Firm- and country-level determinants of green investments: An empirical analysis

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Abstract

We explain the determinants of corporate green investments (GI) by using a series of both firm- and country-level factors. Employing environmental expenditures as a proxy for green investments at the firm level, we find that larger firms tend to invest more in green projects, whereas firms that are more profitable are less likely to go green. In terms of country-level determinants, we find that GDP per capita and population are positively related with GI, while GDP growth and surface area are negatively associated with GI. Additionally, firms in common-law countries and English-speaking countries invest less in GI than firms in other countries. .

Keywords: Green investments, Sustainability, Environmental expenditures, Ecological footprint
JEL codes: G11, M14, O13

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Abstract
We explain the determinants of corporate green investments (GI) by using a series of both firm- and country-level factors. Employing environmental expenditures as a proxy for green investments at the firm level, we find that larger firms tend to invest more in green projects, whereas firms that are more profitable are less likely to go green. In terms of country-level determinants, we find that GDP per capita and population are positively related with GI, while GDP growth and surface area are negatively associated with GI. Additionally, firms in common-law countries and English-speaking countries invest less in GI than firms in other countries.

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1. Introduction

Green investments (GI) are receiving substantial attention among businesses, policy makers, researchers and the general public. In 2015, a record amount of global new investments in renewable energy of $323.4bn was documented, which was topped only in 2018 totalling $332.1bn. According to the 2018 Global Trends in Renewable Energy Investment report[1], global new investments in renewable energy increased particularly strongly to $287.8 billion in 2011 from $211 billion in 2010 ($162 billion in 2009 and $173 billion in 2008) and have fluctuated around that level since then (see Figure 1).

Eyraud et al. (2013) define GI as the investments necessary to reduce greenhouse gas and air pollutant emissions without significantly reducing the production and consumption of non-energy goods. Examples of GI include renewable energy technologies, environmentally friendly transportation, projects that are committed to preserving natural resources, clean air, water and waste projects, and more generally the implementation of environmentally conscious business practices, to name a few. We expand Eyraud et al.'s (2013) definition of GI by including all investment and expenditure activities that focus on projects that are committed to environmentally conscious business practices. These practices could be aimed at preventing or controlling environmental impacts or hazards and can include treatment, disposal, sanitation and clean-up expenses.[2]

Insert Figure 1 around here

[1] Frankfurt School-UNEP Centre/BNEF, 2018.

[2] We employ one variable that includes both investments and expenditures as explained in the text. Different proxies may be available when focusing on single countries or when exploring country- rather than firm-specific determinants of GI in a cross-country setting. However, the availability of data on environmental investments and expenditures allows us to provide a cross-sectional international study of GI. We recognize though that there is no universal measurement of GI and that our results may at least be partially influenced by our variable choice.

Clarkson et al. (2011) find that a positive change in environmental performance, measured as reduction of the amount of toxics released into the air by the company, improves the financial performance of a company. Tate, Ellram, and Kirchoff (2009) indicate that firms use environmental expenditure to build their reputation among environmentally sensitive shareholders. Ambec and Lanoie (2008) explain that GI can help firms through better access to certain markets, product differentiation, reduced cost of capital, and better risk management. Even though GI can be advantageous to a company, and have been growing rapidly, the driving forces behind GI have not been fully understood yet. Eyraud et al. (2013) show a positive association between countries' GDP, economic growth, oil prices, and feed-in-tariffs with GI, whereas it still remains unclear how firm- and further country-level factors affect firms' GI. Our study aims to fill this gap in the literature by exploring key determinants of GI.

In particular, we examine whether certain firm characteristics and country-level factors, such as macroeconomic, institutional, environment, political, legal, and cultural variables influence firms' GI at both the firm and the country levels. Our study contributes to the literature on sustainable investments, as well as, to the newly emerging literature that examines the association between sustainable investments, ethical finance, and economic growth. The findings of our research not only contribute to the academic literature in these areas, but also have important implications for both regulators and policymakers in countries that exhibit sub-par GI investments or who otherwise aim to increase GI.

Our paper is structured as follows: In Section 2, we review the related literature and develop the hypotheses for the empirical analysis. In Section 3, we describe the dataset and explain the explanatory variables. In Section 4, we describe the empirical methodology and

present the results. In Section 5, we present our robustness tests. Finally, we conclude in Section 6.

2. Literature review and hypothesis development

2.1. Literature review

Jaraitė et al. (2014) and Haller and Murphy (2012) find that larger firms are more likely to spend on environmental protection. Similarly, Hofer, Cantor, and Dai (2012) find that larger and profitable firms, mostly because of their financial capabilities to bear the expenses, are involved more in environment management activities such as investing in environmentally friendly production lines, focusing on renewable resources, managing environmental risks, etc. Similarly, larger firms with focus on firm image and reputation tend to invest more in corporate social responsibility (CSR) as a means to signal their quality to the investors (Tate, Ellram, and Kirchoff 2009). Horbach (2008) show that firms' technological capabilities can induce environmental innovation.

Few other specific determinants have been studied in some detail, in particular those that bear an obvious relationship to GI such as environmental policies. Johnstone et al. (2010) observe that public policies have a very significant influence on the development of new technologies in renewable energy. Similarly, Nesta (2014) reports that the combination of environmental policies and market deregulation is the most effective method of facilitating renewable energy innovation. Renewable energy policies are in place in 146 countries according to the Renewables 2018 Global Status Report (REN21 2018). Countries around the world continue to develop new policy measures to support renewable energy investments. According to Eyraud et al. (2013), specific public interventions such as feed-in-tariffs stand out as one of the most important instruments for supporting the

expansion of GI; countries undertake two to three times more GI when adopting such a scheme.

Demirel and Kesidou (2011) illustrate that environmental regulations can create pressure and a motive for environmental innovation. These regulations not only influence the investments in short term projects such as end-of-pipeline technologies, but also drive long-run product innovation through research and development (R&D). Brunnermeier and Cohen (2003) reveal that increased monitoring and enforcement are likely to lead to more environmental innovation because firms tend to comply with regulations when faced with the threat of penalties.

Some studies have empirically investigated the impact of a broader range of country-level drivers on GI, such as macroeconomic and cultural factors. Stern (2004) finds that higher-income countries have larger environmental expenditures and are involved more in environmental innovation. Eyraud et al. (2013) study the effect of a series of macroeconomic factors on GI, including GDP, GDP per capita, inflation, income, and interest rates. Their results suggest that higher GDP growth and higher income levels result in an increase in GI, while interest rates are negatively associated with GI. Furthermore, they report that a country's population may affect GI. Countries with rapidly increasing populations face important energy needs, but traditional energy resources are sometimes not able to meet these needs because of scarce fossil fuels. To make up for this shortfall, investments in alternative energy sources and green technologies are required.

