Environmental costs and Performance in the Financial Services Industries: Evidence around the world

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ABSTRACT

This paper examines how environmental costs affect performance of firms in the financial services industries for 29 countries. We find that countries in Europe have the largest difference between ROA and environmental cost-adjusted ROA (i.e., TruROA). We also show that countries with well-developed financial markets have a higher level of total environmental costs than other countries. It appears that active transactions and business activities generate a substantial amount of indirect environmental costs for firms in the well-developed financial markets. Our regression results report that lowering environmental costs has a significant role in enhancing firm performance. Lowering environmental costs is expected to precede at least one or two years before enhancing ROA. The results, however, vary depending on the levels of the financial market development. This indicates that lowering environmental costs has a more immediate impact on firm performance in well-developed financial markets than in less-developed financial markets. These results are robust even after employing various panel-data regression methods and additional performance measure. Our findings suggest that policy makers dealing with corporate sustainability management should continue to pursue an environment-centered industry policy as firms with lower environmental costs consistently perform better.

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1. Introduction

There is well documented literature that corporate social responsibility (CSR) and firm financial performance are positively related. Extant studies broadly report that firms with a higher level of CSR are associated with greater financial performance. This suggests that although CSR activities incur costs, their positive effects on firm performance typically surpass the costs. Preston and O'Bannon (1997) further discuss that there are intermediate mechanisms on CSR activities including enhancing firm's reputation, decreasing business failure and risk premium, lowering the costs of capital, increasing profit opportunities, and ultimately giving a positive impact on firm financial performance.[1] Marom (2006) also points out that this positive effect can come from hiring more qualified employees, increased sales from satisfied customers and improved reputation, and easier access to raising capital.[2]

Academic research on the relationship between environmental management and firm performance is scare. Among the few papers, Porter (1990) and Nehrt (1996) argue that environmental innovation technology can minimize the costs from inefficient production processes. Thus, firms will lower the unit production cost and enhance sales in the long-term. Miles and Covin (2000) and Konar and Cohen (2001) further examine the interrelationships between environmental performance, reputation of firms, and financial performance. They conclude that a good environmental management creates a firms' reputational advantage that leads to increasing marketing and financial performance. In the CSR and environmental management literature, however, little evidence is provided on how environmental costs affect the firm performance although this issue has become significantly important in recent years.

This paper examines how environmental costs affect performance of firms in the financial services industries. We test for region and industry variation in financial performance and environmental cost-adjusted performance for 29 countries during the 2002-2011 period. We find that countries in Europe have the largest difference between firm performance and environmental cost-adjusted performance. We also show that countries with well-developed financial markets have the higher levels of total environmental costs than other countries. It appears that active transactions and business activities generate a substantial amount of indirect environmental costs for firms in the well-developed financial markets. We find that the banking industry is the most eco-friendly sector in the financial services industries, while the securities industry has substantially a high level of total environmental costs to total assets.

Our regression results show that lowering environmental costs has a significant role in enhancing firm performance. Lowering environmental costs also affects firm performance more significantly and positively in Europe and North America than in Asia Pacific. It may reflect the differential recognition of

[1] This is often called social impact hypothesis which is based on the stakeholder theory and argues that serving the implicit claims of stakeholders enhances a company reputation and positively affects its corporate financial performance (Freeman, 1984; Makni, Francoeur, and Bellavance, 2009).

[2] Defining and measuring CSR has also been an important task in the literature. Earlier studies such as Frederick (1994) and Griffin (2000) report that there is no consensus on the contents of CSR. On the other hand, Beurden and Gossling (2008) have analyzed existing studies in CSR and grouped into three categories: 1) social concerns, 2) social action such as philanthropy, social programs, and pollution control, and 3) corporate reputation ratings.

environmental problem by executives around the world. Customers in Europe and North America also react more positively to the environmental management than in Asia Pacific.

We also find that lowering environmental costs is expected to precede at least one or two years before enhancing ROA. The results, however, vary depending on the levels of the financial market development. Lowering environmental costs has a more immediate impact on firm performance in well-developed financial markets than in less-developed financial markets. These results are robust even after employing various panel data regression methods and additional performance variable. Our findings suggest that policy makers dealing with corporate sustainability management should continue to pursue an environment-centered industry policy as firms with lower environmental costs consistently perform better.

The results of our empirical work have important implications for policy makers of firm sustainability management. First, environmental costs significantly vary by different industries, different regions, and the levels of financial market developments. Therefore, our study suggests an international cooperation to reduce environmental costs is crucial. Second, the amount of environmental costs is significant for financial services firms and lowering the environmental costs will enhance the firm performance. Third, lowering environmental costs will improve the firm financial performance better in the long-term. This implies that short-term approach may not be optimal in sustainability management.

The remainder of this paper is organized as follows. In section 2, we discuss previous papers that examine the relation between environmental management and financial performance and CSR and firm financial performance. We also review the literature which deals environmental costs and corporate finance. In section 3, we describe the sample data and discuss the empirical methodologies employed to test our hypotheses. In section 4, the empirical results are provided. In section 5, we conclude the paper.

2. Related Literature

The existing literature on the relationship between environmental management and firm performance is scarce. Among the few papers, Porter (1990) argues that environmental regulations lead to technical innovation and enhance the company's competitiveness in the long-term. He also point out that environmental innovation technology can minimize the costs from inefficient production processes. Thus, innovation for the environmental improvement is likely to maintain a relatively low production cost and firms can be more competitive. On the other hand, Nehrt (1996) shows that firms investing earlier in pollution-reducing technologies have more financial advantage by examining 50 chemical bleached paper pulp firms in eight countries. He argues that pollution-reducing technologies may enable firms to reduce unit production cost and enhance sales in the long-term. Miles and Covin (2000) further examine the interrelationships between environmental performance, company reputation, and financial performance. They find that corporate reputation is one of the most important intangible assets; however that is related to marketing and firm performance. They conclude that a good environmental management creates a firms' reputational advantage that leads to increasing marketing and financial performance. In addition, Konar and Cohen (2001) show that poor environmental performance has a negative effect on the intangible asset value such as reputation of manufacturing firms in the S&P 500. They argue that good environmental management may lead to higher firm's reputation and then increase the firm performance.

Corporate social responsibility (CSR) is becoming an important financial risk factor. The relation between CSR and corporate financial performance (CFP) is widely discussed questions both in academia and in practice. There exists a literature documenting the relation between CSR and firm performance. Beurden and Gossling (2008) have made an extensive review on this literature and report that the majority of research finds a positive relation between CSR and CFP. They present an overview of 35 published

research results on the relation between corporate social performance (CSP) and CFP. Their review shows that the majority (23 published papers) of studies looking at the relation between CSP and CFP find a positive relation, but two papers find a negative relation and ten studies find a non-significant relation.

The social impact hypothesis is based on the stakeholder theory and argues that serving the implicit claims of stakeholders enhances a company reputation and positively affects its CFP (Freeman, 1984; Makni, Francoeur, and Bellavance, 2009). The positive synergy hypothesis supposes that higher levels of CSP lead to an improvement of CFP and offers the possibility of reinvestment in socially responsible activities. Therefore, it may be a simultaneous and interactive positive relation between CSP and CFP (Waddock and Graves, 1997; Makni et al., 2009). Preston and O'Bannon (1997) find a positive relationship between CSR activities and firm financial performance. They argue that favorable social ativities such as satisfying the needs of corporate stakeholders will lead to increase firm financial performance. They also suggest the intermediate mechanisms between social responsibility and financial performance. These include enhancing firm's reputation, decreasing business failure and risk premium, lowering the costs of capital, increasing profit opportunities, and ultimately giving a positive impact on financial performance.[3]

Ogrizek (2002) argues that like manufacturing industries, CSR branding is also becoming paramount important to the financial services industries. If a financial firm mismanages the CSR branding, a firm's reputation can be damaged. It may give direct and indirect negative impact on firm performance. By using CSP, Luo and Bhattacharya (2006) investigate the relation between CSR and firm market value. They develop a conceptual framework for predicting that (a) customer satisfaction partially mediates the relation between CSR and firm market value, (b) corporate abilities moderate the financial returns to CSR, and (3) these moderated relations are mediated by customer satisfaction. They find the results supporting this framework and customer satisfaction plays a significant role in the relation between CSP and CFP.

Barnett and Salomon (2006) measure the financial–social performance link within mutual funds that practice socially responsible investing (SRI) through a panel of 61 SRI funds from 1972 to 2000. They find that as the number of social screens used by an SRI fund increases, financial returns decline at first, but then rebound as the number of screens reaches a maximum. Ruf, Muralidhar, and Brown (2001) examine how change in CSP relates to change in financial accounting measures from a stakeholder perspective. This provides a better control over extraneous factors and a more sensitive test than examining the levels of CSP. They find a change in CSP is positively related to growth in sales for the current and subsequent years. Russo and Fouts (1997) test the relation between environmental performance and economic performance with an analysis of 243 firms over two years. They use the environmental ratings of Franklin Research and Development Corporation (FRDC) which list four specific questions when evaluating companies. Their results indicate that firms with environment-friendly management tend to achieve higher economic performance. Hart and Ahuja (1996) examine the relation between emissions reduction and firm performance by using data drawn from the Investor Responsibility Research Center (IRRC)'s corporate environmental profile. They use IRRC for an independent variable which provides a summary of the reported emissions of selected pollutants from U.S. manufacturing facilities and use ROA for firm financial performance variable. The result indicates that reducing emissions increases efficiency, saves money, and then gives firms a cost advantage. The findings of Hart

[3] Preston and O'Bannon (1997) measure the company's reputation using Fortune's annual corporate reputation survey data. The Fortune survey gathers data on corporate reputation along eight dimensions, including financial, social, etc.

and Ahuja (1996) are broadly consistent with our study that finds that lowering environmental costs enhances firm financial performance around the world.

