wealth of shareholders. When the director acts in a social interest, he or she is using another person's money towards an initiative that may not be a reflection of that person's beliefs. This reasoning implies the negative effect of CSP on firm performance.

Third, following up the aforementioned second issue, there is a question of whether firm performance indeed drives CSP (see e.g., Callan and Thomas, 2009). That is, do firms undertake social responsibility activities because they have the resources to do so? There is a view that CSP only occurs because the firm has the financial excess to afford such disclosure. If better firm performance indeed allowed firms to engage in corporate social activities, empirical approaches used by prior studies would lead to mixed results. Recent studies have attempted to address this issue. For example, Mittal et al. (2008) find some evidence for a negative relationship between profitability and social performance for a sample of Indian firms.

Fourth, because firm performance can be measured using different proxies (e.g., ROA, ROE, ROS, stock returns) and prior studies tend to use only one measure of firm performance in their studies, the mixed results might be attributed to the choice of the firm performance measure.

In summary, we observe that empirical evidence for the effect of CSP on firm performance is mixed.

2.2. The influence of corporate environmental performance on firm performance

Corporate social activities encompass different dimensions, one of which is corporate environmental activities. By focusing on one dimension of CSP such as corporate environmental performance (CEP), we would expect a more conclusive result. However, our review of the literature still finds that empirical evidence on the effect of CEP on firm performance is inconclusive (see e.g., Konar and Cohen, 2001; Margolis and Walsh, 2003;

Russo and Fouts, 1997). The reasons for the mixed results are similar to those of the relationship between CSP and firm performance discussed earlier. That is, there is no common measure of environmental performance (see e.g., Dixon-Fowler et al., 2013; Horváthová, 2010).[4] A recent meta-analysis study by Horváthová (2010) shows that about 55% of 37 empirical studies under review document a positive relationship between CEP and firm performance (e.g., Konar and Cohen, 2001; Russo and Fouts, 1997), about 15% of the studies report a negative relationship (e.g., Cordeiro and Sarkis, 1997; Jaggi and Freedman, 1992) and about 30% of the studies find an insignificant relationship (e.g., Freedman and Jaggi, 1994; Hart and Ahuja, 1996). A more recent meta-analysis study by Albertini (2013) on 52 studies from 1975 to 2011 reports a similar pattern of findings.

Recent studies appear to show that corporate environmental activities exert an influence on firm performance in the long run. For example, Chopra and Wu (2016) find that for a sample of firms in the computer and electronics industry during the period 2000–2011, eco-activities have a positive effect on operating income and operating margin about three years after the announcement of eco-activities implementation. In a recent study, Muhammad et al. (2015) document a positive effect of CEP, measured as Australian Pollutant Release and Transfer Registers, on firm performance, measured as ROA and Tobin's Q during the pre-global financial crisis period (2001–2007), but find that the relationship does not exist during the global financial crisis period (2008–2010).

In addition, we find that there is limited research on the association between various corporate renewable energy activities and firm performance. Empirical results on this relationship are also mixed (Escobar and Vredenburg, 2011; Ruggiero and Lehkonen, 2017; Shin et al., 2016). Some studies (Shin et al., 2016) show that corporate renewable energy activities have a positive effect on firm performance. Some studies (Ruggiero and Lehkonen,

[4] See Ilinitch et al. (1998) for a discussion of problems in defining and measuring environmental performance.

2017; Sueyoshi and Goto, 2009) document a negative relationship between corporate renewable energy activities and firm performance. Some studies (Dixon-Fowler et al., 2013; Escobar and Vredenburg, 2011) find that corporate renewable energy activities are not associated with firm performance. Du (2015) examines how the market values greenwashing in China and finds that greenwashing is significantly negatively associated with cumulative abnormal returns (CAR) around the exposure of greenwashing. In addition, corporate environmental performance, which is a measure based on the Global Reporting Initiative (GRI), is significantly positively associated with CAR around the exposure of greenwashing.

2.3. Hypothesis development

In this section, we develop our theoretical arguments for the positive influence of environmental efforts on firm performance. More importantly, we propose that the effect of environmental efforts on firm performance exists under certain conditions.

Based on the literature review in the previous sections, we argue that firms with better performance have incentives to focus more on environmental efforts in order to enhance their reputation perceived by their customers/consumers. These efforts will help improve a firm's competitive position or mitigate the increasing pressure from the market. On the other hand, firms with poor performance also have incentives to pay more attention to environmental efforts as demanded by the market. For this group of firms, the environmental efforts might be, to some extent, required for corporate turnaround.

Environmental efforts are more likely to be costly in the short run. A firm's investment in environmentally friendly equipment and/or processes would increase the cost in the short run. If these efforts are well perceived by the market, there would be a high possibility that the firm can pass through some of the cost to customers, thereby lowering the negative impact of the costs associated with environmental efforts on profitability. If the

market does not recognize the environmental efforts, the firm may not be able to pass through the cost, thereby resulting in lower profitability. In the long run, when the market becomes more concerned with environmental issues, firms that can provide a better signal to the market about their environmental efforts are more likely to have better performance than those who have lower environmental efforts.

We expect that the effect of environmental efforts on firm performance is conditional on prior firm performance. More specifically, we focus on two conditions under which environmental efforts positively affect firm performance: (1) prior firm performance and (2) risky investments.

First, firms with good firm performance may have surplus resources, called "slack resources" by Waddock and Graves (1997), and the capability to absorb higher (initial) costs of environmental efforts than those with poor firm performance. As a result, it is more likely to observe the positive effect of environmental efforts on firm performance for firms with good prior performance. Along a similar line of argument, firms with poor prior firm performance have fewer resources and less capability to absorb the high (initial) costs associated with environmental efforts; therefore, it is more likely to observe the negative effect of environmental on firm performance.

Second, firms with risky investments (assets-in-place) tend to be in a weaker position to absorb the costs associated with environmental efforts than do firms with less operating risk (e.g., low-risk investments/assets-in-place). We argue that, by definition, risky investments can lead to either very high returns or very poor returns. Thus, firms with riskier investments have higher performance variation. As a result, higher environmental efforts will subject firms with riskier investments (which can be measured by using firm performance variation) to a higher probability of having a poorer performance than firms with less risky investments (e.g., low firm performance variation). Therefore, we should observe the positive

effect of environmental efforts on firm performance for firms with low firm performance variation. Likewise, we should observe the negative effect of environmental efforts on firm performance for firms with high firm performance variation.

Overall, we hypothesize that firms with higher environmental efforts perform better than those with lower environmental efforts. In sum, we propose the following testable hypotheses.

Hypothesis 1: There is a positive relationship between environmental efforts and firm performance.