2.2. Hypothesis development

2.2.1. Firm-level factors

Recent studies (Haller and Murphy 2012, and Jaraitė et al. 2014) suggest that larger firms are more likely to be polluting and hence are more likely to undertake GI. Accordingly, we propose a similar hypothesis, i.e. larger firms tend to have more GI. Higher-valued firms, in terms of market capitalization compared to their book value, also tend to give more emphasis on their image, thereby making investments in environmentally friendly projects or increasing their effort to reduce their carbon footprints. Therefore, we hypothesize that firms with higher Tobin's Q have higher GI.

Firms can increase their (short-term) profits by reducing seemingly unnecessary expenses such as those related to the environment or by foregoing investments without immediate or short-term payoffs, including GI (GI normally take a long time to provide a decent payoff). Therefore, we expect more profitable firms to invest less in GI. Similarly, firms with higher amount of debt may be more inclined to invest in short-term projects that provide them enough cash to make interest payments, leading to a negative relationship between leverage and GI.

2.2.2. Macroeconomic factors

Eyraud et al. (2013) document the influence of several macroeconomic factors, such as GDP per capita, GDP growth, CPI inflation, and gasoline prices on GI. Naturally, companies in wealthier countries, i.e. countries with a higher GDP per capita, will be able to afford larger investments in the environment. Our expectations for the GDP growth variable, on the contrary, are not straightforward. Recent studies (Haller and Murphy

2012, and Jaraitė et al. 2014) suggest that larger firms are more likely to be polluting and hence are more likely to undertake GI. Accordingly, we propose a similar hypothesis, i.e. larger firms tend to have more GI. Except for GDP growth for which our expectations are mixed, we hypothesize that each of the above mentioned macroeconomic determinants is positively associated with GI.

Furthermore, economic freedom is an important indicator of a country's macro-economy. Economic freedom measures the extent to which rightly acquired property is protected and individuals are free to engage in voluntary transactions (de Haan and Sturm 2000). Doucouliagos and Ulubasoglu (2006) perform a meta-analysis showing a positive and statistically significant association between economic freedom and economic growth. In our study, we assume that countries with higher economic freedom are more likely to invest in green projects.

According to Eyraud et al. (2013), countries with larger populations are more likely to invest in green projects. However, we attempt to differentiate between population size and density. We hypothesize that more densely populated countries will invest more in green initiatives. Therefore, even though population size is correlated with physical size, we expect a positive relationship between a country's population and GI, but a negative relationship between country's surface area and GI. Following Eyraud et al. (2013), we hypothesize that the adoption of feed-in-tariff leads to more investment in GI.

2.2.3. Environmental factors

We expect a mixed relationship between a country's level of greenhouse gas emissions and air pollution with GI. International agreements to reduce emissions can drive firms in countries with higher emissions to invest more in GI. However, firms in European countries

with comparably better environmental performance also prefer to invest more in the environment.

2.2.4. *Political factors*

A country's political system and regime type also have a considerable indirect influence on economic performance and investment behavior. Drury et al. (2006) argue that democracy allows for the eviction of incompetent politicians who may harm the economy. Furthermore, democracy may motivate citizens to work, save, and invest. Zouhaier and Karim (2012) observe a positive relationship between democracy and investment. Thus, we hypothesize that firms in democratic countries are more likely to go green, with firms in autocratic countries investing less in the environment.

2.2.5. Institutional factors

The effects of investor protection and legal origin on firms' investment and access to external finance have been widely analyzed. Mclean, Zhang and Zhao (2012) assume that in countries with stronger investor protection laws, managers and shareholders are less likely to abuse the firm's resources and more likely to invest in projects that benefit shareholders. In addition, they find that it is much easier for firms to secure external finance in countries with stronger investor protection laws. Benmelech and Bergman (2011) demonstrate that good legal protection of creditors makes it easier for firms to make large capital investments. Further, La Porta et al. (1997) find that common law countries have higher shareholder protection laws. Based on these studies, we hypothesize that firms in countries with better creditor rights and better investor protection, and common law countries are more likely to invest in green projects.

2.2.6. Cultural factors

Stulz and Williamson (2003), while examining the nature of the relationship between cultural factors (including language) and investor rights, demonstrate that English-speaking countries and Protestant countries afford shareholders more rights than countries with other predominant languages and religions. Following Stulz and Williamson (2003) and assuming a positive relationship between shareholder protection and GI, we hypothesize firms in Protestant and English-speaking countries spend more in GI.

3. Data

3.1. Samples construction and dependent variable definition

We collect firms' GI data from the Thomson Reuters ESG – Asset4 database that is accessible through Datastream. More specifically, we use the data item "*Environmental Expenditures"* which according to Thomson Reuters includes "all environmental investment & expenditures for environmental protection or to prevent, reduce, control environmental aspects, impacts, and hazards. It also includes disposal, treatment, sanitation, and clean-up expenditure".[3] We begin our sample period in 2002 because the ESG-Asset4 database provides information on environmental expenditures starting from that year. We collect the data for a period of 13 years, thereby ending our sample in 2015. Forty countries have firms (123 firms in North America and 640 firms in the rest of the world) that disclose their environmental expenditures. Our sample consists of 5,582 firm-year observations. We merge this data with firm-level variables from Compustat and country-level variables from World Bank, Heritage Foundation, Center for Systemic Peace

[3] For consistency reasons we continue to use the term GI, recognizing though that the data item includes both investments and expenditures.

(CSP), and CIA Factbook to examine the influence of firm and country-level variables on GI.

3.2. Independent variables

To examine the determinants of firms' GI, we employ the following firm characteristics: size, Tobin's Q, profitability, and leverage. We define firm size as the natural logarithm of the firm's market capitalization (market value of equity), Tobin's Q as the ratio of market value of equity to book value of equity, profitability (return on assets, ROA) as the ratio of earnings before interest and taxes (EBIT) to total assets, and leverage as the ratio of total liabilities to total assets.

As for the country level variables, we measure GDP per capita as the natural logarithm of the ratio of a country's GDP to its population, GDP growth rate as the percentage change in a country's GDP in a particular year from the previous year, and CPI inflation as the percentage change in the price level of basket of consumable goods and service purchased by the households in a country. Following de Haan and Sturm (2000), we use the economic freedom index from Heritage Foundation to measure the economic freedom. The index ranges from 0 to 100, with a higher score implying greater economic freedom. Furthermore, using the data from World Bank database, we define population as the natural logarithm of a country's population, surface as the natural logarithm of a country's surface area (in sq. km), and gasoline price as the pump price of gasoline (in USD per liter). For feed-in-tariff policies, we construct a dummy variable that takes on a value of 1 if a country imposes feed-in-tariff policies, and 0 otherwise.