The trade-off and negative synergy hypotheses, however, predict that higher levels of CSP lead to decreased CFP. This is due to the socially responsible behavior which is likely to net few economic benefits while its numerous costs will reduce profits and shareholder wealth and form a vicious circle (Makni, Francoeur, and Bellavance, 2009). Brammer, Brooks, and Pavelin (2006) investigate the relation between CSP and CFP for a sample of U.K. companies. They find that firms with higher social performance tent to experience diminishing financial returns. Firms with the lowest CSP, on the other hand, considerably outperformed the market. Boyle, Higgins, and Rhee (1997) also find a similar relation between CSP and CFP. On the other hand, Chih, Chih and Chen (2010) investigate a total of 520 financial firms in 34 countries between 2003 and 2005. They find the link between CSR and CFP is insignificant and larger firms will be more CSR minded. Moore (2001) also investigates U.K. supermarket industry, but cannot find significant relation between CSP and CFP.

The extant literature on the effect of environmental costs on firm value, however, is scarce and it is yet to be established. Using the Trucost database only for 33 U.S. electric power companies on environmental costs for the year 2004, Thomas, Repetto, and Dias (2007) investigate the difference between economic value-added (EVA) and environmental costs adjusted EVA (i.e., TruEVA). They find that the majority of firms experience a positive EVA turning into a negative TruEVA which is after considering the environmental costs. On the other hand, Dawkins and Fraas (2011) investigate the relation between environmental performance and voluntary climate change disclosure by using Trucost data of S&P 500 companies. They find a positive relation between environmental performance and environmental disclosure. Their study also identifies an important role for media visibility in the types of disclosure and recognizes other factors that interact with environmental performance to influence corporate responses. In a recent paper by Kim, Lee, and Park (2013), they examine the relation between environmental costs and firm performance in manufacturing industry. However, there are still no extant studies which investigate the impact of environmental costs on firm performance in the financial services industries. Our study uses the Trucost database, and we further extend the research issue across multiple countries, regions, different levels of financial market development, and industries using more conventional measures such as the ratio of ROA or earnings before tax and interest (EBIT) to total assets as proxies for firm financial performance.

3. Data and Methodology

3.1 Data Description

Financial statement data employed in our analysis are collected from the Worldscope database by Thomson Financials and S&P Capital IQ for 29 countries over the 2002-2011 period. We change the monetary unit of each country's data to the U.S. dollars. Our sample is comprised of total 4,924 firm-year observations and among those observations, 1,783 firm-years observations belong to 11 countries in Asia Pacific, 1,836 firm-year observations are from 16 countries in Europe, and the remainders of 1,305 firm-years observations are affiliated with the Unite States and Canada in North America. This is a largely expanded data and a sample period from earlier studies such as Thomas, Repetto and Dias (2007) who examine only with the 33 U.S. electric power companies. We winsorize the dependent variable and explanatory variables at 1 percent and 99 percent to take into account the extreme outlier observations.

In this paper, a unique environment cost data are provided by Trucost Plc for listed firms around the world.[4] By multiplying its physical quantity by a notional price based on economic estimates of the marginal damages, Trucost Plc calculates the total direct and total indirect external environmental costs. The total direct environmental costs are imposed on the rest of the economy by the firm's operations and based on six direct emissions: (a) Greenhouse Gases Direct Cost, (b) Water Direct Cost, (c) Waste Direct Cost, (d) Land & Water Pollutants Direct Cost, (e) Air Pollutants Direct Cost, and (f) Natural Resource Use Direct Cost. The total indirect environmental costs also are environmental impacts by six indirect emissions: (a) Greenhouse Gases Indirect Cost, (b) Water Indirect Cost, (c) Waste Indirect Cost, (d) Land and Water Pollutants Indirect Cost, (e) Air Pollutants Indirect Cost, and (f) Natural Resource Use Indirect Cost.

We use total environmental costs which are the sum of total direct and total indirect environmental costs. In the financial services industries, total environmental costs, however, are almost composed of indirect environmental costs. The ROA used in this study is adjusted for total environmental costs and we call it TruROA. ROA is obtained from net income divided by total assets. TruROA further is calculated by subtracting the total direct and indirect environmental costs from net income and dividing by total assets.[5] Total direct environmental costs are direct environmental impacts that a company has on the environment through their own activities. On the other hand, total indirect environmental costs are from the consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity.[6] For example, the main sources of total indirect environmental costs are the costs of CO_2 emissions from consumption of purchased electricity and employees' business trips.

3.2 Empirical design

We employ panel data regression analyses similar to those used by Barclay and Smith (1995) and Benson and Davidson (2009) due to the endogenous characteristics embedded in the panel data. To solve this problem, we use least square dummy variables method (LSDV) with clusters, two-way fixed effects method (Within-group estimator) with clusters, and Arellano-Bond generalized method of moments (GMM).[7] To determine appropriate model between the fixed-effects and random-effects model, we do the Hausman specification test (Wooldridge, 2002). This test gives a χ^2 of 108.23 (p = 0.000) and then we use the fixed-effects model. We perform a robustness test using additional dependent variable such as EBIT to total assets. Our basic regression equation for LSDV is as follows:

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Market\ to\ Book + \beta 4\ Ln\ Total\ Assets + \beta 5\ Stock\ Return\ Volatility + \beta 6\ Capital\ to\ Assets + \beta 7 Expenses\ to\ Revenues + \beta 8\ Asset\ Growth\ Rate + Year\ effects + Firm\ effects + \varepsilon_{it}$$

where 'Ln Total Environmental Costs' is the logarithm of total environmental costs with lags by one and two periods. 'Market to Book' is the sum of book value of assets and market value of equity minus book

[4] Trucost Plc is an U.K. based environmental research company that creates databases estimating these externality costs for 3,500 of the world's largest corporations.

[5] We come up with an idea of TruROA on the strength of Thomas et al. (2007) which introduce TruEVA. TruEVA is defined as Economic Value-Added (EVA) adjusted for total environmental costs.

[6] This data is calculated by multiplying the quantities of all indirect emissions and their respective environmental damage costs as obtained by Trucost and its academic panel.

[7] In this study, we have the same number of endogenous variable and instrument variable. Thus, it is just identified and we don't need Sargan test of over-identification.

value of equity divided by total assets. 'Ln Total Assets' is the logarithm of total assets. 'Stock Return Volatility' is the standard deviation of monthly stock returns over the prior two years. Since our sample firms are from the financial services industries, we follow the approach by Cornett and Tehranian (1992). 'Capital to Assets' is defined as total equity capital divided by total assets. 'Expenses to Revenues' is operating expenses divided by operating revenue. 'Asset Growth Rate' is the change in book value of total assets to total assets in the previous year. In Table 9, we use interaction terms and industry clusters in regression analysis. The regression equation is given as follows:

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ costs_{it-2} + \beta 3\ Bank + \beta 4\ Bank*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 5\ Securities + \beta 6\ Securities*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 7\ Real\ Estate + \beta 8\ Real\ Estate*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 9\ Insurance + \beta 10\ Insurance*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 11\ Market\ to\ Book + \beta 12\ Ln\ Total\ Assets + \beta 13\ Stock\ Return\ Volatility + \beta 14\ Capital\ to\ Assets + \beta 15 Expenses\ to\ Revenues + \beta 16\ Asset\ Growth\ Rate + Year\ effects + \varepsilon_{it}$$

We multiply the industry dummies by 'Ln Total Environmental $costs_{it-1(it-2)}$' to investigate industry wide variations. Industry dummies are comprised of Bank, Securities, Real Estate, and Insurance dummies.

4. Empirical Results

4.1 Summary Statistics

Panel A of Table 1 reports summary statistics for the variables used in this study. The variables include total assets, revenues, ROA, EBIT, net income, total environmental costs, total direct environmental costs, total indirect environmental costs, operating expenses, market to book, stock return volatility, capital to assets, expenses to revenues, and asset growth rate. The sample is comprised of 4,924 firm-year observations for 29 countries during the 2002-2011 period. The mean (median) of total assets is 121.5 (17.8) billion U.S. dollars, while the mean (median) of revenues is 9.4 (2.0) billion U.S. dollars. Table 1 also provides information on environmental costs. The mean (median) of total environmental costs is 30.7 (8.0) million U.S. dollars. The mean (median) of total direct environmental costs is 3.0 (0.2) million U.S. dollars and total indirect environmental costs is 27.7 (7.5) million U.S. dollars. Thus, in the financial services industries, total indirect environmental costs account for most of total environmental costs.

Panel B of Table 1 shows summary statistics by firms in different regions. The median values of firm size scaled by total assets in Asia Pacific and European countries are 15.9 and 17.3 billion U.S. dollars which is similar, while the median of total assets for the U.S. firms is 22.5 billion U.S. dollars which are much larger than other regions. Profitability and environmental costs, however, show the variations by regions. North American firms show the highest median net income at 575 million U.S. dollars, while Asia Pacific firms have median net income of only 14 million U.S. dollars in Panel B of Table 1. Interestingly, Asia Pacific firms have the lowest median total environmental costs at only 5.9 million U.S. dollars. These firms also have the lowest median operating expenses (739 million U.S. dollars) in Panel B of Table 1.

4.2 Univariate tests: How environment-adjusted costs are different?

One of our main research questions in this paper is to examine how firm financial performance is affected when environmental costs are taken into account. As a first step, this paper examines whether there exist any significant differences in ROA after adjusting for environmental costs (i.e., TruROA) by

country and region. We obtain TruROA by subtracting the total environmental costs from the net income and then dividing by total assets. We further test whether there are any significant differences between ROA and TruROA by industry.