Hypothesis 2: Prior firm performance strengthens the effect of environmental efforts on firm performance. More specifically, the positive effect of environmental efforts on firm performance is stronger (weaker) for well-performing (poor-performing) firms.

Hypothesis 3: Firm performance variation weakens the positive effect of environmental efforts on firm performance. More specifically, the positive effect of environmental efforts on firm performance is stronger (weaker) for firms with low (high) firm performance variation.

3. Data and descriptive statistics

3.1. Sample

As discussed in Section 2, our main prediction is that firms with higher environmental efforts should have better firm performance than those with lower environmental efforts. We empirically test this prediction using a sample of firms in an advanced market economy. More specifically, we use a sample of publicly listed non-financial firms in the Netherlands over the period 2001–2014. We choose the Netherlands for two reasons. First, the Netherlands is one of the small and advanced economies and is a part of the European Union

(EU). Firms in the Netherlands are therefore subject to both local and EU regulations. Second, environmental concerns in the EU have been growing rapidly over the past few decades, which should change the way in which firms in the Netherlands operate with respect to environmental issues. Thus, testing our prediction using the sample of firms in the Netherlands would provide new insights into the relationship between environmental efforts and firm performance.

We retrieve a list of firms and annual financial data during the period 2000–2014 from Thompson Reuters Datastream. After constructing the initial sample, we first exclude IPOs between 2013 and 2014. We then exclude observations with missing key variables. Please see a full list of variables in the appendix.

3.2. Dependent variables

To examine the impact of environmental efforts on firm performance, we use four measures to proxy for firm performance: (1) return on assets (ROA), measured as the ratio of earnings before interest and taxes (EBIT) to total assets; (2) return on equity (ROE), measured as the ratio of earnings before interest and taxes (EBIT) to the book value of equity; (3) return on sales (ROS), measured as the ratio of earnings before interest and taxes (EBIT) to net sales; and (4) stock return (RETURN), measured as the first difference in the natural logarithm of a firm's year-end stock price.

3.3. Independent variable of interest

To measure a firm's environmental efforts, which are unobservable, we use two proxies. First, renewable energy intensity (ENEF1) is measured as the ratio of total energy generated from primary renewable energy sources to total energy, as a rough proxy for the firm's environmental efforts. Environmentally friendly sites or offices (ENEF2) is a binary

variable taking a value of one if the company has environmentally friendly or green sites or offices, and zero otherwise. Both measures are observable and available in the ESG-ASSET4 database. ENEF1 and ENEF2 are reported for the first time in 2005 and 2006, respectively.

3.4. Control variables

To control for industry-level effects on firm performance, we use an industry's stock return (INDRET), which is computed as the first difference in the natural logarithm of the industry price index associated with the firm. In some model specifications, we alternatively use the industry dummy variable (INDDUMMY) to control for any unobservable time-invariant industry effects. However, with the inclusion of firm fixed effects in the model, the industry dummy variable cannot be used. Therefore, we either replace the firm fixed effects with INDDUMMY in the model or interact INDDUMMY with YEAR, which is a time-trend variable, in the model with the firm fixed effects.

Consistent with the finance literature (e.g., Barontini and Caprio, 2006; Hogan and Lewis, 2005; Lee and Suh, 2012; Margaritis and Psillaki, 2010), we include a large set of firm-level control variables. More specifically, we use firm size (LNTA), leverage (LEV), the tangible asset ratio (PPETA), the current ratio (CURRENT), capital investment (CAPEXTA), the cash-to-asset ratio (CASHTA), the market-to-book ratio (MBV), the payout ratio (POUT) and sales growth (SALESGROWTH).

We include a large set of firm-level control variables to control for the firm-specific effects on firm performance. To control for the size of a firm, we use firm size (LNTA), which is computed as the natural logarithm of real total assets (in millions EUR). To control for capital structure, we use leverage (LEV), which is measured as the ratio of total debt to total assets. To control for fixed assets effects, we use the tangible asset ratio (PPETA),

which is measured as the ratio of property, plant and equipment to total assets. To control for growth opportunities, we use the market-to-book ratio (MBV), which is measured as the market value of common equity to the book value of common equity. To control for liquidity, we use the current ratio (CURRENT), which is measured as the ratio of current assets to current liabilities. We use capital investment (CAPEXTA), which is measured as the ratio of capital expenditure to one-year lagged total assets, to control for new capital investment. We include dividend payout ratio (POUT), which is the ratio of dividend per share to earnings per share, to control for dividend payout policy. We use sales growth (ΔSALES), which is computed as the first difference in the natural logarithm of net sales, to control for the firm's growth associated with assets-in-place.

3.5. Methodology

3.5.1. The impact of environmental efforts on firm performance

To test whether the variation in firm performance can be explained by environmental efforts, we estimate the following panel OLS regression:

$$PERF_{i,j,t} = \alpha + \beta_1 ENEF1_{i,j,t-1} + \beta_2 ENEF2_{i,j,t-1} + \delta \mathbf{Z}_{i,j,t-1} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (1)$$

where *i*, *j* and *t*, respectively, index firm, industry and time. $PERF_{i,j,t}$ is a proxy for firm performance. $ENEF1_{i,j,t}$ and $ENEF2_{i,j,t}$ are proxies for environmental efforts for firm *i* in industry *j* at time *t*. **Z** is a vector of firm- and industry-level control variables; η_i is the firm fixed effect; ν_t is the year fixed effect; and ϵ is an error term. We include the firm fixed effects in the regression to control for unobservable firm-specific and time-invariant heterogeneity. We add the year fixed effects to account for unobserved time-variant common

shocks to all firms in the sample. Furthermore, we alternatively add industry-fixed effects in the regressions.

To further alleviate the endogeneity concerns, we use the 2SLS regressions to test the effect of environmental efforts on firm performance. In the first stage, we estimate a panel OLS regression of ENEF1 and a probit model of ENEF2, respectively, as follows.

$$ENEF1_{i,j,t} = \alpha + \delta \mathbf{Z}_{i,j,t-1} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (2)$$

$$ENEF2_{i,j,t} = \alpha + \delta \mathbf{Z}_{i,j,t-1} + \varepsilon_{i,j,t}, \quad (3)$$

where all variables are defined as before. All right-hand-side variables are lagged one period. We used PENEF1 (PENEF2), which is the predicted value of ENEF1 (ENEF2) obtained from the first-stage regression, as the measure of environmental efforts in the second-stage regression. We estimate the second-stage panel OLS regression as follows.

$$PERF_{i,j,t} = \alpha + \beta_1 PENEF1_{i,j,t-1} + \beta_2 PENEF2_{i,j,t-1} + \delta \mathbf{Z}_{i,j,t-1} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (4)$$

where all variables are defined as before. All explanatory variables are lagged one period.