To examine the effect of environmental factors on GI, we use the natural logarithm of CO_2 emissions and PM2.5 air pollution (micrograms per cubic meter of air) because these

variables proxy for the state of the environment. PM2.5 measures the microscopic solid or liquid matter suspended in the Earth's atmosphere. To characterize the political regime, we employ the commonly used Polity IV data, which measures a country's level of democracy and autocracy, from Center for Systemic Peace. The democracy variable and the autocracy variable range from 0 to 10, 10 being the strongest possible form of the regime. To measure shareholder rights protection, we employ the investor protection index from Doing Business 2014 report (also found in Global Competitiveness Index Historical Dataset 2005-2014, World Economic Forum). This index measures the extent of transparency in transactions, liabilities for directors, and shareholders' ability to sue directors and management.[4] Similarly, we proxy creditor rights with a legal rights index from Doing Business 2014, in which the index measures the degree of protection for borrower and lender, thereby facilitating the lending. In addition to these two institutional indices, we adopt the legal origin classification by Djankov et al. (2007) and CIA Factbook that categorizes countries into five legal origins, i.e. English common law, French civil law, German civil law, Scandinavian civil law, and Socialist civil law. Because the biggest difference in legal origin lies between English common law and civil law, we employ a dummy variable, *common law*, which equals 1 if the country adopts English common law and, 0 otherwise.

Similar to Stulz and Williamson (2003), we restrict our choice of proxies for culture to language and religion. We define the primary religion (language) as the one practiced (spoken) by the majority of the population in a given country. Using the CIA Factbook, we

[4] More details can be obtained at https://reports.weforum.org/global-competitiveness-report-2014-2015/technical-notes-and-sources/.

employ two dummy variables that equal 1 if a country's main religion (language) is Protestant (English), and 0 otherwise.

We include a summary of definitions and sources for all firm- and country-level variables in Table 1 and include the correlation coefficients for all independent variables in Table 2. We observe that the range of Tobin's Q is very large (0.003-8,000) and thus winsorize the variable at the 5^{th} and 95^{th} percentile.

Please insert Tables 1 and 2 about here

4. Methodology and results

4.1. Univariate analysis

To provide some initial insight into the variables we use in our subsequent regression analysis, we perform a series of univariate tests. Similar to Walker et al. (2014), we use two-sample t-tests and Kruskal-Wallis median tests to examine the differences in means/medians between each set of subsamples. Median tests have the advantage of being more robust to outliers.

For all firm-level and macroeconomic factors, we construct two sub-samples, one with values below the median and the other with values above the median. For creditor rights, investor protection, democracy, and autocracy variables, we construct the sub-samples along a score of 5, i.e., one sample with scores 0-5 and the other with scores 6-10. Finally, we divide the sample into no feed-in-tariff vs feed-in-tariff, civil law vs common law, non-protestant vs protestant, and non-English vs English speaking countries. Our univariate analyses are presented in Table 3.

Please insert Table 3 about here

We observe that the mean and median tests show similar levels of significance for each variable. Thus, all numerical results discussed hereafter refer to the mean value. We find that there are significant differences for all firm-level variables. In particular, firms of bigger size invest significantly more in the environment (7.719 vs 2.848), whereas firms with higher Tobin's Q, higher profitability, and higher leverage invest less in the environment (4.549 vs 6.153, 4.750 vs 5.934, and 5.240 vs 5.436 for their respective counterparts). In terms of country-level variables, we surprisingly find that firms in countries with lower GDP per capita, lower GDP growth, lower CPI inflation and less economic freedom invest more in the environment. Moreover, firms in countries with larger populations, stronger creditor and investor protection, greater CO_2 emissions, and higher PM2.5 tend to invest more in green projects. Firms that are located in countries with a larger surface area, with autocratic regime, that follow common law, with majority people following Protestant religion and with majority English speaking population invest less in the environment.

4.2. Regression analysis

We estimate a series of firm random effects regressions in Table 4. A natural alternative specification is fixed effects. However, our variables of interest such as surface, creditor rights, investor protection, democracy, autocracy, common law, protestant, and English are time-invariant. Thus, fixed effects models are not appropriate. Further, the result of performing Breusch and Pagan's (1980) Lagrange multiplier test supports the use of random effects models. Thus, we estimate the following equation:

$$Env\ \ exp_{ij} = \alpha + \beta_0 firm_{ij} + \beta_1 country_j + \beta_2 X_j + u_i + \epsilon_{ij} \qquad (1)$$

Where, $env\ exp_{ij}$ is the environmental expenditure of a firm i in a country j; $firm_{ij}$ is a vector of firm-level factors such as size, Tobin's Q, performance, and leverage; $country_j$ is a vector of basic country-level factors such as GDP per capita, GDP growth, CPI inflation, economic freedom index, population, surface area, gasoline prices, feed-in tariff, creditor rights, and investor protection; X_j is a vector of environmental (CO_2 emissions and PM2.5) or political (democracy and autocracy dummies) or legal origin (common law dummy) or cultural (protestant and English dummies) factors; u_i is a firm-specific random effect ; and ϵ_{ij} is the error term.

We do not estimate the full equation in all the models in Table 4. In Model 1, we only include the firm-level variables while in Model 2, we only include the country-level variables. Because a firm's GI can be affected by both firm- and country-level factors, we include both the firm-level and basic country variables in Model 3. In Models 4, 5, 6, and 7, we add our environmental, political, legal origin and cultural variables, respectively. Because democracy, autocracy, creditor rights, investor protection, legal origin, language, and religion are highly correlated, we add each of these variables separately in different models.

Please insert Table 4 about here

In Model 1 with only firm-level financial variables, we find that firm size is positively related to environmental expenditures, while ROA shows a negative association. It is noteworthy that their significance persists throughout each model. Larger firms are more inclined to invest in the environment. This is in line with our hypotheses and as suggested by Haller and Murphy (2012) and Jaraite et al. (2014). As expected, firms with greater profitability are less likely to invest in the environment because of their tendency to

emphasize on their cost cutting measures. Further, this negative association may also be explained by the fact that less profitable firms use environmental investments as a differentiating factor and try to increase customer demand by portraying themselves as green firms, even though GI generally take longer to pay off. Apart from this, the impact of Tobin's Q is significantly positive in four out of seven regressions. This confirms our hypothesis that supports the signalling through environmental expenses. However, we do not find any significant effect of leverage on a firm's environmental expenditures.