Panel A of Table 2 shows the results of univariate tests for countries in Asia Pacific. We find that the mean (median) ROA in this region is 1.04 (0.10) percent, while the mean (median) of TruROA becomes 0.85 (0.03) percent. This indicates that the mean (median) difference between ROA and TruROA is 0.19 (0.07) percent in Asia Pacific. The mean (median) difference between ROA and TruROA is greatest for Australia with 0.41 (0.46) percent followed by Hong Kong with 0.26 (0.30) percent. Hong Kong has the most developed financial market and Australia has 8th developed financial market in the world. On the other hand, Thailand and South Korea have the lowest mean (median) difference between ROA and TruROA with 0.06 (0.01) percent and 0.08 (0.05) percent in Asia Pacific, while FD rankings of these countries are 43th and 71th, respectively. Interestingly, our univariate tests show that countries with well-developed financial markets are more likely to have greater deviation between ROA and TruROA, while countries with less-developed financial markets are more likely to have lower difference.

The results of univariate tests for countries in Europe are reported in Panel B of Table 2. The difference between ROA and TruROA of Europe is highest. The mean (median) difference between ROA and TruROA is 0.34 (0.05) percent in Europe. We find that the mean (median) difference is greatest for United Kingdom with 0.63 (0.30) percent followed by Sweden with 0.59 (0.23) percent except Turkey. The FD Ranks of these two countries are 13th and 10th. Ireland and Portugal, however, have the lowest mean (median) difference with 0.01 (0.02) percent and 0.02 (0.03) percent, respectively. The FD rankings of these countries are 108th and 99th. Like Asia Pacific countries, European countries with well-developed financial markets also are more likely to have greater deviation between ROA and TruROA, while countries with less-developed financial markets are more likely to have lower difference.

Figure 1 graphically shows the levels of the financial market development and total environmental costs by countries in Europe during 2002-2011. The countries in white (black) have the well-developed (less-developed) financial markets and have total environmental costs above (below) the median. The countries in lighter (darker) grey have the well-developed (less-developed) financial markets and have total environmental costs below (above) the median. Although there are several exceptions, Southern European countries including Portugal, Italy, Greece, and Spain (PIGS) generally have less-developed financial markets with low total environmental costs. On the other hand, Western European countries have well-developed financial markets with high total environmental costs.

Panel C of Table 2 reports the results of univariate tests for countries in North America. The mean (median) ROA for United States is 4.22 (2.64) percent and it is higher than other countries. United States has larger difference between ROA and TruROA than Canada. It may result from the differences in the composition of financial services industries in Canada and United States. For Canada, the proportion of banking and insurance industries is over 73 percent and much higher than other countries. On the other hand, the proportion of banking and insurance industries in United States is about 51 percent. The environmental costs of banking and insurance industries are much lower than other financial industries.[8] Table 2 also reports the portion of total indirect environmental costs on total environmental costs. The mean (median) Ind EC/TEC for total sample is 0.94 (0.97).[9] Thus, total indirect environmental costs account for most of total environmental costs in the financial services industries.

[8] We report the total environmental costs to total assets of each financial services industry in Table 4.
[9] Ind EC/TEC is the total indirect environmental costs to total environmental costs.

Table 3 further shows differences in firm performance and environmental cost-adjusted performance by regions and the levels of financial market development. In Panel A of Table 3, firms in Asia Pacific have the mean (median) of ROA of 1.04 (0.10) percent, while the mean (median) of ROA for European firms is as high as 4.60 (1.93) percent, leading to a mean (median) difference of -3.56 (-1.83) percent between the two regions. The mean (median) difference of TruROA between Asia Pacific and Europe is large at -3.41 (-1.78) percent. We also find similar patterns but with a smaller difference when comparing ROA and TruROA between Asia Pacific and North America. On the other hand, firms in Europe have somewhat greater ROA (and TruROA) than firms in North America. Table 3 further shows that the total environmental costs to total assets are highest for firms in Europe. The mean (median) of this ratio is 0.34 (0.05) percent, while the means (medians) of these ratios for firms in Asia Pacific and North America are 0.19 (0.05) and 0.15 (0.06), respectively. There is no significant mean difference between Asia Pacific and North America.[10]

Panel B of Table 3 shows the results of univariate tests between firms in well-developed financial markets and less-developed financial markets. We divide the group based on the median of financial market development score (FD Score). Firms in well-developed financial markets have the mean (median) of ROA of 4.43 (2.10) percent, while the mean (median) of ROA for firms in less-developed financial markets is 1.26 (0.15) percent. Interestingly, the mean (median) of total environmental costs to total assets for companies with well-developed financial markets is 0.31 (0.06) percent and it is over two times higher than companies with less-developed financial markets. The mean (median) difference of total environmental costs to total assets between two groups is also substantially large at 0.19 (0.05) percent and significant at a *p*-value less than 1%. Hence, as preliminary results of Table 2, firms in well-developed financial markets have much greater total environmental costs to total assets than firms in less-developed financial markets.

Companies in highly developed financial markets should have easy access to capital and then may easily obtain large-scale funds. Investors in well-developed financial markets also have better availability of financial services. Therefore, in well-developed financial markets, financial transactions such as stock trading and derivative transactions can be more active than in less-developed financial markets. Business activities such as business trips may also be more active in well-developed financial markets. Indirect environmental costs are composed mainly of the costs of CO_2 emissions from consumption of electricity and employees' business trip. Thus, environmental costs of firms in well-developed financial markets may be larger than other firms in less-developed financial markets. We also use Organization for Economic Cooperation and Development (OECD) as an additional proxy for the measure of development of financial markets, because countries in OECD generally have well-developed financial markets. They also have higher total environmental costs to total assets than countries in non-OECD in Panel B of Table 3.

Interesting industry variations in environment cost adjusted performance can be found in Table 4. As expected, the securities industry has the largest total environmental costs to total assets with the mean (median) of 0.48 (0.32) percent. The substantial environmental costs for the securities industry may be mainly due to the indirect environmental costs as the industry essentially has large amounts of CO_2 emissions from consumption of purchased electricity during a lot of stock trading and derivative transactions. On the other hands, Table 4 shows that the banking industry has the lowest total environmental costs to total assets at only 0.01 (0.01) percent. In other words, banking industry is the

[10] In an earlier analyses, Kim, Lee, and Park (2013) show that Asia Pacific has the highest total environmental costs to total assets, while Europe has the lowest total environmental costs to total assets in manufacturing industry.

most eco-friendly sector in the financial services industries. Overall, Table 4 suggests that there are large variations in financial performance and environmental costs-adjusted performance by different industries.

4.3 Multivariate Analysis: Does lowering environmental costs enhance firm performance?

Overall sample results of our multivariate analysis are provided in Table 5 and 6. These tables report the results by using least square dummy variables (LSDV) method, two-way fixed effects method (Within-group estimator), and Arellano-Bond GMM of ROA against total environmental costs during the 2002-2011 period. ROA is employed in a number of studies in CSR and climate change including Hart and Ahuja (1996), Jo and Kim (2008), Makni et al. (2009), and Pae and Choi (2011). In Row (1)-(3) of Table 5, we report the results of LSDV with year fixed effects and firm fixed effects. These results show that both the logarithm of total environmental costs at time t-1 and the logarithm of total environmental costs at time t-2 have statistically significant negative coefficients when these are estimated separately and simultaneously.[11] In Row (4)-(6) of Table 5, regressions use year fixed effects, firm fixed effects, and firm clusters. Similarly, Equations (4)-(6) of Table 5 report statistically significant negative between ROA and the logarithm of total environmental costs at time t-1 and t-2 after clustering.

In Row (1)-(3) of Table 6, we use fixed effects method (Within-group estimator) with year effects and firm clusters. The coefficients on the lagged variables of total environmental costs are economically and statistically significant negative. Regressions (4)-(6) of Table 6 show the Arellano-Bond GMM results. By using this method, we relieve the potential endogeneity problems caused by endogenous variable and time-invariant unobserved effects in panel data. Our instrument variable for '*Ln Total Environmental Costs*$_{it\text{-}1(t\text{-}2)}$' is '*Ln Total Environmental Costs*$_{it\text{-}3(t\text{-}4)}$'.[12]

In table 6, we find statistically significant negative coefficients which are similar to our prior results in Table 5. This implies that lowering environmental costs will enhance firm financial performance. Because lowering environmental costs has a lot of advantages such as leading to higher company reputation, enabling firms to hire more qualified employees, improving production efficiency and competitiveness, decreasing business failure and risk premium, facilitating easier access to raising capital, lowering the costs of capital, and increasing profit opportunities. These results are broadly consistent with the social impact hypothesis and Ogrizek (2002) who argues that CSR branding is also becoming paramount important to the financial services industries. We also show that lowering environmental costs is expected to precede for one or two years before enhancing firm performance. This suggests that there exists some time lag in improving firm performance after lowered the environmental costs. These results are consistent with Miles and Covin (2000) and Konar and Cohen (2001) in the sense of good environmental management improving the firm's reputation and then increasing the firm financial performance in the long-term.

Table 7 shows the results from LSDV of ROA against total environmental costs by region during the 2002-2011 period. It shows that lowering environmental costs will improve firm performance in Asia Pacific, Europe, and North America. Table 7 further reports that there exist some dynamic effects. Equation (1) for Asia Pacific shows that the logarithm of total environmental costs at time t-1 is negative and marginally significant. However, in Equation (3), the significance of coefficients, however, disappears. This result can be occurred due to multicollinearity problem between the logarithm of total

[11] We also estimate a regression with the total environmental costs at time t-3, but the coefficient turns to be insignificant and hence un-tabulated.

[12] Like Arellano and Bond (1991), we use the lagged variables of endogenous variable as instrument variable (IV).

environmental costs at time t-1 and t-2. Equation (4) and (5) of Table 7 show that the logarithm of total environmental costs at time t-1 and time t-2 are negative and significant.