3.6. Descriptive statistics

We winsorize all variables at the 1st and 99th percentiles to reduce the impact of extreme values or recoding errors (Oikonomou et al., 2012). We report summary statistics related to firm characteristics for our sample during the period 2001–2014 in Table 1. The mean value of ENEF1 is very low (0.01 or 1%). A primary reason for the low value is that there are many observations with missing values, which have been recorded for zero. We find

that the mean value of ENEF2 is higher than that of ENEF1 (0.06 vs. 0.01). The mean value of 0.06 suggests that 6% of firms on average are identified as having environmental friendly or green sites or offices. The average value of LEV of 0.24 for our sample is substantially lower than the average leverage ratio (0.61) of firms in the Netherlands during the period 1998–2001, as reported by Duffhues and Kabir (2008), suggesting that the Dutch firms have gone through the deleveraging processes during our sample period.

[INSERT TABLE 1 HERE]

Table 2 reports correlation coefficients of key variables. As can be seen, CURRENT and CASHTA are highly correlated. Likewise, PPETA and CAPEXTA are highly correlated. Therefore, when we estimate our regressions, we do not include CURRENT and PPETA in the models to alleviate multicollinearity concerns. As ENEF1 and ENEF2 are not highly correlated, which may imply that both variables reflect different dimensions of environmental efforts, they can be simultaneously included in the equation.

[INSERT TABLE 2 HERE]

4. Empirical results: The impact of environmental efforts on firm performance

4.1. Main results

In this section, we examine whether environmental efforts have a significant effect on firm performance. Table 3 presents the panel OLS regression results of the effect of environmental efforts on firm performance. The dependent variable is ROA (in Models 1 and 2), ROE (in Models 3 and 4), ROS (in Models 5 and 6) and RETURN (in Models 7 and 8).

To address the endogeneity concerns and establish causation, we lag all explanatory variables one period (Oikonomou et al., 2012). Standard errors are clustered at the firm level and are robust to heteroskedasticity and autocorrelation.

[INSERT TABLE 3 HERE]

Models 1, 3, 5 and 7 are our baseline models where only control variables are included. We find that firm size (LNTA) is negatively associated with ROA, ROE, ROS, and RETURN. Growth opportunities (MBV) are positively associated with ROA and are negatively associated with RETURN. Sales growth (ΔSALES) is positively associated with ROE and ROS.

As discussed earlier that ENEF1 and ENEF2 are first reported in 2005 and 2006, respectively, we repeat our regression analysis for the sub-period of 2005–2014. To conserve space, we do not tabulate the results. These results show that our main findings are qualitatively unchanged; that is the level of environmental efforts is not associated with firm performance.

Overall, the results in Table 3 show that environmental efforts have no effect on firm performance. More specifically, neither the coefficient on ENEF1 nor the coefficient on ENEF2 is statistically significant in Models 2, 4, 6 and 8. Our findings point to the notion that firms with higher environmental efforts do not necessarily have better performance. The results are consistent with Hart and Ahuja (1996) and Freedman and Jaggi (1994). The results in Table 3 do not support our hypothesis that there is a positive relationship between environmental efforts and firm performance.

[INSERT TABLE 4 HERE]

As the environmental efforts are more likely to be jointly determined with other strategic decisions and thus are not exogenous, we address this endogeneity issue by using the 2SLS approach (as discussed in Section 3). Table 4 presents the results of our first- and second-stage regressions. We restrict our sample to cover the period 2005–2014. Model 1 of Table 4 is the first-stage panel OLS regression of ENEF1. We find that firm size (LNTA) and growth opportunities (MBV) are negatively associated with ENEF1 while leverage (LEV) is positively associated with ENEF1. The model's adjusted R^2 is 0.417, indicating that it has a good predictive power of ENEF1. Model 2 of Table 4 is the first-stage probit model of ENEF2. The coefficient on LNTA is positive and statistically significant, while the coefficient on CASHTA is negative and statistically significant.

Models 3–6 report the second-stage panel OLS regression of firm performance. Looking across all second-stage models, we find that the coefficient on PENEF1 is positive and statistically significant in Model 3 and is negative and statistically significant in Model 5. That is, it has a positive effect on ROA and a negative effect on ROS but has no effect on ROE and stock return. The negative effect of PENEF1 on ROS is inconsistent with most prior studies, but it is similar to that of Sarkis and Cordeiro (2001), who find a significant negative relationship between environmental efficiency based on Toxic Release Inventory data and financial performance measured as ROS. The coefficient on PENEF2 is not statistically significant in all models, indicating that the second measure of environmental efforts has no effect on firm performance.

Overall, the 2SLS regression results provide some empirical evidence to support the notion that firms with greater environmental efforts tend to have better performance, measured as ROA. This finding provides support to Hypothesis 1, which predicts that there is a positive relationship between environmental efforts and firm performance. However, when

we measure firm performance using ROS, we find that firms with greater environmental efforts have poorer firm performance. We do not find evidence to indicate that environmental efforts are associated with ROE or stock return. Our interpretation of the findings is that firms that have a high level of environmental efforts appear to benefit from having a higher profitability, which is captured by ROA, than those with a lower level of environmental efforts. Nevertheless, firms with a higher level of environmental efforts seem to have lower profitability, measured as ROS. Investors may be skeptical about the influence of environmental efforts on firm performance, and thus do not reward firms with higher degrees of environmental efforts.

[INSERT TABLE 5 HERE]

To test Hypothesis 2, which predicts that prior firm performance strengthens the effect of environmental efforts on firm performance, we estimate the 2SLS regressions again. We add two interaction terms in the second-stage regressions: (1) the interaction between PENEF1 and prior firm performance (PFP), which is measured as the rolling three-year average ROA; and (2) the interaction between PENEF2 and PFP. We expect the coefficient on the interaction terms to be positive.

Table 5 reports the results of the 2SLS regressions. We find that the coefficient on the interaction term between PENEF1 and PFP is negative and statistically significant when the dependent variable is ROA (see Model 3) and RETURN (see Model 6), and is positive and statistically significant when the dependent variable is ROE (see Model 4). The coefficient on the interaction term between PENEF2 and PFP is positive and statistically significant when the dependent variable is RETURN (see Model 6). Overall, we do not find empirical support

to suggest that prior firm performance moderates the effect of environmental efforts on firm performance.

[INSERT TABLE 6 HERE]

To test Hypothesis 3, which predicts that firm performance variation weakens the positive effect of environmental efforts on firm performance, we repeat our analysis using 2SLS regressions. Table 6 presents the results of the 2SLS regressions. We measure variation in firm performance (RISK) as the ratio of the rolling three-year standard deviation of ROA to the rolling three-year average ROA. We find that variation in firm performance does not moderate the influence of environmental efforts on firm performance as the results in Table 6 show that the coefficients on the interaction terms are not statistically significant in all models. Thus, our findings do not support Hypothesis 3.