As for our basic country variables, we find that GDP per capita and population are positively associated with GI, while GDP growth, economic freedom, and surface area show negative association. These relationships mostly support our hypotheses. Firms in countries with higher GDP per capita invest more in the environment. Eyraud et al. (2013) also show that richer countries tend to invest more in green technologies because they can afford to do so. However, Grossman and Krueger (2005) show a non-linear relationship of GDP per capital and environmental expenses. In the earlier stages of economic growth, as the economy develops, environmental expenditures decrease. Yet, when the living standard of a country has reached a sufficiently high level, people will pay greater attention to environmental protection[5]. However, to facilitate the increase in the growth rate of a country, firms tend to focus more on rapid consumption of natural resources and less on environmental costs, thereby indicating a negative relationship with GDP growth rate as seen in our models, except in Model 4. Ward et al. (2016) support this finding by demonstrating that GDP growth cannot be decoupled from the higher use of energy and/or

[5] We address this issue by performing a robustness test in which we include (GDP per capita)^2 as an additional variable. Please refer to our robustness test section for details.

materials. We do not intend to debate whether material consumption and GDP growth can be decoupled in the future or GDP growth rate should be sacrificed for the sake of environment (Kallis 2011), but rather just present the historical relationship as evident in the data.

Economic freedom is negatively significant in Model 2 but becomes insignificant in other models. Thus, we cannot fully confirm the negative relationship. However, pertaining to Doucouliagos and Ulubasoglu (2006) who show a positive association between economic freedom and economic growth, and our findings of a negative relationship between GDP growth rate and GI, we postulate that the transitive property may be behind the phenomena. Additionally, firms in countries with a larger population tend to invest more in the environment, while those in countries with greater surface area invest less. This confirms our prediction of firms headquartered in densely populated area to be more environmental conscious. Similarly, firms may be more inclined to invest in alternative forms of energy when gasoline prices are higher. The gasoline price variable is significantly positive in four out of seven models. This is in line with Eyraud et al. (2013) who state that the return to GI increases by lowering the relative cost of electricity produced compared to the crude oil consumption at higher prices. In addition, CPI inflation and feed-in-tariff variables do not make a significant impact.

In Model 4, we observe a significantly positive relationship of CO_2 emissions and PM2.5 factors with GI. Higher gas emissions and polluted environment lead to more investment in the environment. To test whether this relationship holds in environmentally friendly countries, we estimate Model 4 with and without European countries. In unreported results, we do find that the impact of CO_2 emission is significantly positive in

non-European countries but insignificant in European countries. Moreover, in Model 5, we do not find any significance for democracy or autocracy dummies. As for institutional factors, we find some support to our hypotheses. The investor protection variable is significantly positively related with GI. Yet, the other two variables – creditor rights and common law dummy – are significantly negative and do not support our hypotheses. Rather than influencing firms to carry out long-term investments via strong credit market, stronger creditor rights could force these companies to focus on short-term cash availability so that the creditors' regular scheduled interest payments are made. Subsequently, firms in countries with strong creditor protection may forgo positive NPV GI projects. Stulz and Williamson (2003) show that common law countries have strong creditor protection. Thus, following the inverse relationship of creditor rights, firms in common law countries may prefer to invest less in GI. A common convention following La Porta et al. (1998) is that common law countries provide stronger shareholder protection. This stronger shareholder protection, then, should percolate to more GI. However, Spamann (2010) show that La Porta et al. (1998) did not employ local lawyers to correctly map the relevant rules in each country and thus, failed to produce an accurate measure of anti-director rights (a measure of shareholder protection). Spamann's (2010) corrected anti-director rights index fails to provide support that common law countries provide higher shareholder protection.

In Model 7, we find that firms in countries with pre-dominantly Protestant and English speaking population have less GI. This relationship, rejecting our hypotheses, could again be the result of shareholder rights not perfectly aligning with these variables but rather aligning more towards creditors rights as shown by Stulz and Williamson (2003).

5. Robustness tests

To ensure that our results are not driven by US firms, our choice of sample period, or the construction of our main variables, we perform several robustness tests.

5.1. Determinants of GI in non-US firms

We have a comparatively large number of observations for US firms (1,296). To examine whether the relationship between the variables holds in other countries, we exclude all US firms, which leaves us with 4,298 observations. We, then, estimate similar regressions as in Table 4. Overall, our results when excluding US firms, which are presented in Table 5, are almost identical to the initial results in Table 4, which indicates that our results are not specifically affected by the inclusion of US firms.

Please insert Table 5 about here

5.2. Determinants of GI after excluding the financial crisis period

We further explore whether our results are affected by the inclusion of the financial crisis in 2008 by removing all firm-year observations from 2008 and 2009. As presented in Table 6, we find that both our firm- and country-level variables exhibit results that are overall similar to those in Table 4.

Please insert Tables 6 here

5.3. Test for a U-shaped relationship

Beckerman (1992) finds that although economic growth usually leads to environmental degradation in the early stages of a country's economic development, in the end environmental quality will improve as countries gets richer. Mirroring these results, Grossman and Krueger (1995) find an inverted-U relationship between economic development and the level of pollutants (see also the more detailed discussion provided by

Stern, 2004). To test this relationship, we divide our sample countries into two groups: countries that belong to the Organization for Economic Co-operation and Development (OECD) and countries that do not. In 2015, OECD had 34 members, most of which are regarded as developed countries. We have 4,360 observations for OECD countries and 535 for non-OECD countries. Because we aim to test the U-shaped relationship between GDP per capita and GI, we focus our attention on the variable Ln(GDP per capita).

We estimate three regressions for each group. The first model incorporates firm-level variables, the second model incorporates our basic country variables and the third model incorporates both our firm-level and basic country variables. The results are shown in Table 7.

Please insert Table 7 here

Ln(GDP per capita) and its squared term are not significant. Thus, we cannot confirm the inverted U-shaped relationship between economic development and GI. Most of the above-mentioned studies examined the relationship on a broader economic-level while we examine it on a firm-level. Our results, thus, show that the inverted U-shaped relationship may not exist at a firm-level. Other firm-level and country-level variables have similar significance as in Table 4, with few exceptions such as economic freedom.

6. Conclusions

When examining the firm-level determinants of green investments, we find that larger firms are more likely to invest in the environment, while firms that are more profitable invest less in the environment. The reason for this finding could be the involvement of big firms (in size) in polluting activities, forcing them to undertake more GI and the strategies

of less profitable firms to try to gain back revenues by marketing themselves as green, i.e. by increasing GI.

Regarding our country-level factors, we find that GDP per capita and population show positive association to GI, while GDP growth and surface show negative association. Firms in richer countries can afford more GI to reduce the ecological footprint. However, countries with more focus on GDP growth will foster firms/industries in their jurisdiction to increase production and care less about the environment unless these countries are densely populated and need to invest in alternative sources of energy to fulfill their energy demands.