Interestingly, in Equation (6) for Europe, the coefficient of total environmental costs for time t-2 becomes insignificant while the coefficient of total environmental costs for time t-1 remains negative and statistically significant. It may be probably due to fact that the impact of total environmental costs for time t-1 is stronger than for time t-2. On the other hand, in Equation (9) of Table 7, lowering environmental costs is expected to precede for two years before enhancing ROA for North American firms. These results support the view that lowering environmental costs has a rapidly impact on the firm performance of European companies, while North American companies are affected in the long-term.

Our results also show that lowering environmental costs has a greater effect on firms in Europe and North America than in Asia Pacific. It may reflect the differential recognition of environmental problem by executives around the world. Customers in Europe and North America also react positively to the environmental management. We further find that the negative relation between ROA and total environmental costs is largest for firms in North America with the total environmental costs coefficient for time t-2 of -0.017.[13] It appears that firms in North America have the most efficient system to implement the environmental costs savings into firm performance. Our results are broadly consistent with the results of Hart and Ahuja (1996) which use IRRC's Corporate Environmental Profile for the U.S. sample firms.

In Table 7, countries with well-developed or less-developed financial markets, however, are mixed in each region. Thus, we divide the sample based on the levels of financial market development in Table 8.[14] We use the sample firms in well-developed financial markets in Row (1)-(3) and the sample firms in less-developed financial markets in Row (4)-(6) of Table 8. In Row (3) of Table 8, reducing environmental costs increases firm performance one year later. On the other hand, in Row (6) of Table 8, lowering environmental costs affects firm performance two years later. These results provide the evidence that, in well-developed financial markets, lowering environmental costs is rapidly and significantly affected the firm financial performance.

Table 9 shows the role of lowering environmental costs with varying effects on different industries. Equation (1) and (2) of Table 9 report that the interaction terms between the bank dummy and the logarithm of total environmental costs at time t-1(t-2) are statistically significant positive at 0.007 (0.008). These results suggest that the impacts of lowing environmental costs on financial performance are almost offset by interaction terms in the banking industry. Equation (4) of Table 9 shows that the interaction term between securities dummy and the logarithm of total environmental costs at time t-2 is statistically significant negative at -0.005. Thus, the total impact of the logarithm of total environmental costs on ROA for securities is -0.011. These results suggest that the effect is most pronounced in the securities industry which has the highest level of total environmental costs out of total assets and weakest in the bank industry which is environmentally-friendly sector.

One may ask whether our results remain robust even after we employ alternative firm performance measure. In robustness check, we use the dependent variable as EBIT normalized by total assets. We also use LSDV and two-way fixed effects method (Within-group estimator) in Table 10. It appears that there is the two year lagged impact for firms to enhance financial performance after lowering environmental costs. These results are consistent with our previous results.

[13] This is followed by firms in Europe with the total environmental costs coefficient for time t-1 of -0.012.

[14] We also use the median of FD Score for dividing our sample like table 3.

5. Concluding Remarks

Using a unique dataset, this paper investigates how environmental costs affect performance of firms in the financial services industries around the world. We test for region and industry variation in financial performance and environmental cost-adjusted performance. We find that countries in Europe have the largest difference between firm performance and environmental cost-adjusted performance. We also show that countries with well-developed financial markets have much greater total environmental costs to total assets than countries with less-developed financial markets. It appears that active transactions and business activities for firms in the financial services industries generate a substantial amount of indirect environmental costs in the well-developed financial markets. We further show that the securities industry has the highest total environmental costs to total assets, while the banking industry is the most eco-friendly sector in the financial services industries.

Our regression results show that lowering environmental costs increase financial performance in long-term. Because, Implying from social impact hypothesis, lowering environmental costs has a lot of advantages such as leading to higher company reputation, enabling firms to hire more qualified employees, improving production efficiency and competitiveness, decreasing business failure and risk premium, easing access to raising capital, lowering the costs of capital, and increasing profit opportunities. These positive effects on firm performance typically surpass the costs that are incurred for lowering environmental costs. Furthermore, lowering environmental costs more significantly affects firms in Europe and North America than in Asia Pacific. It may reflect the differential recognition of environmental problem by executives around the world. Customers in Europe and North America also react more positively to the environmental management than in Asia Pacific.

We also find that lowering environmental costs is expected to precede at least one or two years before enhancing firm performance using ROA. The effect, however, slightly varies depending on regions and levels of financial development markets. Lowering environmental costs has a rapidly impact on firm performance of well-developed financial markets, but firms in less-developed financial markets are affected in the long-term. The impact of lowing environmental costs on firm performance is most pronounced in the securities industry which has the highest level of total environmental costs out of total assets. These findings are robust even after we employ various panel-data regression methods and additional firm performance measure such as EBIT to total assets. Our results suggest that policy makers dealing with corporate sustainability management should continue to pursue an environment-oriented industry policy as firms with lower environmental costs are performing better.

The results of our empirical work have important implications for policy makers of firm sustainability management. First, environmental costs are significantly varying by different industries, different regions, and the levels of financial market development. Therefore, our study suggests that an international cooperation to reduce environmental costs is crucial. Second, the amount of environmental costs is significant for financial services firms and lowering the environmental costs will enhance the firm performance. Third, lowering environmental costs will improve firm financial performance better in the long-term. This implies that short-term approach should be avoided in sustainability management.

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Table 1 Summary Statistics of the Financial services industries around the World

This table reports summary statistics for total assets, revenues, ROA, EBIT (Earnings Before interest and Taxes), net income, total environmental costs, total direct environmental costs, total indirect environmental costs, operating expenses, market to book, stock return volatility, capital to assets, expense to revenues, and asset growth rate for the sample covering fiscal years 2002-2011. Total assets, revenues, EBIT, net income, total environmental costs, total direct environmental costs, total indirect environmental costs, operating expenses are measured in millions of dollars. EBIT is defined as (revenue – operating expenses + non-operating income). Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year.

Panel A

Variable	Obs.	Mean	SD	P(0.01)	P(0.25)	Median	P(0.75)	P(0.99)
Total Assets	4,895	121,523	295,520	270	4,510	17,810	80,449	1,830,226
Revenues	4,895	9,433	19,694	29	630	2,020	7,539	112,452
ROA	4,787	3.182	6.301	-16.220	0.140	1.230	3.970	32.540
EBIT	4,849	1,720	3,744	-2,142	146	457	1,463	23,168
Net Income	4,787	1,192	3,154	-1,437	17	203	845	20,779
Total Environmental Costs	4,924	30.728	63.692	0.256	2.893	8.028	25.352	405.645
Total Direct Env. Costs	4,924	2.981	16.435	0.007	0.082	0.236	0.799	68.474
Total Indirect Env. Costs	4,924	27.663	55.077	0.249	2.745	7.498	23.405	334.960
Operating Expenses	4,913	5,614	13,721	4	295	1,050	4,145	69,542
Market to Book	4,702	1.143	0.623	0.299	0.935	1.015	1.149	4.884
Stock Return Volatility	4,775	0.376	0.226	0.099	0.212	0.318	0.476	1.303
Capital to Assets	4,889	0.063	0.161	0.001	0.003	0.013	0.042	0.742
Expenses to Revenues	4,890	0.737	3.353	0.016	0.534	0.695	0.854	1.503
Asset Growth Rate	4,863	0.597	24.219	-0.384	0.012	0.112	0.246	1.976

Table 1 (Continued)

This table reports summary statistics for total assets, revenues, ROA, EBIT (Earnings Before interest and Taxes), net income, total environmental costs, total direct environmental costs, total indirect environmental costs, operating expenses, market to book, stock return volatility, capital to assets, expense to revenues, and asset growth rate for three regions which are Asia Pacific, Europe, and North America during 2002-2011 period. Total assets, revenues, EBIT, net income, total environmental costs, total direct environmental costs, total indirect environmental costs, operating expenses are measured in millions of dollars. EBIT is defined as (revenue – operating expenses + non-operating income). Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year.

Panel B

Region	**Asia Pacific (AP)**			**Europe (E)**			**North America (NA)**		
Variable	**Obs.**	**Mean**	**Median**	**Obs.**	**Mean**	**Median**	**Obs.**	**Mean**	**Median**
Total Assets	1,768	79,968	15,855	1,828	162,635	17,258	1,299	120,227	22,474
Revenues	1,768	4,878	1,506	1,828	12,708	1,751	1,299	11,024	3,497
ROA	1,718	1.040	0.100	1,790	4.600	1.930	1,279	4.070	2.300
EBIT	1,737	1,203	384	1,809	1,918	381	1,303	2,133	742
Net Income	1,718	242	14	1,790	1,762	374	1,279	1,670	575
Total Environmental Costs	1,783	18.670	5.860	1,836	38.080	6.350	1,305	36.860	12.180
Total Direct Env. Costs	1,768	1.470	0.210	1,828	3.810	0.200	1,299	3.870	0.370
Total Indirect Env. Costs	1,768	17.110	5.350	1,828	33.970	5.930	1,299	33.160	11.650
Operating Expenses	1,774	2,705	739	1,836	7,386	888	1,303	7,077	2,244
Market to Book	1,714	0.870	0.920	1,781	1.250	1.060	1,207	1.380	1.090
Stock Return Volatility	1,720	0.400	0.360	1,781	0.370	0.300	1,274	0.360	0.260
Capital to Assets	1,763	0.120	0.030	1,828	0.030	0.010	1,298	0.030	0.000
Expenses to Revenues	1,764	0.650	0.660	1,825	0.750	0.710	1,301	0.840	0.720
Asset Growth Rate	1,750	1.210	0.160	1,822	0.320	0.100	1,291	0.150	0.070

Table 2 Univariate Tests for Firm performance and Environmental costs-adjusted Performance by Countries