5. What drives firms to provide information on environmental efforts?

In this section, we empirically address the question of what factors drive a firm to report its environmental efforts. More specifically, we test whether firm characteristics[5] such as firm size and profitability can predict whether the firm would provide its environmental efforts (e.g., ENEF1D and ENEF2D). We estimate the following baseline probit models.

$$ENEF1D_{i,j,t} = \alpha + \beta_1 PERF_{i,j,t-1} + \delta \mathbf{Z}_{i,j,t-1} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (5)$$

$$ENEF2D_{i,j,t} = \alpha + \beta_1 PERF_{i,j,t-1} + \delta \mathbf{Z}_{i,j,t-1} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (6)$$

[5] Dixon-Fowler et al. (2013) examine firm characteristics such as large versus small firms, public versus private firms, US versus international firms and worst industry versus others.

where *ENEF1D* (*ENEF2D*) is an environmental disclosure indicator, which takes a value of one for observations with the value of *ENEF1* (*ENEF2*) reported in the database, and zero otherwise. Other variables are defined as before.

Our main prediction is that firm performance is more likely to play a major role in determining whether the firm reports its environmental efforts. Thus, we are interested in the estimated coefficient on *PERF* in Equations (5) and (6).

[INSERT TABLE 7 HERE]

Table 7 presents the results of the probit model where *ENEF1D* and *ENEF2D* are the dependent variable in Models 1 and 2, respectively. We estimate the probit models with Huber/White robust standard errors. Looking at Model 1, we find that the coefficient on LNTA is positive and statistically significant, indicating that larger firms tend to report the level of environmental efforts. In addition, we observe that the coefficient on LEV is positive and statistically significant, implying that firms with higher financial leverage tend to disclose the level of environmental efforts. However, the coefficient on ROA is not statistically significant, thereby providing no empirical support to the notion that more profitable firms report the degree of environmental efforts. Al-Tuwaijri et al. (2004) find that good environmental performers disclose more pollution-related environmental information than do poor environmental performers.

Looking at Model 2, we observe a similar pattern of results. However, we find that more profitable firms are less likely to disclose their environmental efforts, as the coefficient on ROA is negative and statistically significant. There is evidence to suggest that firms with large capital investment tend to disclose their environmental efforts, given that the coefficient

on CAPEXTA is positive and statistically significant. In addition, the coefficient on MBV is positive and statistically significant, indicating that firms with better growth opportunities are more likely to report their environmental efforts.

In summary, we find empirical evidence to support the notion that larger firms are more inclined to report their environmental efforts than smaller firms and that profitability does not have an influence on the firm's decision to disclose their environmental efforts.

6. Conclusion

In this paper, we provide a new empirical answer to the question of whether firms with a higher degree of environmental efforts exhibit better firm performance. We consider that while the environmental efforts represent one CSR activities, they are more likely to be more economically motivated than other CSR activities.

To test whether the environmental efforts affect firm performance, we analyze a sample of publicly listed non-financial firms in the Netherlands over the period 2001–2014 using panel OLS regressions and 2SLS regressions. We find empirical evidence to support the notion that firms with higher degrees of environmental efforts have better firm performance, measured as ROA, but have poorer firm performance, measured as ROS. However, the association between environmental efforts and firm performance disappears when we measure firm performance as ROE or stock return.

Our results show that the mixed results observed in the literature might be attributable to the measurable issue and the statistical issue. The results of our probit models reveal that better firm performance does not necessarily lead to a disclosure of the firm's environmental efforts. We find that larger firms are more inclined to report their environmental efforts than smaller firms. Our findings show that prior firm performance does not moderate or strengthen

the effect of environmental efforts on firm performance. In addition, we find that variation in performance, which represents operating risk, has neither a direct effect on firm performance nor a moderating effect on the relationship between environmental efforts and firm performance.

Appendix. Definition of variables

This table provides a full description of the variables used in this study.

Variable	Symbol	Definition
Industry-level variable		
Industry stock return	INDRET	The first difference in the natural logarithm of the industry price index associated with a firm.
Firm-level variables		
Return on assets	ROA	Earnings before interest and taxes divided by total assets.
Return on equity	ROE	Earnings before interest and taxes divided by the book value of equity.
Return on sales	ROS	Earnings before interest and taxes divided by net sales
Stock return	RETURN	The first difference in the natural logarithm of a firm's year-end stock price.
Firm size	LNTA	The natural logarithm of total assets (in millions EUR).
Leverage	LEV	The ratio of total debt to total assets.
Tangible asset	PPETA	The ratio of net property, plant, and equipment to total assets.
Market to book value	MBV	The ratio of the market value of equity to the book value of equity
Cash ratio	CASHTA	The ratio of cash to total assets.
Corporate investment	CAPEXTA	The ratio of capital expenditure to prior-period total assets.
Current ratio	CURRENT	The ratio of current assets to current liabilities.
Dividend payout ratio	POUT	The ratio of dividend per share to earnings per share.
Sales growth	ΔSALES	The first difference in the natural logarithm of net sales
Renewable energy intensity	ENEF1	The ratio of total energy generated from primary renewable energy sources to total energy. A value of zero is recoded for ENEF1 for observations with missing value. ENRRO06V in the ESG-ASSET4 database. A value of zero is recoded for ENEF2 for observations with missing value.
Environmentally friendly sites or offices	ENEF2	A binary variable taking a value of one if the company has environmentally friendly or

	green sites or offices, and zero otherwise. This measure is ENRRO07V in the ESG-ASSET4 database. A value of zero is recoded for ENEF2 for observations with missing value.

References

Al-Tuwaijri, S.A., Christensen, T.E., Hughes Ii, K.E., 2004. The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach. Accounting, Organizations and Society 29, 447-471.

Albertini, E., 2013. Does environmental management improve financial performance? A meta-analytical review. Organization & Environment 26, 431-457.

Barontini, R., Caprio, L., 2006. The effect of family control on firm value and performance: Evidence from Continental Europe. European Financial Management 12, 689-723.

Boyle, E.J., Higgins, M.M., Rhee, G.S., 1997. Stock market reaction to ethical initiatives of defence contractors: Theory and Evidence. Critical Perspectives on Accounting 8, 541-561.

Brammer, S., Brooks, C., Pavelin, S., 2006. Corporate social performance and stock returns: UK evidence from disaggregate measures. Financial Management 35, 97-116.