As for institutional determinants, creditor rights and common law dummy negatively affect GI while investor protection make a positive impact. Firms in countries with strong creditor rights may be forced to invest in short-term projects to make sure that there is enough cash to make regular interest payments, thereby avoiding long-term investments such as GI. Common law, Protestant, and English dummies have strong association with creditor rights and thus hamper GI. Our political variables do not show any significance.

Our findings are robust to the exclusion of US firms or the financial crisis period. Based on these results, we can postulate several implications of our study. First, a government focusing its efforts on protecting the environment can target profitable firms, for example through policies similar to feed-in-tariffs, but more customized or designed for them. Second, eco-friendly densely populated countries can achieve their sustainable goals by facilitating the investment in different forms of alternative energy, allowing these governments to care for the environment and to fulfill their growing energy demands at the same time. Third, with the focus of sustainable growth around the world, it may be a good

time for firms in rich countries and following common law (English speaking countries) to step up for green investment.

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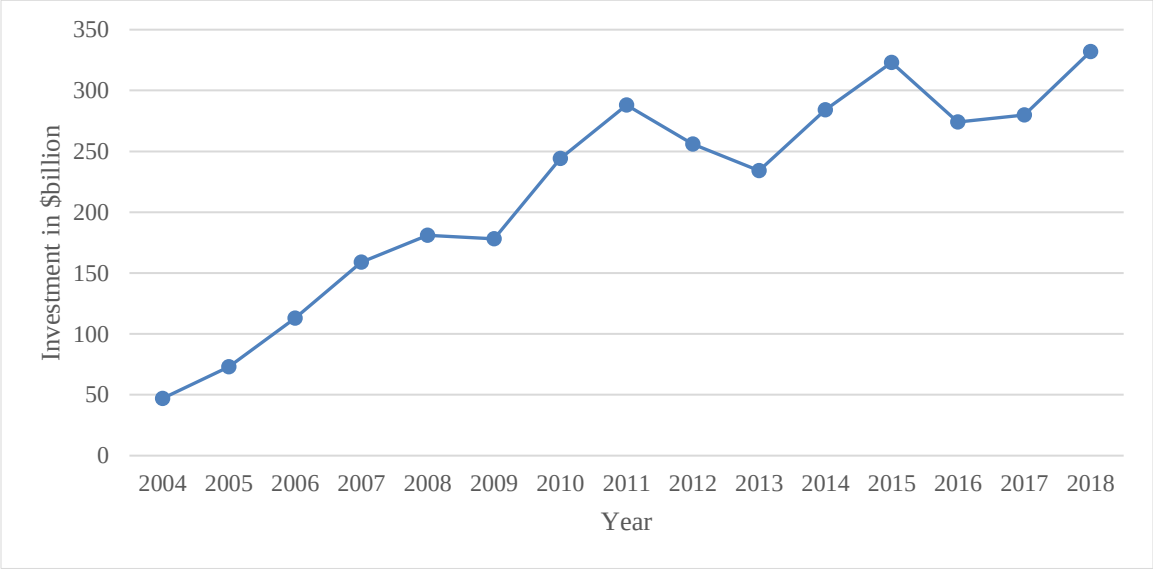
Figure 1: Global Green Investments in Renewable Energies from 2004 to 2018



Source: Bloomberg NEF Research

Table 1: Definition of variables

Variable	Data source	Description
Panel A: Firm variables		
Ln (Size)	Compustat	Natural log of a firm's market capitalization
Tobin's Q	Compustat, Datastream	Market value of equity divided by book value of equity
ROA	Compustat	Earnings before income and tax (EBIT) divided by assets
Leverage	Compustat	Total liabilities divided by total assets
Panel B: Country variables		
Ln (GDP per capita)	World Bank Database	Natural log of a country's GDP divided by its total population
GDP growth	World Bank Database	Percentage change in GDP compared to the previous year
CPI inflation	World Bank Database	Percentage change in the price level of a market basket of consumer goods and services purchased by households
Economic freedom	Heritage Foundation	A score that ranges from 0-100, with a higher score meaning greater economic freedom. It measures economic freedom based on 10 quantitative and qualitative factors: property rights, freedom from corruption, fiscal freedom, government spending, business freedom, labour freedom, monetary freedom, trade freedom, investment freedom, and financial freedom.
Ln (Population)	World Bank Database	Natural log of the population for each country
Ln (Surface)	World Bank Database	Natural log of the surface area (sq. km) for each country
Gasoline price	World Bank Database	Pump price of gasoline (US$ per liter)
Feed-in-tariff dummy	Global status reports (REN21)	A dummy variable that equals 1 if the country imposes feed-in-tariff policies, 0 otherwise
Creditor rights	doingbusiness.org	A score that ranges from 0 to 10, with higher scores representing higher level of creditor legal rights
Investor protection	doingbusiness.org	A score that ranges from 0 to 10, with higher scores representing stronger investor protection
Ln (CO_2 emissions)	World Bank Database	Natural log of CO_2 emissions in kilotons
PM2.5	World Bank Database	PM2.5 air pollution, mean annual exposure (micrograms per cubic meter of air)
Democracy dummy	Center for Systemic Peace (CSP)	A score that ranges from 0 to 10, with a higher score meaning higher democracy
Autocracy dummy	Center for Systemic Peace (CSP)	A score that ranges from 0 to 10, with a higher score meaning higher autocracy
Common law dummy	Djankov et al. (2007), CIA Factbook	A dummy variable that equals 1 if the country adopts English common law, 0 otherwise
Protestant	CIA Factbook	A dummy variable that takes on a value of 1 if a country's primary religion is Protestant
English	CIA Factbook	A dummy variable that takes on a value of 1 if a country's primary language is English