This table classifies countries in our sample by region and reports 4,924 firm-year observations, percentage of component countries, FD Rank (Score), total assets (million dollars), Ind EC/TEC, ROA (%), TruROA (%), and TEC/TA (%) for total of 29 countries during the 2002-2011 period. FD Rank (Score) is that financial market development rankings are from 'The Global Competitiveness Report 2012-2013' of 'World Economic Forum'. This variable is based on several criteria, including availability of financial services, affordability of financial services, financing through local equity market, and ease of access to loans. Ind EC/TEC is defined as total indirect environmental costs to total environmental costs. ROA is defined as the percentage of net income divided by total assets. TruROA is the firm's net income after subtracting the total direct and indirect environmental costs and divided by total assets for the year. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). TEC/TA is calculated by subtracting TruROA from ROA. To determine whether of ROA and TruROA differ across countries with each region, we calculate differences in the mean and median values of these variables. We determine the statistical significance of the differences using the t-test and Wilcoxon rank-sum test (or Mann-Whitney test). ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Panel A

Region	Country	Obs.	Per.	FD Rank (Score)	TA (A)	Ind EC/TEC (B)	ROA (C)	TruROA (D)	TEC/TA (C-D)
Asia Pacific (11)	China	100	2.03	54 (4.31)	390,459 (174,093)	0.94 (0.97)	0.36 (0.21)	0.12 (0.17)	0.23*** (0.04***)
	Hong Kong	278	5.65	1 (5.89)	17,073 (8,857)	0.91 (0.92)	0.91 (0.81)	0.65 (0.51)	0.26*** (0.30***)
	India	139	2.82	21 (4.90)	36,986 (21,667)	0.96 (0.97)	0.11 (0.05)	0.02 (0.03)	0.09*** (0.02***)
	Japan	451	9.16	36 (4.63)	132,335 (48,914)	0.95 (0.97)	0.01 (0.01)	-0.11 (-0.03)	0.11*** (0.04***)
	Malaysia	98	1.99	6 (5.44)	25,308 (17,331)	0.96 (0.97)	0.91 (0.44)	0.75 (0.43)	0.16*** (0.01***)
	Philippines	33	0.67	58 (4.25)	9,303 (8,281)	0.89 (0.95)	0.09 (0.07)	-0.12 (0.01)	0.21*** (0.06***)
	Singapore	72	1.46	2 (5.85)	39,130 (6,332)	0.94 (0.92)	4.29 (3.15)	4.20 (3.10)	0.09*** (0.05***)
	South Korea	111	2.25	71 (4.06)	58,907 (13,136)	0.97 (0.98)	0.01 (0.00)	-0.08 (-0.05)	0.08*** (0.05***)
	Taiwan	146	2.97	19 (4.98)	34,785 (25,797)	0.97 (0.98)	0.06 (0.03)	-0.06 (0.01)	0.13*** (0.02***)
	Thailand	65	1.32	43 (4.46)	25,112 (21,945)	0.97 (0.97)	0.07 (0.04)	0.01 (0.03)	0.06*** (0.01***)
	Australia	290	5.89	8 (5.35)	51,264 (4,331)	0.91 (0.97)	3.88 (3.54)	3.47 (3.06)	0.41*** (0.46***)
Total Obs. & Means/Median		1,783	36.21	24.27 (5.02)	79,968 (15,855)	0.94 (0.97)	1.04 (0.10)	0.85 (0.03)	0.19*** (0.07***)

Table 2 (Continued). Univariate Tests for Firm performance and Environmental costs-adjusted Performance by Countries

This table classifies countries in our sample by region and reports 4,924 firm-year observations, percentage of component countries, FD Rank (Score), total assets (million dollars), Ind EC/TEC, ROA (%), TruROA (%), and TEC/TA (%) for total of 29 countries during the 2002-2011 period. FD Rank (Score) is that financial market development rankings are from 'The Global Competitiveness Report 2012-2013' of 'World Economic Forum'. This variable is based on several criteria, including availability of financial services, affordability of financial services, financing through local equity market, and ease of access to loans. Ind EC/TEC is defined as total indirect environmental costs to total environmental costs. ROA is defined as the percentage of net income divided by total assets. TruROA is the firm's net income after subtracting the total direct and indirect environmental costs and divided by total assets for the year. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). TEC/TA is calculated by subtracting TruROA from ROA. To determine whether of ROA and TruROA differ across countries with each region, we calculate differences in the mean and median values of these variables. We determine the statistical significance of the differences using the t-test and Wilcoxon rank-sum test (or Mann-Whitney test). ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Panel B

Region	Country	Obs.	Per.	FD Rank (Score)	TA (A)	Ind EC/TEC (B)	ROA (C)	TruROA (D)	TEC/TA (C-D)
Europe (16)	Austria	43	0.87	34	84,347	0.95	1.69	1.65	0.04***
				(4.65)	(35,972)	(0.97)	(1.79)	(1.74)	(0.05***)
	Belgium	76	1.54	31	201,082	0.92	3.72	3.49	0.23***
				(4.68)	(17,972)	(0.93)	(2.85)	(2.46)	(0.39***)
	Denmark	46	0.93	30	118,973	0.98	0.36	0.31	0.04***
				(4.69)	(20,341)	(0.98)	(0.28)	(0.27)	(0.01***)
	France	134	2.72	27	438,590	0.95	3.93	3.86	0.07***
				(4.73)	(35,012)	(0.98)	(1.29)	(1.24)	(0.05***)
	Germany	106	2.15	32	388,925	0.97	2.13	2.09	0.04***
				(4.66)	(152,796)	(0.99)	(1.29)	(1.24)	(0.05***)
	Greece	53	1.08	132	72,460	0.97	0.90	0.73	0.17*
				(3.13)	(64,234)	(0.98)	(1.09)	(1.07)	(0.02***)
	Ireland	30	0.61	108	152,864	0.98	0.96	0.95	0.01***
				(3.60)	(126,625)	(0.98)	(1.34)	(1.32)	(0.02***)
	Italy	133	2.70	111	161,449	0.96	1.70	1.63	0.08**
				(3.57)	(61,914)	(0.97)	(1.18)	(1.17)	(0.01***)
	Netherlands	53	1.08	20	373,969	0.95	4.15	4.11	0.04***
				(4.96)	(100,920)	(0.98)	(1.79)	(1.76)	(0.03***)
	Poland	42	0.85	37	18,939	0.95	1.50	1.45	0.05***
				(4.59)	(15,523)	(0.97)	(0.82)	(0.80)	(0.02***)
	Portugal	30	0.61	99	79,681	0.91	1.99	1.97	0.02***
				(3.71)	(72,312)	(0.97)	(1.94)	(1.91)	(0.03***)
	Spain	100	2.03	82	218,420	0.97	4.52	4.47	0.04***
				(3.90)	(56,873)	(0.98)	(2.03)	(2.02)	(0.01***)
	Sweden	109	2.21	10	121,371	0.92	0.77	0.18	0.59***
				(5.29)	(8,906)	(0.97)	(0.45)	(0.22)	(0.23***)
	Switzerland	112	2.27	9	153,992	0.97	2.57	2.51	0.06***
				(5.30)	(35,392)	(0.98)	(1.18)	(1.04)	(0.14***)
	Turkey	72	1.46	44	44,108	0.86	2.24	1.54	0.70***
				(4.46)	(44,140)	(0.97)	(1.96)	(1.63)	(0.33***)
	United Kingdom	697	14.16	13	94,686	0.93	8.11	7.48	0.63***
				(5.16)	(2,107)	(0.98)	(5.82)	(5.52)	(0.30***)
Total Obs. & Means/Median		1,836	37.28	35.58	162,634	0.94	4.60	4.26	0.34***
				(4.73)	(17,258)	(0.98)	(1.93)	(1.82)	(0.05***)

Table 2 (Continued). Univariate Tests for Firm performance and Environmental costs-adjusted Performance by Countries

This table classifies countries in our sample by region and reports 4,924 firm-year observations, percentage of component countries, FD Rank (Score), total assets (million dollars), Ind EC/TEC, ROA (%), TruROA (%), and TEC/TA (%) for total of 29 countries during the 2002-2011 period. FD Rank (Score) is that financial market development rankings are from 'The Global Competitiveness Report 2012-2013' of 'World Economic Forum'. This variable is based on several criteria, including availability of financial services, affordability of financial services, financing through local equity market, and ease of access to loans. Ind EC/TEC is defined as total indirect environmental costs to total environmental costs. ROA is defined as the percentage of net income divided by total assets. TruROA is the firm's net income after subtracting the total direct and indirect environmental costs and divided by total assets for the year. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). TEC/TA is calculated by subtracting TruROA from ROA. To determine whether of ROA and TruROA differ across countries with each region, we calculate differences in the mean and median values of these variables. We determine the statistical significance of the differences using the t-test and Wilcoxon rank-sum test (or Mann-Whitney test). ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Panel C

Region	Country	Obs.	Per.	FD Rank (Score)	TA (A)	Ind EC/TEC (B)	ROA (C)	TruROA (D)	TEC/TA (C-D)
North America (2)	Canada	157	3.19	11 (5.28)	181,892 (127,994)	0.96 (0.98)	2.93 (1.17)	2.88 (1.14)	0.05*** (0.03***)
	United States	1,148	23.31	16 (5.07)	112,115 (19,257)	0.94 (0.98)	4.22 (2.64)	4.05 (2.59)	0.17*** (0.05***)
	Total Obs. & Means	1,305	26.50	15.40 (5.10)	120,226 (22,474)	0.94 (0.98)	4.07 (2.30)	3.92 (2.23)	0.15*** (0.06***)
Total Obs. & Means/Median		4,924	100	26.13 (4.93)	121,522 (17,809)	0.94 (0.97)	3.18 (1.23)	2.94 (1.14)	0.24*** (0.09***)

Table 3 Univariate Tests for Firm performance and Environmental costs-adjusted Performance by Regions