Callan, S.J., Thomas, J.M., 2009. Corporate financial performance and corporate social performance: an update and reinvestigation. Corporate Social Responsibility and Environmental Management 16, 61-78.

Chopra, S., Wu, P.-J., 2016. Eco-activities and operating performance in the computer and electronics industry. European Journal of Operational Research 248, 971-981.

Cordeiro, J.J., Sarkis, J., 1997. Environmental proactivism and firm performance: evidence from security analyst earnings forecasts. Business Strategy and the Environment 6, 104–114

Dixon-Fowler, H.R., Slater, D.J., Johnson, J.L., Ellstrand, A.E., Romi, A.M., 2013. Beyond "does it pay to be green?" A meta-analysis of moderators of the CEP–CFP relationship. Journal of Business Ethics 112, 353-366.

Dowell, G., Hart, S., Yeung, B., 2000. Do corporate global environmental standards create or destroy market value? Management Science 46, 1059-1074.

Du, X., 2015. How the market values greenwashing? Evidence from China. Journal of Business Ethics 128, 547-574.

Ducassy, I., 2013. Does corporate social responsibility pay off in times of crisis? An alternate perspective on the relationship between financial and corporate social performance. Corporate Social Responsibility and Environmental Management 20, 157-167.

Duffhues, P., Kabir, R., 2008. Is the pay–performance relationship always positive?: Evidence from the Netherlands. Journal of Multinational Financial Management 18, 45-60.

Escobar, L.F., Vredenburg, H., 2011. Multinational oil companies and the adoption of sustainable development: A resource-based and institutional theory interpretation of adoption heterogeneity. Journal of Business Ethics 98, 39-65.

Freedman, M., Jaggi, B., 1994. Analysis of the association between pollution performance and input cost factors: The case of electric utility plants. Journal of Accounting and Public Policy 13, 31-48.

Griffin, J.J., Mahon, J.F., 1997. The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research. Business & Society 36, 5-31.

Hart, S.L., Ahuja, G., 1996. Does it pay to be green? an empirical examination of the relationship between emission reduction and firm performance. Business Strategy and the Environment 5, 30-37.

Hogan, C.E., Lewis, C.M., 2005. Long-run investment decisions, operating performance, and shareholder value creation of firms adopting compensation plans based on economic profits. Journal of Financial and Quantitative Analysis 40, 721-745.

Horváthová, E., 2010. Does environmental performance affect financial performance? A meta-analysis. Ecological Economics 70, 52-59.

Igalens, J., Gond, J.-P., 2005. Measuring corporate social performance in France: a critical and empirical analysis of ARESE data. Journal of Business Ethics 56, 131-148.

Ilinitch, A.Y., Soderstrom, N.S., E. Thomas, T., 1998. Measuring corporate environmental performance. Journal of Accounting and Public Policy 17, 383-408.

Jaggi, B., Freedman, M., 1992. An examination of the impact of pollution performance on economic and market performance: Pulp and paper firms. Journal of Business Finance & Accounting 19, 697-713.

Konar, S., Cohen, M.A., 2001. Does the market value environmental performance? Review of Economics and Statistics 83, 281-289.

Lee, B.-S., Suh, J., 2012. Exchange rate changes and the operating performance of multinationals. European Financial Management 18, 88-116.

Lerner, L.D., Fryxell, G.E., 1988. An empirical study of the predictors of corporate social performance: A multi-dimensional analysis. Journal of Business Ethics 7, 951-959.

Luo, X., Bhattacharya, C.B., 2006. Corporate social responsibility, customer satisfaction, and market value. Journal of Marketing 70, 1-18.

Margaritis, D., Psillaki, M., 2010. Capital structure, equity ownership and firm performance. Journal of Banking & Finance 34, 621-632.

Margolis, J.D., Walsh, J.P., 2003. Misery loves companies: Rethinking social initiatives by business. Administrative Science Quarterly 48, 268-305.

Mittal, R.K., Sinha, N., Singh, A., 2008. An analysis of linkage between economic value added and corporate social responsibility. Management Decision 46, 1437-1443.

Muhammad, N., Scrimgeour, F., Reddy, K., Abidin, S., 2015. The relationship between environmental performance and financial performance in periods of growth and contraction: evidence from Australian publicly listed companies. Journal of Cleaner Production 102, 324-332.

Oikonomou, I., Brooks, C., Pavelin, S., 2012. The impact of corporate social performance on financial risk and utility: A longitudinal analysis. Financial Management 41, 483-515.

Orlitzky, M., Schmidt, F.L., Rynes, S.L., 2003. Corporate social and financial performance: A meta-analysis. Organization Studies 24, 403-441

Patten, D.M., 1990. The market reaction to social responsibility disclosures: The case of the Sullivan principles signings. Accounting, Organizations and Society 15, 575-587.

Pava, M.L., Krausz, J., 1996. The association between corporate social-responsibility and financial performance: The paradox of social cost. Journal of Business Ethics 15, 321-357.

Ruggiero, S., Lehkonen, H., 2017. Renewable energy growth and the financial performance of electric utilities: A panel data study. Journal of Cleaner Production 142, Part 4, 3676-3688.

Russo, M.V., Fouts, P.A., 1997. A resource-based perspective on corporate environmental performance and profitability. The Academy of Management Journal 40, 534-559.

Sarkis, J., Cordeiro, J.J., 2001. An empirical evaluation of environmental efficiencies and firm performance: Pollution prevention versus end-of-pipe practice. European Journal of Operational Research 135, 102-113.

Seifert, B., Morris, S.A., Bartkus, B.R., 2004. Having, giving, and getting: slack resources, corporate philanthropy, and firm financial performance Business & Society 43, 135-161.

Shin, H., Ellinger, A.E., Nolan, H.H., DeCoster, T.D., Lane, F., 2016. An assessment of the association between renewable energy utilization and firm financial performance. Journal of Business Ethics, 1-18.

Sueyoshi, T., Goto, M., 2009. Can environmental investment and expenditure enhance financial performance of US electric utility firms under the clean air act amendment of 1990? Energy Policy 37, 4819-4826.

Ullmann, A.A., 1985. Data in search of a theory: a critical examination of the relationships among social performance, social disclosure, and economic performance of U. S. firms. The Academy of Management Review 10, 540-557.

van Beurden, P., Gössling, T., 2008. The worth of values – a literature review on the relation between corporate social and financial performance. Journal of Business Ethics 82, 407.

Waddock, S.A., Graves, S.S., 1997. The corporate social performance–financial performance link. Strategic Management Journal 18, 303–319

Wu, M.-W., Shen, C.-H., 2013. Corporate social responsibility in the banking industry: Motives and financial performance. Journal of Banking & Finance 37, 3529-3547.