Table 2: Firm-level correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Ln (Size)																				
2	Tobin's Q	0.087																			
		(0.000)																			
3	ROA	0.066	0.029																		
		(0.000)	(0.048)																		
4	Leverage	-0.174	-0.040	-0.148																	
		(0.000)	(0.005)	(0.000)																	
5	Ln (GDP per capita)	-0.259	-0.026	-0.139	0.098																
		(0.000)	(0.072)	(0.000)	(0.000)																
6	GDP growth	0.069	0.016	0.140	-0.097	-0.310															
		(0.000)	(0.277)	(0.000)	(0.000)	(0.000)															
7	CPI inflation	-0.165	0.008	0.170	-0.039	-0.621	0.349														
		(0.000)	(0.562)	(0.000)	(0.007)	(0.000)	(0.000)														
8	Economic freedom	-0.345	-0.170	-0.050	0.001	0.419	-0.154	-0.202													
		(0.000)	(0.000)	(0.000)	(0.951)	(0.000)	(0.000)	(0.000)													
9	Ln (Population)	0.244	-0.010	0.074	0.077	-0.189	0.099	0.072	0.016												
		(0.000)	(0.485)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.264)												
10	Ln (Surface)	-0.261	-0.037	0.036	0.014	-0.051	0.177	0.298	0.256	0.544											
		(0.000)	(0.011)	(0.012)	(0.348)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)											
11	Gasoline price	0.015	0.015	-0.100	0.001	0.074	-0.167	-0.201	-0.210	-0.471	-0.711										
		(0.315)	(0.310)	(0.000)	(0.928)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)										
12	Feed-in-tariff dummy	-0.089	-0.072	-0.062	0.049	0.385	-0.176	-0.329	0.467	0.204	0.044	-0.030									
		(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.081)									
13	Creditor rights	-0.161	0.009	-0.012	-0.036	0.411	0.083	-0.129	0.293	0.125	0.277	-0.354	0.284								
		(0.000)	(0.522)	(0.422)	(0.012)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)								
14	Investor protection	0.102	-0.033	-0.028	-0.011	0.143	0.015	-0.056	0.303	0.456	0.488	-0.475	0.148	0.444							
		(0.000)	(0.024)	(0.052)	(0.439)	(0.000)	(0.307)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)							
15	Ln (CO_2 emissions)	0.164	-0.004	0.021	0.078	0.109	0.041	-0.065	0.136	0.912	0.611	-0.585	0.304	-0.157	0.639						
		(0.000)	(0.781)	(0.156)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
16	PM2.5	0.258	0.057	0.109	-0.113	-0.775	0.425	0.544	-0.431	0.257	-0.057	0.022	-0.160	0.141	-0.281	0.006					
		(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.227)	(0.000)	(0.000)	(0.000)	(0.723)					
17	Democracy dummy	-0.113	-0.083	-0.079	0.064	0.545	-0.267	-0.408	0.516	-0.074	-0.057	-0.032	0.379	0.081	0.254	0.098	-0.426				
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.033)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
18	Autocracy dummy	0.012	0.044	-0.008	-0.018	-0.203	0.167	0.090	-0.088	0.127	0.090	-0.030	0.014	0.019	-0.016	0.089	0.262	-0.681			
		(0.387)	(0.002)	(0.557)	(0.208)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.047)	(0.406)	(0.185)	(0.257)	(0.000)	(0.000)	(0.000)			
19	Common law dummy	-0.387	-0.026	0.033	0.018	0.064	0.188	0.303	0.352	0.211	0.636	-0.561	0.137	0.006	0.757	0.377	-0.006	0.115	-0.027		
		(0.000)	(0.067)	(0.023)	(0.211)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.686)	(0.000)	(0.000)	(0.737)	(0.000)	(0.057)		
20	Protestant	-0.423	-0.011	0.028	0.094	0.226	0.089	0.151	0.295	0.189	0.585	-0.513	0.081	0.528	0.311	0.391	-0.225	0.171	-0.047	0.631	
		(0.000)	(0.435)	(0.050)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	
21	English	-0.424	-0.024	0.012	0.052	0.336	0.104	0.118	0.405	0.202	0.684	-0.572	0.224	0.676	0.631	0.426	-0.316	0.216	-0.046	0.905	0.617
		(0.000)	(0.095)	(0.392)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)

Notes: We report Pearson/Spearman correlation coefficients for each variable pair at the firm level. P-values are reported in brackets below each correlation coefficient.

Table 3: Preliminary examination of firm level environmental expenditures – univariate tests

Subsample 1	N mean median	Subsample 2	N Mean median	Tests of differences means (p-value) medians (p-value)
Low Ln (Size)	2355	High Ln (Size)	2463	
	2.848		7.719	0.000
	3.045		8.179	0.000
Low Tobin's Q	2370	High Tobin's Q	2448	
	6.153		4.549	0.000
	6.688		4.214	0.000
Low ROA	2394	High ROA	2424	
	5.934		4.750	0.000
	6.067		4.539	0.000
Low Leverage	2403	High Leverage	2415	
	5.436		5.240	0.055
	5.598		4.770	0.029
Low Ln (GDP per capita)	2369	High Ln (GDP per capita)	6.368	
	6.368		4.341	0.000
	7.053		3.695	0.000
Low GDP growth	2335	High GDP growth	2483	
	5.631		5.062	0.000
	5.811		4.761	0.000
Low CPI inflation	2327	High CPI inflation	2491	
	6.564		4.192	0.000
	7.555		3.945	0.000
Low Economic freedom	2463	High Economic freedom	2355	
	5.597		5.067	0.000
	5.677		4.694	0.000
Low Ln (Population)	2267	High Ln (Population)	2551	
	3.863		6.649	0.000
	3.497		7.275	0.000
Low Ln (Surface)	2564	High Ln (Surface)	2254	
	6.848		3.62	0.000
	7.813		3.664	0.000
Low Gasoline price	2334	High Gasoline price	2484	
	5.415		5.266	0.142
	5.261		5.153	0.174
No Feed-in-tariff dummy	535	Feed-in-tariff dummy	3035	
	4.846		5.229	0.023
	4.382		4.990	0.004
Creditor rights (0-5)	452	Creditor rights (6-10)	4366	
	4.176		5.458	0.000
	3.989		5.394	0.000
Investor protection (0-5)	624	Investor protection (6-10)	4194	
	3.240		5.65	0.000
	3.442		5.697	0.000
Low Ln (CO_2 emissions)	2245	High Ln (CO_2 emissions)	2573	
	3.551		6.897	0.000
	3.332		7.540	0.000
Low PM2.5	1533	High PM2.5	3285	
	4.116		5.908	0.000
	3.807		6.133	0.000
Democracy dummy (0-5)	49	Democracy dummy (6-10)	4769	

	6.09		5.33	0.135
	6.254		5.198	0.119
Autocracy dummy (0-5)	4775	Autocracy dummy (6-10)	43	
	5.356		3.342	0.000
	5.220		3.534	0.000
Civil law	3341	Common law	1477	
	6.158		3.483	0.000
	6.890		3.638	0.000
Non-Protestant	3521	Protestant	1297	
	6.019		3.49	0.000
	6.800		3.699	0.000
Non-English	3538	English	1280	
	6.059		3.343	0.000
	6.747		3.552	0.000

Notes: We form subsets of firm samples along various dimensions, as described in the text. For each univariate test, the first row shows the number of observations, the second row shows the mean values and the third row shows the median values for the two subsamples. We employ t-tests and Kruskal-Wallis tests to test for the equality of the means and medians, respectively, of the two subsamples. The last column reports the p-values for both tests.