This table presents the mean (median) values of firm characteristics by each region, levels of financial market development, and members of Organization for Economic Cooperation and Development (OECD) during the 2002-2011 period. The total number of firm-year observation is 4,924 in 29 countries. This table shows ROA(%), TruROA(%), Total Env. Costs/TA (%), and Indirect Env. Costs/Total Env. Costs. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Total Env. Cost/TA is total environmental costs divided by total assets. It can be calculated by subtracting TruROA from ROA. Indirect Env. Cost/Total Env. Cost is total indirect environmental costs to total environmental costs. AP-E is the difference of Asia Pacific from Europe. AP-N is the difference between Asia Pacific and North America. E-NA is the difference of Europe from North America. Well DFM (WDFM) is well-developed financial market and Less DFM (LDFM) is less-developed financial market. It is divided by median of FD Score. The differences in the means between each pair of regions are evaluated using t-statistics and the differences in the medians are evaluated using Z-statistics (Wilcoxon rank-sum test or Mann-Whitney two-sample statistic). ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Panel A

Variable	Asia Pacific (AP)	Europe (E)	North America (NA)	AP-E	AP-N	E-NA
ROA	1.042 (0.100)	4.599 (1.930)	4.073 (2.300)	-3.557*** (-1.830)***	-3.031*** (-2.200)***	0.526** (-0.370)**
TruROA	0.851 (0.031)	4.258 (1.815)	3.920 (2.227)	-3.407*** (-1.784)***	-3.069*** (-2.196)***	0.338 (-0.412)***
Total Env. Costs/TA	0.191 (0.050)	0.342 (0.047)	0.153 (0.061)	-0.151*** (0.003)	0.038 (-0.011)***	0.189*** (-0.014)***
Indirect Env. Costs/ Total Env. Costs	0.940 (0.972)	0.944 (0.975)	0.943 (0.978)	-0.004 (-0.003)***	-0.003 (-0.006)***	0.001 (-0.003)
Total Obs.	1,718	1,790	1,279			

Panel B

Variable	Well DFM (WDEM)	Less DFM (LDFM)	WDEM - LDFM	OECD (OE)	Non-OECD (NO)	OE-NO
ROA	4.432 (2.100)	1.261 (0.150)	3.171*** (1.95)***	3.741 (1.680)	0.781 (0.240)	2.960*** (1.440)***
TruROA	4.121 (1.994)	1.139 (0.069)	2.982*** (1.925)***	3.489 (1.588)	0.609 (0.153)	2.880*** (1.435)***
Total Env. Costs/TA	0.312 (0.066)	0.122 (0.021)	0.190*** (0.045)***	0.252 (0.055)	0.172 (0.036)	0.080* (0.019)**
Indirect Env. Costs/ Total Env. Costs	0.935 (0.975)	0.954 (0.974)	-0.019** (0.001)	0.943 (0.975)	0.940 (0.972)	0.003 (0.003)***
Total Obs.	2,899	1,888		3,993	931	

Table 4 Univariate Tests for Firm performance and Environmental costs-adjusted Performance by Industries

This table reports 4,924 firm-year observations, percentage of component industries, mean (median) of total assets (million dollars), Ind EC/TEC, ROA (%), TruROA (%), and TEC/TA (%) for total of 4 industries during the 2002-2011 period. Ind EC/TEC is defined as total indirect environmental costs to total environmental costs. ROA is defined as the percentage of net income divided by total assets. TruROA is the firm's net income after subtracting the total direct and indirect environmental costs and divided by total assets for the year. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). TEC/TA is calculated by subtracting TruROA from ROA. To determine whether of ROA and TruROA differ across countries with each region, we calculate differences in the mean and median values of these variables. We determine the statistical significance of the differences using the t-test and Wilcoxon rank-sum test (or Mann-Whitney test). ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Industry	Obs.	Per.	TA (A)	Ind EC/TEC (B)	ROA (C)	TruROA (D)	TEC/TA (C-D)
Banks	1,477	30.00	280,016 (83,639)	0.97 (0.97)	0.78 (0.58)	0.77 (0.57)	0.01*** (0.01***)
Securities	1,311	26.62	37,005 (7,291)	0.94 (0.98)	5.84 (2.88)	5.37 (2.56)	0.48*** (0.32***)
Real Estate	1,223	24.84	7,885 (4,571)	0.88 (0.92)	3.66 (2.29)	3.29 (2.08)	0.37*** (0.21***)
Insurance	913	18.54	138,601 (37,996)	0.98 (0.98)	2.46 (1.18)	2.38 (1.13)	0.08*** (0.05***)
Total Obs. & Means	4,924	100	121,522 (17,809)	0.94 (0.97)	3.18 (1.23)	2.94 (1.14)	0.24*** (0.09***)

Table 5 Least Square Dummy Variables method (LSDV) of ROA and Total Environmental Costs

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Market\ to\ Book + \beta 4\ Ln\ Total\ Assets + \beta 5\ Stock\ Return\ Volatility + \beta 6\ Capital\ to\ Assets + \beta 7 Expenses\ to\ Revenues + \beta 8\ Asset\ Growth\ Rate + Year\ effects + Firm\ effects + \varepsilon_{it}$$

This table reports results from least square dummy variables method (LSDV) of ROA against total environmental cost around the world during the 2002-2011 period. Columns 1 to 3 present the results of LSDV with year fixed effects and firm fixed effects. Columns 4 to 9 estimate LSDV model with year fixed effects, firm fixed effects, and firm clusters. Ln Total Environmental $Costs_{t-1}$ is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable	**ROA**					
Methods	Least Square Dummy Variables (LSDV) model					
Equations	(1)	(2)	(3)	(4)	(5)	(6)
Ln Total Environmental $Costs_{t-1}$	-0.008***		-0.008***	-0.008***		-0.008**
	(-4.29)		(-2.87)	(-3.09)		(-2.17)
Ln Total Environmental $Costs_{t-2}$		-0.009***	-0.005**		-0.009***	-0.005*
		(-4.03)	(-2.04)		(-3.40)	(-1.89)
Market to Book	0.073***	0.075***	0.074***	0.073***	0.075***	0.074***
	(20.72)	(18.69)	(17.64)	(10.28)	(9.08)	(8.41)
Ln Total Assets	0.012***	0.012***	0.013***	0.012***	0.012**	0.013**
	(4.20)	(3.60)	(3.81)	(2.79)	(2.39)	(2.43)
Stock Return Volatility	-0.021***	-0.017***	-0.017***	-0.021***	-0.017**	-0.017**
	(-3.87)	(-2.71)	(-2.74)	(-2.97)	(-2.14)	(-2.15)
Capital to Assets	-0.042***	-0.018	-0.016	-0.042**	-0.018	-0.016
	(-2.90)	(-0.98)	(-0.90)	(-2.45)	(-0.72)	(-0.71)
Expenses to Revenues	0.001	0.001	0.001	0.001	0.001	0.001
	(0.02)	(0.03)	(0.04)	(0.07)	(0.12)	(0.17)
Asset Growth Rate	0.001	0.001	0.001	0.001	0.001	0.001
	(1.58)	(1.32)	(1.12)	(1.12)	(1.12)	(1.05)
Constant	-0.253***	-0.259***	-0.270***	-0.253***	-0.259***	-0.270***
	(-4.60)	(-4.00)	(-4.01)	(-3.18)	(-2.73)	(-2.63)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	No	No	No	Firm	Firm	Firm
R-squared	0.63	0.61	0.60	0.63	0.61	0.60
Number of observations	3,819	3,182	3,118	3,819	3,182	3,118

Table 6 Two-way Fixed Effects method (Within-group estimator) and Arellano-Bond GMM of ROA and Total Environmental Costs

$$ROA_{it} = \beta 0 + \beta 1\ ROA_{t-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 3\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 4\ Market\ to\ Book + \beta 5\ Ln\ Total\ Assets + \beta 6\ Stock\ Return\ Volatility + \beta 7\ Capital\ to\ Assets + \beta 8\ Expenses\ to\ Revenues + \beta 9\ Asset\ Growth\ Rate + Year\ effects + \varepsilon_{it}$$

This table reports results from two-way fixed effects (Within-group estimator) method and Arellano-Bond GMM of ROA against total environmental cost around the world during the 2002-2011 period. Columns 1 to 3 present the results Two-way Fixed Effects (Within-group estimator) method. Columns 4 to 9 estimate Arellano-Bond GMM. Ln Total Environmental $Costs_{t-1}$ is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable	**ROA**					
Methods	Two-way Fixed Effects model			Arellano-Bond GMM		
Equations	(1)	(2)	(3)	(4)	(5)	(6)
ROA_{t-1}				-0.078**	-0.351***	-0.234***
				(-2.15)	(-6.10)	(-5.28)
Ln Total Environmental $Costs_{t-1}$	-0.008***		-0.008**	-0.071***		-0.044***
	(-3.41)		(-2.40)	(-5.50)		(-3.00)
Ln Total Environmental $Costs_{t-2}$		-0.009***	-0.005**		-0.173***	-0.110***
		(-3.75)	(-2.09)		(-10.86)	(-10.29)
Market to Book	0.073***	0.075***	0.074***	0.075***	0.071***	0.071***
	(11.37)	(10.02)	(9.28)	(13.88)	(8.25)	(10.26)
Ln Total Assets	0.012***	0.012***	0.013***	0.040***	0.082***	0.072***
	(3.09)	(2.63)	(2.68)	(6.60)	(9.49)	(9.63)
Stock Return Volatility	-0.021***	-0.017**	-0.017**	-0.032***	-0.043***	-0.034***
	(-3.28)	(-2.37)	(-2.38)	(-4.88)	(-4.59)	(-4.49)
Capital to Assets	-0.042***	-0.018	-0.016	-0.018	0.054	0.046
	(-2.71)	(-0.79)	(-0.78)	(-0.83)	(1.53)	(1.58)
Expenses to Revenues	0.001	0.001	0.001	-0.001	-0.001	-0.001
	(0.08)	(0.13)	(0.18)	(-0.76)	(-0.05)	(-0.35)
Asset Growth Rate	0.001	0.001	0.001	-0.001	-0.002	-0.002**
	(1.24)	(1.23)	(1.16)	(-1.31)	(-1.48)	(-2.01)
Constant	-0.219***	-0.227***	-0.239***			
	(-3.45)	(-2.98)	(-2.89)			
Year fixed effects	Yes	Yes	Yes	NA	NA	NA
Clusters	Firms	Firms	Firms	NA	NA	NA
R-squared	0.22	0.23	0.22	NA	NA	NA
Number of observations	3,819	3,182	3,118	3,026	2,507	2,507