Table 1: Summary statistics
This table reports summary statistics for key variables for the sample of publicly listed firms in the Netherlands over the period 2001–2014.

	Mean	Median	S.D.	Minimum	Maximum	N
ROA	0.02	0.07	0.28	-1.96	0.38	1,202
ROE	0.14	0.18	0.53	-3.16	1.53	1,202
ROS	0.03	0.06	0.78	-5.85	2.13	1,184
RETURN	-0.03	0.04	0.46	-1.80	0.96	1,137
ENEF1	0.01	0.00	0.06	0.00	0.80	1,320
ENEF2	0.06	0.00	0.24	0.00	1.00	1,320
LNTA	6.19	6.45	2.56	-2.05	11.81	1,227
LEV	0.24	0.22	0.19	0.00	1.10	1,224
CAPEXTA	0.05	0.03	0.05	0.00	0.28	1,205
CASHTA	0.11	0.06	0.14	0.00	0.68	1,227
CURRENT	1.53	1.34	0.91	0.18	6.17	1,103
ΔSALES	0.03	0.03	0.29	-1.18	1.28	1,110
PPETA	0.27	0.20	0.26	0.00	0.99	1,224
MBV	2.40	1.70	2.55	-1.11	17.39	1,198
POUT	33.92	37.43	29.06	0.00	100.00	1,218
INDRET	0.00	0.08	0.35	-1.00	0.62	1,190

Table 2: Correlations between key variables

This table reports correlation coefficients between key variables for a sample of 939 firm-year observations covering the period 2001–2014. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. ROA	1.00															
2. ROE	0.41***	1.00														
3. ROS	0.60***	0.31***	1.00													
4. RETURN	0.34***	0.26***	0.20***	1.00												
5. ENEF1	0.03	0.05	0.03	-0.02	1.00											
6. ENEF2	0.04	0.04	0.05	0.01	0.11***	1.00										
7. LNTA	0.25***	0.24***	0.20***	0.08**	0.18***	0.36***	1.00									
8. LEV	-0.25***	0.05	-0.12***	-0.15***	0.18***	0.07**	0.21***	1.00								
9. CAPEXTA	0.18***	0.20***	0.10***	0.02	0.00	-0.04	0.09***	0.19***	1.00							
10. CASHTA	0.02	-0.06*	-0.17***	0.06*	0.00	-0.04	-0.07**	-0.36***	-0.16***	1.00						
11. CURRENT	0.15***	0.00	-0.04	0.07**	-0.11***	-0.15***	-0.18***	-0.38***	-0.12***	0.65***	1.00					
12. ΔSALES	0.19***	0.20***	0.15***	0.08**	-0.03	-0.03	0.04	-0.03	0.14***	-0.03	-0.07**	1.00				
13. PPETA	0.09**	0.12***	0.06*	0.06*	0.03	0.02	0.19***	0.28***	0.64***	-0.27***	-0.13***	0.01	1.00			
14. MBV	0.12***	0.03	-0.09**	0.20***	0.01	0.02	0.11***	0.13***	0.07*	0.13***	-0.07**	0.01	-0.05	1.00		
15. POUT	0.37***	0.32***	0.20***	0.20***	-0.02	0.07**	0.19***	-0.08**	0.10***	-0.02	0.06*	0.05	0.10***	0.15***	1.00	
16. INDRET	0.02	0.05	0.05	0.62***	-0.02	0.01	-0.01	-0.08**	-0.11***	0.04	-0.01	-0.07**	-0.06*	0.12***	0.03	1.00

Table 3: Panel OLS regressions of firm performance

This table presents panel OLS regressions of firm performance for a sample of firms over the period 2002–2014. Firm performance is measured as ROA (Models 1 and 2), ROE (Models 3 and 4), ROS (Models 5 and 6), and RETURN (Models 7 and 8). Please see the appendix for other variable definitions. All explanatory variables are one-period lagged. Firm- and year fixed effects are included in all regressions. Robust standard errors, which are clustered at the firm level, are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) ROA	(2) ROA	(3) ROE	(4) ROE	(5) ROS	(6) ROS	(7) RETURN	(8) RETURN
Constant	0.241**	0.241**	0.682**	0.717**	0.945**	1.006**	1.232***	1.277***
	(0.096)	(0.097)	(0.274)	(0.277)	(0.397)	(0.406)	(0.205)	(0.206)
$LNTA_{t-1}$	-0.037**	-0.037**	-0.097**	-0.103**	-0.146**	-0.156**	-0.175***	-0.182***
	(0.015)	(0.015)	(0.042)	(0.042)	(0.061)	(0.063)	(0.032)	(0.032)
LEV_{t-1}	-0.068	-0.068	-0.014	0.004	0.148	0.182	-0.144	-0.120
	(0.055)	(0.056)	(0.155)	(0.157)	(0.202)	(0.201)	(0.118)	(0.118)
$CAPEXTA_{t-1}$	0.145	0.145	0.195	0.227	-0.066	-0.015	-0.107	-0.069
	(0.152)	(0.152)	(0.487)	(0.489)	(0.548)	(0.549)	(0.341)	(0.341)
$CASHTA_{t-1}$	0.095	0.095	-0.044	-0.030	0.211	0.234	-0.186	-0.173
	(0.059)	(0.060)	(0.168)	(0.168)	(0.254)	(0.253)	(0.136)	(0.137)
$\Delta SALES_{t-1}$	0.005	0.005	0.124**	0.125**	0.213**	0.213***	0.056	0.057
	(0.018)	(0.018)	(0.059)	(0.059)	(0.071)	(0.071)	(0.042)	(0.042)
MBV_{t-1}	0.014***	0.014***	0.006	0.006	-0.020	-0.022	-0.034***	-0.035***
	(0.004)	(0.004)	(0.011)	(0.011)	(0.014)	(0.014)	(0.008)	(0.008)
$POUT_{t-1}$	0.000	0.000	0.002**	0.002**	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$INDRET_{t-1}$	0.012	0.012	0.095	0.091	-0.003	-0.010	-0.059	-0.065
	(0.032)	(0.032)	(0.075)	(0.075)	(0.101)	(0.100)	(0.061)	(0.061)
$ENEF1_{t-1}$		-0.003		-0.156		-0.340		-0.386
		(0.110)		(0.318)		(0.579)		(0.276)
$ENEF2_{t-1}$		-0.001		-0.063		-0.068		-0.016
		(0.028)		(0.072)		(0.117)		(0.063)

Firm-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.500	0.500	0.314	0.315	0.580	0.581	0.539	0.541
Adjusted R^2	0.441	0.440	0.233	0.233	0.531	0.531	0.486	0.487
F-statistic	8.538***	8.355***	3.905***	3.838***	11.761***	11.537***	10.213***	10.058***
Firms included	83	83	83	83	83	83	83	83
Observations	974	974	974	974	970	970	993	993