Table 4: Multi-variate analysis of firm-level environmental expenditures

	(1) Firm	(2) Country	(3) Firm + Country	(4) Firm + Environment	(5) Firm + Polity	(6) Firm + Legal Origin	(7) Firm + Culture
Constant	11.216***	-1.603	-7.662***	-0.508	-9.135***	-10.317***	-13.995***
	(0.000)	(0.583)	(0.001)	(0.888)	(0.000)	(0.000)	(0.000)
Ln (Size)	0.680***		0.652***	0.710***	0.676***	0.650***	0.636***
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobin's Q	0.001		0.001**	-0.000	0.001*	0.001*	0.001*
	(0.125)		(0.043)	(0.626)	(0.061)	(0.061)	(0.051)
ROA	-2.070***		-1.768**	-2.551***	-1.777**	-1.773**	-1.699**
	(0.001)		(0.012)	(0.004)	(0.012)	(0.012)	(0.015)
Leverage	0.416		-0.352	-0.481	-0.284	-0.328	-0.300
	(0.165)		(0.308)	(0.310)	(0.411)	(0.341)	(0.381)
Ln (GDP per capita)		0.790***	0.878***	0.752***	0.775***	0.794***	1.121***
		(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
GDP growth		-0.015***	-0.021***	-0.000	-0.022***	-0.021***	-0.021***
		(0.005)	(0.000)	(0.970)	(0.000)	(0.000)	(0.000)
CPI inflation		0.022	0.023	0.035	0.023	0.025	0.029*
		(0.164)	(0.151)	(0.137)	(0.152)	(0.121)	(0.072)
Economic freedom		-0.034***	-0.009	-0.001	-0.006	-0.003	-0.005
		(0.000)	(0.239)	(0.877)	(0.400)	(0.656)	(0.497)
Ln (Population)		1.552***	0.950***	-0.093	1.019***	0.999***	0.937***
		(0.000)	(0.000)	(0.691)	(0.000)	(0.000)	(0.000)
Ln (Surface)		-1.125***	-0.509***	-0.478***	-0.486***	-0.293***	-0.143
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.124)
Gasoline price		-0.140	0.296**	0.401***	0.361***	0.319**	0.186
		(0.269)	(0.028)	(0.001)	(0.005)	(0.015)	(0.177)
Feed-in-tariff dummy		0.003	0.028	0.102	-0.028	0.004	0.021
		(0.985)	(0.865)	(0.589)	(0.867)	(0.982)	(0.901)
Creditor rights		-0.336***	-0.214***	-0.318***			
		(0.000)	(0.000)	(0.000)			
Investor protection		0.619***	0.287***	0.112			
		(0.000)	(0.001)	(0.233)			
Ln (CO_2 emissions)				0.973***			
				(0.000)			
PM2.5				0.019*			
				(0.067)			
Democracy dummy					0.085		
					(0.406)		
Autocracy dummy					0.365		
					(0.148)		
Common law dummy						-1.077***	
						(0.000)	
Protestant							-0.562**
							(0.034)
English							-1.458***
							(0.000)
No. of observations	4725	3382	3321	2607	3321	3321	3321
R-squared	0.598	0.323	0.643	0.661	0.638	0.637	0.638
χ-squared	414.035	370.006	1080.309	1152.935	1016.540	1061.186	1171.574

Notes: We examine whether firm-level and country-level determinants influence a firm's environmental expenditure. The first model includes the firm-level variables, the second model includes the basic country variables, while the third model includes both the firm and country variables. The subsequent four models add the environment, political, legal origin, and cultural factors, respectively. For each variable, we report the coefficient and the corresponding heteroskedasticity-adjusted p-value below the coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Robustness test- Regression analysis of environmental expenditure for non-US firms

	(1) Firm	(2) Country	(3) Firm + Country	(4) Firm + Environment	(5) Firm + Polity	(6) Firm + Legal Origin	(7) Firm + Culture
Constant	10.613***	-19.974***	-18.442***	-9.538**	-19.232***	-18.055***	-19.117***
	(0.000)	(0.000)	(0.000)	(0.016)	(0.000)	(0.000)	(0.000)
Ln (Size)	0.728***		0.654***	0.719***	0.695***	0.684***	0.682***
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobin's Q	0.001		0.001**	-0.000	0.001*	0.001*	0.001*
	(0.108)		(0.043)	(0.683)	(0.066)	(0.062)	(0.061)
ROA	-2.401***		-2.377**	-3.710***	-2.483***	-2.518***	-2.498***
	(0.003)		(0.012)	(0.000)	(0.009)	(0.008)	(0.009)
Leverage	0.693*		-0.144	-0.282	-0.118	-0.171	-0.182
	(0.075)		(0.724)	(0.574)	(0.773)	(0.675)	(0.656)
Ln (GDP per capita)		1.357***	1.281***	1.034***	1.175***	1.148***	1.296***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth		-0.016***	-0.018***	0.003	-0.020***	-0.019***	-0.019***
		(0.003)	(0.002)	(0.811)	(0.001)	(0.001)	(0.001)
CPI inflation		0.024	0.029	0.039	0.029	0.029	0.031*
		(0.162)	(0.101)	(0.123)	(0.101)	(0.104)	(0.084)
Economic freedom		-0.048***	-0.020**	-0.009	-0.016*	-0.011	-0.012
		(0.000)	(0.011)	(0.245)	(0.052)	(0.134)	(0.125)
Ln (Population)		1.909***	1.151***	0.116	1.208***	1.172***	1.106***
		(0.000)	(0.000)	(0.635)	(0.000)	(0.000)	(0.000)
Ln (Surface)		-0.730***	-0.294***	-0.295***	-0.264***	-0.197**	-0.131
		(0.000)	(0.000)	(0.000)	(0.000)	(0.019)	(0.161)
Gasoline price		-0.425***	0.100	0.202	0.181	0.186	0.140
		(0.002)	(0.514)	(0.153)	(0.228)	(0.217)	(0.353)
Feed-in-tariff dummy		0.027	0.050	0.113	-0.011	0.013	0.029
		(0.862)	(0.762)	(0.549)	(0.950)	(0.938)	(0.862)
Creditor rights		-0.206***	-0.156***	-0.250***			
		(0.010)	(0.006)	(0.000)			
Investor protection		0.864***	0.414***	0.216**			
		(0.000)	(0.000)	(0.026)			
Ln (CO_2 emissions)				0.951***			
				(0.000)			
PM2.5				0.013			
				(0.206)			
Democracy dummy					0.124		
					(0.238)		
Autocracy dummy					0.364		
					(0.170)		
Common law dummy						-0.556**	
						(0.044)	
Protestant							-0.084
							(0.774)
English							-1.004***
							(0.002)
No. of observations	3953	2859	2806	2219	2806	2806	2806
R-squared	0.612	0.404	0.670	0.689	0.665	0.662	0.664
χ-squared	396.163	490.398	1216.231	1251.447	1098.381	1102.841	1153.742