Table 7 Least Square Dummy Variables method (LSDV) of ROA and Total Environmental Costs by Regions

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Market\ to\ Book + \beta 4\ Ln\ Total\ Assets + \beta 5\ Stock\ Return\ Volatility + \beta 6\ Capital\ to\ Assets + \beta 7 Expenses\ to\ Revenues + \beta 8\ Asset\ Growth\ Rate + Year\ effects + Firm\ effects + \varepsilon_{it}$$

This table reports results from fixed effect model with year dummies and firm clustering of ROA against total environmental cost around the world during the 2002-2011 period. Columns 1 to 3 present the regression specification for Asia Pacific. Similarly, columns 4(7) to 6(9) present the regression specification for Europe (North America). Ln Total Environmental $Costs_{t-1}$ is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable					**ROA**				
Region	Asia Pacific (AP)			Europe (E)			North America (NA)		
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ln Total Environmental $Costs_{t-1}$	-0.004*		-0.003	-0.011***		-0.013***	-0.006		0.003
	(-1.72)		(-0.95)	(-3.19)		(-2.67)	(-1.32)		(0.49)
Ln Total Environmental $Costs_{t-2}$		-0.001	-0.001		-0.007*	0.001		-0.014***	-0.017***
		(-0.34)	(-0.16)		(-1.83)	(0.02)		(-3.02)	(-3.19)
Market to Book	0.061***	0.067***	0.067***	0.083***	0.084***	0.084***	0.047***	0.045***	0.045***
	(9.75)	(5.89)	(5.76)	(12.71)	(11.64)	(11.05)	(10.55)	(9.70)	(9.40)
Ln Total Assets	0.005	-0.001	0.001	0.017***	0.017***	0.019***	-0.003	-0.001	-0.002
	(1.42)	(-0.16)	(0.19)	(3.43)	(2.87)	(3.15)	(-0.49)	(-0.12)	(-0.34)
Stock Return Volatility	-0.039***	-0.032***	-0.034***	-0.034***	-0.032**	-0.034**	-0.004	-0.002	-0.001
	(-5.84)	(-4.10)	(-4.19)	(-3.00)	(-2.47)	(-2.55)	(-0.64)	(-0.27)	(-0.14)
Capital to Assets	-0.047***	-0.049***	-0.046***	0.008	0.027	0.025	0.021	0.014	0.011
	(-4.16)	(-3.51)	(-3.21)	(0.23)	(0.76)	(0.70)	(0.29)	(0.17)	(0.13)
Expenses to Revenues	0.001	0.002	0.002	0.001	0.001	0.002	-0.001	-0.001	-0.001
	(0.78)	(0.91)	(0.88)	(0.25)	(0.39)	(0.52)	(-0.60)	(-0.65)	(-0.64)
Asset Growth Rate	0.007***	0.016***	0.015***	0.001	0.001	0.001	0.002	0.003	0.003
	(3.54)	(4.69)	(4.11)	(0.96)	(0.91)	(0.79)	(0.77)	(0.78)	(0.68)
Constant	0.080	-0.061	0.035	-0.363***	-0.360**	-0.382***	-0.311**	-0.047	0.085
	(1.19)	(-0.74)	(0.44)	(-3.65)	(-3.10)	(-3.20)	(-2.30)	(-0.38)	(0.74)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.63	0.58	0.58	0.57	0.55	0.55	0.82	0.82	0.82
Number of observations	1,343	1,092	1,055	1,487	1,273	1,252	989	817	811

Table 8 Least Square Dummy Variables method (LSDV) of ROA and Total Environmental Costs by Levels of Financial Market Development

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Market\ to\ Book + \beta 4\ Ln\ Total\ Assets + \beta 5\ Stock\ Return\ Volatility + \beta 6\ Capital\ to\ Assets + \beta 7\ Expenses\ to\ Revenues + \beta 8\ Asset\ Growth\ Rate + Year\ effects + Firm\ effects + \varepsilon_{it}$$

This table reports results from least square dummy variables method (LSDV) of ROA against total environmental cost around the world during the 2002-2011 period. Columns 1 to 3 present the regression specification for well-developed Financial Market. Columns 4 to 6 present the regression specification for less-developed Financial Market. Ln Total Environmental $Costs_{t-1}$ is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable	**ROA**					
Market	Well-developed Financial Market			Less-developed Financial Market		
Equations	(1)	(2)	(3)	(4)	(5)	(6)
Ln Total Environmental $Costs_{t-1}$	-0.010***		-0.010**	-0.003		-0.002
	(-3.21)		(-2.50)	(-1.45)		(-0.72)
Ln Total Environmental $Costs_{t-2}$		-0.008**	-0.004		-0.005**	-0.004*
		(-2.52)	(-1.06)		(-1.48)	(-1.68)
Market to Book	0.074***	0.075***	0.073***	0.042***	0.051***	0.051***
	(16.12)	(14.46)	(13.59)	(5.46)	(12.68)	(5.00)
Ln Total Assets	0.013***	0.012**	0.013***	0.003	0.005	0.006
	(3.25)	(2.56)	(2.69)	(0.97)	(2.74)	(1.54)
Stock Return Volatility	-0.019**	-0.015*	-0.015*	-0.021***	-0.018***	-0.018***
	(-2.47)	(-1.73)	(-1.68)	(-4.06)	(-2.31)	(-2.78)
Capital to Assets	-0.056***	-0.037	-0.034	0.010	0.027	0.028
	(-2.90)	(-1.50)	(-1.38)	(0.53)	(-0.65)	(1.31)
Expenses to Revenues	0.001	0.001	0.001	0.001	0.001	0.001
	(0.10)	(0.09)	(0.11)	(0.13)	(-0.18)	(0.47)
Asset Growth Rate	0.001	0.001	0.001	0.016***	0.018***	0.018***
	(0.94)	(0.82)	(0.64)	(6.05)	(0.92)	(5.38)
Constant	-0.066	-0.164*	-0.183*	-0.071	-0.115*	-0.130*
	(-0.68)	(-1.85)	(-1.85)	(-1.32)	(-3.09)	(-1.85)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.62	0.60	0.59	0.64	0.62	0.62
Number of observations	2,304	1,923	1,896	1,515	1,259	1,222

Table 9 Regression Analysis of ROA and Total Environmental Costs by Industries

$$ROA_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Bank + \beta 4\ Bank*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 5\ Securities + \beta 6\ Securities*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 7\ Real\ Estate + \beta 8\ Real\ Estate*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 9\ Insurance + \beta 10\ Insurance*Ln\ Total\ Env.\ Cost_{it-1(t-2)} + \beta 11\ Market\ to\ Book + \beta 12\ Ln\ Total\ Assets + \beta 13\ Stock\ Return\ Volatility + \beta 14\ Capital\ to\ Assets + \beta 15 Expenses\ to\ Revenues + \beta 16\ Asset\ Growth\ Rate + Year\ effects + \varepsilon_{it}$$

This table reports results from least square dummy variables method (LSDV) by the financial services industries. Ln Total Environmental Costst-1 is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Bank, securities, real estate, and insurance are industry dummy variables. Interaction term is industry dummy multiplied by Ln Total Environmental $Costs_{t-1(t-2)}$. Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable	**ROA**							
Methods	Least Square Dummy Variables (LSDV) model							
Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln Total Environmental $Costs_{t-1}$	-0.009***		-0.007***		-0.008***		-0.008***	
	(-4.54)		(-4.54)		(-4.68)		(-5.91)	
Ln Total Environmental $Costs_{t-2}$		-0.009***		-0.006***		-0.009***		-0.009***
		(-7.99)		(-6.23)		(-8.65)		(-10.58)
Bank Dummy	-0.027	-0.004						
	(-1.32)	(-0.72)						
Bank*Ln Total Env. $Costs_{t-1}$	0.007***							
	(3.91)							
Bank*Ln Total Env. $Costs_{t-2}$		0.008**						
		(2.55)						
Securities Dummy			0.055***	0.065***				
			(4.62)	(6.16)				
Securities*Ln Total Env. $Costs_{t-1}$			-0.002					
			(-1.17)					
Securities*Ln Total Env. $Costs_{t-2}$				-0.005***				
				(-3.18)				
Real Estate Dummy					-0.056***	-0.065***		
					(-5.19)	(-8.65)		
Real Estate*Ln Total Env. $Costs_{t-1}$					0.001			
					(0.48)			
Real Estate*Ln Total Env. $Costs_{t-2}$						0.002		
						(0.62)		
Insurance Dummy							-0.015***	-0.017***
							(-3.27)	(-2.80)
Insurance*Ln Total Env. $Costs_{t-1}$							-0.004	
							(-1.28)	
Insurance*Ln Total Env. $Costs_{t-2}$								0.006*
								(1.92)

Table 9 (Continued).