Table 4: Two-stage least squares regressions of firm performance

This table presents the results of two-stage least squares (2SLS) regressions of firm performance for a sample of firms over the period 2005–2014. Models 1 and 2 present the first-stage panel OLS regression of ENEF1 and the first-stage probit regression of ENEF2. Models 3-6 present the second-stage panel OLS regressions. We use ROA, ROE, ROS, and RETURN as the dependent variable in Models 3, 4, 5, and 6, respectively. PENEF1 (PENEF2), which is the predicted value of ENEF1 (ENEF2) obtained from the first-stage regression, is used as the measure of environmental efforts in the second-stage regression. Please see the appendix for other variable definitions. All explanatory variables are one-period lagged. Firm and year fixed effects are included in all regressions. Robust standard errors, which are clustered at the firm level, are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) ENEF1	(2) ENEF2	(3) ROA	(4) ROE	(5) ROS	(6) RETURN
Constant	0.149*	-4.726***	-0.177	0.976**	1.964***	1.031***
	(0.080)	(0.374)	(0.141)	(0.431)	(0.687)	(0.331)
$LNTA_{t-1}$	-0.025**	0.513***	0.027	-0.123*	-0.264**	-0.153***
	(0.012)	(0.048)	(0.022)	(0.066)	(0.106)	(0.051)
LEV_{t-1}	0.126***	-0.894	-0.112	-0.361	-0.552	-0.066
	(0.038)	(0.584)	(0.082)	(0.263)	(0.391)	(0.207)
$CAPEXTA_{t-1}$	0.097	-3.857*	0.200	1.216*	-0.675	0.898
	(0.109)	(2.235)	(0.213)	(0.672)	(0.994)	(0.571)
$CASHTA_{t-1}$	0.098***	-2.160**	0.135*	-0.086	1.092***	-0.212
	(0.036)	(1.011)	(0.071)	(0.223)	(0.364)	(0.192)
$\Delta SALES_{t-1}$	-0.004	-0.683	0.015	0.006	0.348***	0.013
	(0.010)	(0.362)	(0.020)	(0.074)	(0.099)	(0.058)
MBV_{t-1}	-0.005**	0.028	0.008	-0.035**	-0.011	-0.030**
	(0.002)	(0.049)	(0.006)	(0.017)	(0.024)	(0.014)
$POUT_{t-1}$	0.000	-0.001	0.000	0.002*	-0.002	0.000
	(0.000)	(0.003)	(0.000)	(0.001)	(0.002)	(0.001)
ROA_{t-1}	0.026	-0.032				
	(0.025)	(1.028)				
$INDRET_{t-1}$	-0.021	-0.278	-0.030	0.109	-0.071	0.005
	(0.015)	(0.242)	(0.038)	(0.109)	(0.178)	(0.093)

$PENEF1_{t-1}$			1.011**	-1.859	-4.680**	0.745
			(0.428)	(1.246)	(1.873)	(1.030)
$PENEF2_{t-1}$			0.110	0.130	-0.151	0.010
			(0.167)	(0.477)	(0.686)	(0.379)
Firm fixed effects	Yes		Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	Yes	Yes	Yes
R^2	0.494		0.543	0.376	0.603	0.565
Adjusted R^2	0.417		0.464	0.267	0.534	0.490
McFadden R^2		0.342				
F-statistic	6.446***		6.841***	3.459***	8.675***	7.576***
LR statistic		172.023***				
Firms included	83	83	82	82	82	82
Observations	762	762	669	669	665	678

Table 5: Two-stage least squares regressions of firm performance: The moderating effect of prior firm performance

This table presents the results of two-stage least squares (2SLS) regressions of firm performance for a sample of firms over the period 2006–2014. Models 1 and 2 present the first-stage panel OLS regression of ENEF1 and the first-stage probit regression of ENEF2. Models 3-6 present the second-stage panel OLS regressions. We use ROA, ROE, ROS, and RETURN as the dependent variable in Models 3, 4, 5, and 6, respectively. PENEF1 (PENEF2), which is the predicted value of ENEF1 (ENEF2) obtained from the first-stage regression, is used as the measure of environmental efforts in the second-stage regression. Prior firm performance (PFP) is measured as the rolling three-year average ROA. Please see the appendix for other variable definitions. All explanatory variables are one-period lagged. Firm and year fixed effects are included in all regressions. Robust standard errors, which are clustered at the firm level, are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) ENEF1	(2) ENEF2	(3) ROA	(4) ROE	(5) ROS	(6) RETURN
Constant	0.149*	-4.726***	0.084	0.318	1.781**	1.157***
	(0.080)	(0.374)	(0.136)	(0.478)	(0.701)	(0.371)
$LNTA_{t-1}$	-0.025**	0.513***	-0.009	-0.024	-0.216**	-0.172***
	(0.012)	(0.048)	(0.021)	(0.072)	(0.108)	(0.057)
LEV_{t-1}	0.126***	-0.894	0.044	-0.541**	-0.299	0.040
	(0.038)	(0.584)	(0.084)	(0.270)	(0.399)	(0.220)
$CAPEXTA_{t-1}$	0.097	-3.857*	0.108	1.496**	-0.257	1.012*
	(0.109)	(2.235)	(0.199)	(0.679)	(0.916)	(0.587)
$CASHTA_{t-1}$	0.098***	-2.160**	0.086	-0.104	1.033***	-0.219
	(0.036)	(1.011)	(0.070)	(0.231)	(0.369)	(0.207)
$\Delta SALES_{t-1}$	-0.004	-0.683	0.067***	-0.029	0.399***	0.024
	(0.010)	(0.362)	(0.020)	(0.079)	(0.103)	(0.062)
MBV_{t-1}	-0.005**	0.028	-0.002	-0.013	-0.006	-0.037**
	(0.002)	(0.049)	(0.005)	(0.019)	(0.023)	(0.015)
$POUT_{t-1}$	0.000	-0.001	0.000	0.003**	-0.001	0.000
	(0.000)	(0.003)	(0.000)	(0.001)	(0.002)	(0.001)
ROA_{t-1}	0.026	-0.032				
	(0.025)	(1.028)				
$INDRET_{t-1}$	-0.021	-0.278	0.003	0.116	0.022	0.000