Notes: We examine whether firm-level and country-level determinants influence a firm's environmental expenditure for non-US firms. The first model includes the firm-level variables, the second model includes the basic country variables, while the third model includes both the firm and country variables. The subsequent four models add the environment, political, legal origin, and cultural factors, respectively. For each variable, we report the coefficient and the corresponding heteroskedasticity-adjusted p-value below the coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Robustness test - Regression analysis of environmental expenditures excluding the financial crisis period

	(1) Firm	(2) Country	(3) Firm + Country	(4) Firm + Environment	(5) Firm + Polity	(6) Firm + Legal Origin	(7) Firm + Culture
Constant	11.012***	-0.809	-9.427***	-0.508	-10.576***	-11.727***	-15.906***
	(0.000)	(0.799)	(0.000)	(0.888)	(0.000)	(0.000)	(0.000)
Ln (Size)	0.711***		0.674***	0.710***	0.696***	0.671***	0.658***
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobin's Q	0.002**		0.002**	-0.000	0.001**	0.002**	0.002**
	(0.024)		(0.020)	(0.626)	(0.027)	(0.022)	(0.021)
ROA	-3.062***		-1.932**	-2.551***	-1.945**	-1.944**	-1.866**
	(0.000)		(0.017)	(0.004)	(0.017)	(0.017)	(0.020)
Leverage	0.302		-0.320	-0.481	-0.250	-0.293	-0.266
	(0.369)		(0.391)	(0.310)	(0.505)	(0.432)	(0.472)
Ln (GDP per capita)		0.747***	1.011***	0.752***	0.892***	0.906***	1.269***
		(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
GDP growth		-0.025**	-0.003	-0.000	-0.006	-0.004	-0.003
		(0.026)	(0.836)	(0.970)	(0.623)	(0.725)	(0.804)
CPI inflation		0.014	0.051**	0.035	0.049**	0.050**	0.057**
		(0.527)	(0.030)	(0.137)	(0.035)	(0.030)	(0.014)
Economic freedom		-0.037***	-0.009	-0.001	-0.007	-0.004	-0.006
		(0.000)	(0.213)	(0.877)	(0.372)	(0.574)	(0.424)
Ln (Population)		1.532***	0.948***	-0.093	1.009***	0.989***	0.931***
		(0.000)	(0.000)	(0.691)	(0.000)	(0.000)	(0.000)
Ln (Surface)		-1.117***	-0.495***	-0.478***	-0.476***	-0.286***	-0.133
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.161)
Gasoline price		-0.154	0.339**	0.401***	0.406***	0.365***	0.228
		(0.224)	(0.014)	(0.001)	(0.003)	(0.007)	(0.107)
Feed-in-tariff dummy		0.047	0.030	0.102	-0.032	0.006	0.014
		(0.820)	(0.886)	(0.589)	(0.879)	(0.976)	(0.946)
Creditor rights		-0.322***	-0.217***	-0.318***			
		(0.000)	(0.000)	(0.000)			
Investor protection		0.617***	0.268***	0.112			
		(0.000)	(0.002)	(0.233)			
Ln (CO_2 emissions)				0.973***			
				(0.000)			
PM2.5				0.019*			
				(0.067)			
Democracy dummy					0.077		
					(0.455)		
Autocracy dummy					0.360		
					(0.157)		
Common law dummy						-1.053***	
						(0.000)	
Protestant							-0.483*
							(0.073)
English							-1.535***
							(0.000)
No. of observations	3942	2988	2931	2607	2931	2931	2931
R-squared	0.582	0.316	0.639	0.661	0.633	0.633	0.636
χ-squared	436.322	355.330	1070.212	1152.935	1005.343	1037.084	1151.771

Notes: We remove the financial crisis period of 2008/09 and estimate regressions similar to Table 4. For each variable, we report the coefficient and the corresponding heteroskedasticity-adjusted p-value. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Regression analysis of environmental expenditures: OECD vs. non-OECD countries

	OECD Countries			Non-OECD Countries		
	(1) Firm	(2) Country	(3) Firm + Country	(4) Firm	(5) Country	(6) Firm + Country
Constant	10.709***	-31.521	-36.913	12.556***	-3.729	5.235
	(0.000)	(0.312)	(0.157)	(0.000)	(0.901)	(0.864)
Ln (Size)	0.746***		0.676***	0.497***		0.548***
	(0.000)		(0.000)	(0.000)		(0.000)
Tobin's Q	0.001		0.001***	0.000**		0.000
	(0.135)		(0.007)	(0.013)		(0.844)
ROA	-1.918***		-1.485**	-4.590***		-3.958**
	(0.002)		(0.035)	(0.002)		(0.024)
Leverage	0.346		-0.440	0.645		0.801
	(0.262)		(0.193)	(0.452)		(0.470)
Ln (GDP per capita)		6.764	6.649		-3.622	-4.158
		(0.258)	(0.184)		(0.533)	(0.499)
Squared		-0.277	-0.272		0.235	0.292
Ln (GDP per capita)		(0.331)	(0.261)		(0.466)	(0.395)
GDP growth		-0.016***	-0.020***		-0.010	-0.033
		(0.006)	(0.001)		(0.769)	(0.388)
CPI inflation		0.031*	0.023		-0.044	-0.026
		(0.066)	(0.181)		(0.456)	(0.662)
Economic freedom		-0.037***	-0.008		0.070	-0.034
		(0.000)	(0.286)		(0.542)	(0.765)
Ln (Population)		1.417***	0.833***		2.624***	1.623**
		(0.000)	(0.000)		(0.005)	(0.048)
Ln (Surface)		-1.125***	-0.493***		-1.383**	-0.715
		(0.000)	(0.000)		(0.043)	(0.289)
Gasoline price		-0.155	0.326**		-0.756	-0.099
		(0.317)	(0.040)		(0.442)	(0.918)
Feed-in-tariff dummy		-0.009	0.101		-0.052	-0.130
		(0.961)	(0.618)		(0.833)	(0.630)
Creditor rights		-0.340***	-0.214***		-1.006	-0.512
		(0.003)	(0.004)		(0.142)	(0.348)
Investor protection		0.685***	0.320***		1.373	0.882
		(0.000)	(0.002)		(0.190)	(0.290)
No. of observations	4201	3048	2989	524	334	332
R-squared	0.646	0.345	0.675	0.292	0.069	0.314
χ-squared	535.149	361.696	1098.433	40.203	23.105	78.184

Notes: We divide our sample into OECD and non-OECD countries, and focus on the influence of GDP per capita on environmental expenditures. The first three models focus on firms that are headquartered in OECD countries with the first model including only firm-level variables, the second model including the basic-country variables, and the third model consisting of both firm- and country-level variables. Models four, five and six follow a similar pattern for non-OECD countries. For each variable, we report the coefficient and the corresponding heteroskedasticity-adjusted p-value. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.