Equations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market to Book	0.073***	0.074***	0.070***	0.069***	0.070***	0.070***	0.073***	0.075***
	(39.09)	(20.65)	(20.49)	(13.04)	(20.11)	(12.94)	(31.30)	(17.94)
Ln Total Assets	0.012***	0.011*	0.008	0.006	0.008	0.007	0.012***	0.012*
	(3.20)	(1.81)	(1.72)	(0.82)	(1.62)	(0.86)	(3.13)	(1.86)
Stock Return Volatility	-0.021**	-0.017**	-0.019***	-0.016**	-0.019***	-0.016**	-0.021**	-0.016*
	(-2.72)	(-2.58)	(-2.85)	(-2.64)	(-2.86)	(-2.62)	(-2.65)	(-2.44)
Capital to Assets	-0.042	-0.018	-0.045	-0.023	-0.045	-0.022	-0.042	-0.018
	(-1.22)	(-0.32)	(-1.21)	(-0.40)	(-1.20)	(-0.39)	(-1.19)	(-0.32)
Expenses to Revenues	0.001	0.001	-0.001	-0.001	-0.001	-0.001	0.001	0.001
	(0.01)	(0.01)	(-0.03)	(-0.03)	(-0.04)	(-0.01)	(0.06)	(0.10)
Asset Growth Rate	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.79)	(0.65)	(0.82)	(0.67)	(0.82)	(0.67)	(0.79)	(0.65)
Constant	-0.238***	-0.264**	-0.192	-0.158	-0.181	-0.153	-0.255***	-0.257*
	(-2.81)	(-2.18)	(-1.90)	(-1.00)	(-1.77)	(-1.00)	(-3.33)	(-2.03)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	Industry	Industry	Industry	Industry	Industry	Industry	Industry	Industry
R-squared	0.62	0.61	0.63	0.62	0.63	0.62	0.62	0.61
Number of observations	3,819	3,182	3,819	3,182	3,819	3,182	3,819	3,182

Table 10 Least Square Dummy Variables method (LSDV) and Two-way Fixed Effects method (Within-group estimator) of EBIT/Total Assets and Total Environmental Costs

$$EBIT/Total\ Assets_{it} = \beta 0 + \beta 1\ Ln\ Total\ Environmental\ Costs_{it-1} + \beta 2\ Ln\ Total\ Environmental\ Costs_{it-2} + \beta 3\ Market\ to\ Book + \beta 4\ Ln\ Total\ Assets + \beta 5\ Stock\ Return\ Volatility + \beta 6\ Capital\ to\ Assets + \beta 7\ Expenses\ to\ Revenues + \beta 8\ Asset\ Growth\ Rate + Year\ effects + Firm\ effects + \varepsilon_{it}$$

This table reports the results of robustness tests from least square dummy variables method (LSDV) and two-way fixed effects (Within-group estimator) method around the world during the 2002-2011 period. Columns 1 to 3 present the results LSDV with year, firm, industry fixed effects. Columns 4 to 9 estimate two-way fixed effects. Ln Total Environmental $Costs_{t-1}$ is log of total direct plus indirect environmental costs in year t-1. Ln Total Environmental $Costs_{t-2}$ is value of log total direct plus indirect environmental costs in year t-2. Total environmental costs are the sum of total direct environmental costs and total indirect environmental costs. Total direct environmental costs are that direct external environmental impacts are that a company has on the environment through their own activities (Trucost Data Explanation). It is calculated by (greenhouse gases direct cost + water direct cost + waste direct cost + land & water pollutants direct cost + air pollutants direct cost + natural resource use direct cost). Total indirect environmental costs are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. It is calculated by (greenhouse gases indirect cost + water indirect cost + waste indirect cost + land & water pollutants indirect cost + air pollutants indirect cost + natural resource use indirect cost). Operating expenses is the amount paid for asset maintenance or the cost of doing business, excluding depreciation. Market to book is defined as (book value of assets – book value of equity + market value of equity)/assets. Stock return volatility is the standard deviation of monthly stock returns over the prior two years. Capital to assets is defined as total equity capital divided by total assets. Expenses to revenues are operating expenses divided by operating revenue. Asset growth rate is change in book value of total assets to total assets in the previous year. t-statistics are in parentheses. ***Denotes statistical significance at the 1% level, **denotes statistical significance at the 5% level, and *denotes statistical significance at the 10% level.

Dependent Variable	**EBIT/Total Assets**					
Methods	Least Square Dummy Variables (LSDV) model			Two-way Fixed Effects model		
Equations	(1)	(2)	(3)	(4)	(5)	(6)
Ln Total Environmental $Costs_{t-1}$	-0.293*		-0.162	-0.293*		-0.162
	(-1.68)		(-0.68)	(-1.68)		(-0.68)
Ln Total Environmental $Costs_{t-2}$		-0.646***	-0.557***		-0.646***	-0.557***
		(-3.49)	(-2.59)		(-3.49)	(-2.59)
Market to Book	4.910***	5.078***	5.024***	4.910***	5.078***	5.024***
	(15.66)	(14.46)	(13.72)	(15.66)	(14.46)	(13.72)
Ln Total Assets	0.266	0.365	0.372	0.266	0.365	0.372
	(1.06)	(1.28)	(1.24)	(1.06)	(1.28)	(1.24)
Stock Return Volatility	-1.511***	-1.077**	-1.075**	-1.511***	-1.077**	-1.075**
	(-3.19)	(-2.03)	(-1.99)	(-3.19)	(-2.03)	(-1.99)
Capital to Assets	-3.403***	-0.758	-0.762	-3.403***	-0.758	-0.762
	(-2.67)	(-0.48)	(-0.48)	(-2.67)	(-0.48)	(-0.48)
Expenses to Revenues	-0.014	-0.012	-0.012	-0.014	-0.012	-0.012
	(-0.73)	(-0.64)	(-0.63)	(-0.73)	(-0.64)	(-0.63)
Asset Growth Rate	0.040	0.028	0.027	0.040	0.028	0.027
	(0.78)	(0.54)	(0.50)	(0.78)	(0.54)	(0.50)
Constant	-7.249	-8.515	-8.368	-4.346	-5.858	-5.740
	(-1.49)	(-1.51)	(-1.43)	(-1.05)	(-1.21)	(-1.14)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	NA	NA	NA
R-squared	0.68	0.67	0.66	0.18	0.19	0.18
Number of observations	3,857	3,214	3,152	3,857	3,214	3,152

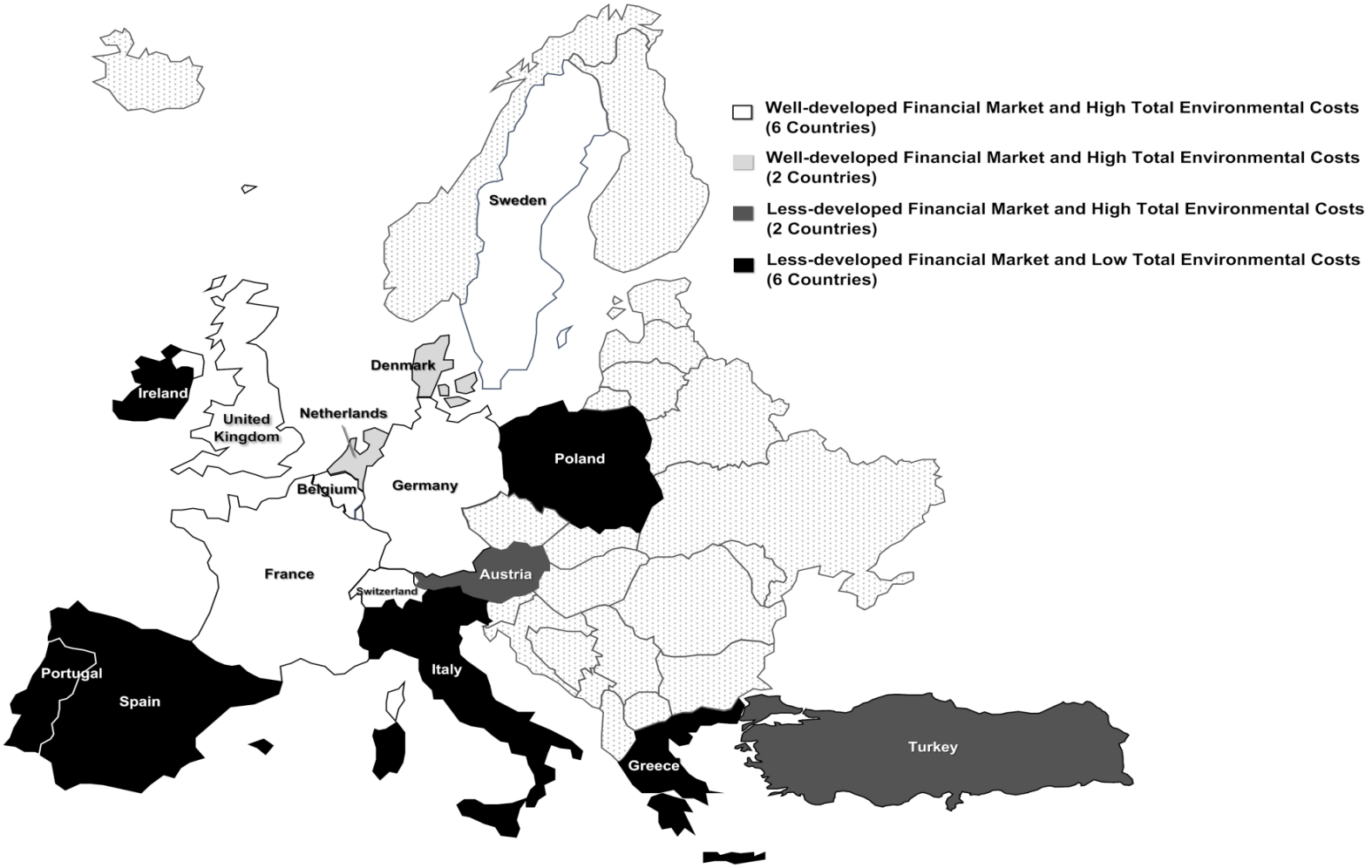

Figure 1 Financial Market Development and Environmental Costs in Europe

This figure graphically shows the levels of the financial market development and total environmental costs by countries in Europe during 2002-2011. The countries in white (black) have the well-developed (less-developed) financial markets and have total environmental costs above (below) the median. The countries in lighter (darker) grey have the well-developed (less-developed) financial markets and have total environmental costs below (above) the median.