	(0.015)	(0.242)	(0.039)	(0.105)	(0.169)	(0.095)
$PENEF1_{t-1}$			-0.282	-0.429	-8.722***	-0.313
			(0.433)	(1.404)	(1.921)	(1.177)
$PENEF2_{t-1}$			-0.082	-0.188	-1.128*	-0.358
			(0.167)	(0.508)	(0.668)	(0.402)
$PENEF1_{t-1}*PFP_{t-1}$			-6.706***	16.378***	-11.488	-9.687***
			(1.616)	(4.243)	(6.984)	(3.325)
$PENEF2_{t-1}*PFP_{t-1}$			0.425	5.253	4.977	5.654**
			(1.163)	(3.635)	(4.439)	(2.806)
PFP_{t-1}			-0.073	-1.523***	-2.314***	-0.006
			(0.108)	(0.355)	(0.451)	(0.277)
Firm fixed effects	Yes		Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	Yes	Yes	Yes
R^2	0.494		0.602	0.418	0.616	0.559
Adjusted R^2	0.417		0.530	0.312	0.546	0.480
McFadden R^2		0.342				
F-statistic	6.446***		8.343***	3.964***	8.804***	7.099***
LR statistic		172.023***				
Firms included	83	83	81	81	81	81
Observations	762	762	660	660	657	667

Table 6: Two-stage least squares regressions of firm performance: The moderating effect of variation in firm performance

This table presents the results of two-stage least squares (2SLS) regressions of firm performance for a sample of firms over the period 2006–2014. Models 1 and 2 present the first-stage panel OLS regression of ENEF1 and the first-stage probit regression of ENEF2. Models 3-6 present the second-stage panel OLS regressions. We use ROA, ROE, ROS, and RETURN as the dependent variable in Models 3, 4, 5, and 6, respectively. PENEF1 (PENEF2), which is the predicted value of ENEF1 (ENEF2) obtained from the first-stage regression, is used as the measure of environmental efforts in the second-stage regression. Variation in firm performance (RISK) is measured as the ratio of rolling three-year standard deviation of ROA to the rolling three-year average ROA. Please see the appendix for other variable definitions. All explanatory variables are one-period lagged. Firm and year fixed effects are included in all regressions. Robust standard errors, which are clustered at the firm level, are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) ENEF1	(2) ENEF2	(3) ROA	(4) ROE	(5) ROS	(6) RETURN
Constant	0.149*	-4.726***	-0.021	1.051**	2.136***	0.886**
	(0.080)	(0.374)	(0.137)	(0.450)	(0.682)	(0.357)
$LNTA_{t-1}$	-0.025**	0.513***	0.004	-0.126*	-0.271***	-0.128**
	(0.012)	(0.048)	(0.021)	(0.068)	(0.105)	(0.054)
LEV_{t-1}	0.126***	-0.894	-0.028	-0.450	-0.615	-0.119
	(0.038)	(0.584)	(0.080)	(0.277)	(0.401)	(0.217)
$CAPEXTA_{t-1}$	0.097	-3.857*	0.144	1.273*	-0.356	1.061*
	(0.109)	(2.235)	(0.199)	(0.685)	(0.952)	(0.592)
$CASHTA_{t-1}$	0.098***	-2.160**	0.077	-0.214	0.806**	-0.196
	(0.036)	(1.011)	(0.069)	(0.235)	(0.372)	(0.205)
$\Delta SALES_{t-1}$	-0.004	-0.683	0.050**	-0.014	0.349***	-0.002
	(0.010)	(0.362)	(0.021)	(0.082)	(0.104)	(0.062)
MBV_{t-1}	-0.005**	0.028	0.001	-0.040**	-0.024	-0.028*
	(0.002)	(0.049)	(0.005)	(0.018)	(0.022)	(0.015)
$POUT_{t-1}$	0.000	-0.001	0.000	0.002*	-0.002	0.000
	(0.000)	(0.003)	(0.000)	(0.001)	(0.002)	(0.001)
ROA_{t-1}	0.026	-0.032				
	(0.025)	(1.028)				
$INDRET_{t-1}$	-0.021	-0.278	-0.001	0.114	-0.016	-0.001

	(0.015)	(0.242)	(0.037)	(0.111)	(0.178)	(0.095)
$PENEF1_{t-1}$			0.506	-2.451*	-7.194***	0.563
			(0.437)	(1.310)	(1.877)	(1.096)
$PENEF2_{t-1}$			0.039	0.051	-0.342	-0.055
			(0.165)	(0.489)	(0.666)	(0.389)
$PENEF1_{t-1}*RISK_{t-1}$			0.015	-0.048	0.011	-0.002
			(0.044)	(0.166)	(0.266)	(0.132)
$PENEF2_{t-1}*RISK_{t-1}$			0.000	0.000	-0.015	0.023
			(0.008)	(0.029)	(0.050)	(0.025)
$RISK_{t-1}$			0.000	0.002	0.004	-0.003
			(0.002)	(0.006)	(0.008)	(0.005)
Firm fixed effects	Yes		Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	Yes	Yes	Yes
R^2	0.494		0.578	0.376	0.594	0.550
Adjusted R^2	0.417		0.502	0.263	0.520	0.470
McFadden R^2		0.342				
F-statistic	6.446***		7.582***	3.333***	8.043***	6.847***
LR statistic		172.023***				
Firms included	83	83	81	81	81	81
Observations	762	762	660	660	657	667

Table 7: Results of probit regressions of environmental efforts.
This table presents the probit regression of environmental efforts for a sample of firms over the period 2004–2014. Environmental efforts are measured as *ENEF1D* and *ENEF2D* in Models 1 and 2, respectively. *ENEF1D* (*ENEF2D*) is an environmental disclosure indicator, which takes a value of one for a firm-year observation with the value of *ENEF1* (*ENEF2*) is reported in the database, and zero otherwise. Please see the appendix for other variable definitions. All explanatory variables are one-period lagged. Firm and year fixed effects are included in all regressions. Huber/White robust standard errors are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)
	ENEF1D	ENEF2D
Constant	-5.601***	-10.284***
	(0.622)	(1.071)
$LNTA_{t-1}$	0.445***	1.362***
	(0.051)	(0.150)
LEV_{t-1}	2.438***	-3.294***
	(0.791)	(0.702)
$CAPEXTA_{t-1}$	-6.863*	5.482***
	(3.736)	(1.554)
$CASHTA_{t-1}$	0.304	-0.401
	(1.073)	(0.921)
$\Delta SALES_{t-1}$	-0.354	-0.297
	(0.351)	(0.330)
MBV_{t-1}	-0.021	0.223***
	(0.051)	(0.058)
$POUT_{t-1}$	0.001	0.002
	(0.004)	(0.003)
ROA_{t-1}	1.824	-1.269**
	(1.456)	(0.613)
$INDRET_{t-1}$	-0.294	0.025
	(0.248)	(0.228)
McFadden R^2	0.326	0.700
LR statistic	130.586***	747.143***
Observations	834	834