

# Leviathan Inc. and Corporate Environmental Engagement

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## Abstract

In a 2010 special report, *The Economist* called the resurgence of state-owned mega-enterprises, especially those in emerging economies, “Leviathan Inc.”, and criticized their poor governance and low efficiency. We show that state-owned enterprises engage more in environmental issues and are more responsive to efforts to address global warming and environmental disasters. The effect is more pronounced in energy firms located in emerging economies and countries with higher energy risks, and with direct ownership held by domestic government rather than sovereign wealth funds. Company valuations and operational performance do not suffer from such engagement. These results suggest that “Leviathan Inc.” may be better positioned at dealing with environmental externalities.

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## 1. Introduction

With the rise of emerging market economies in the last two decades, the role of state capitalism has attracted new attention. In China, companies in which the state is a majority shareholder account for about two-thirds of the local stock market capitalization. Other emerging market governments such as Brazil or Russia also hold majority or significant minority stakes in local publicly listed companies. These stakes can be directly held by central or local governments, as well as held indirectly through public pension funds or sovereign wealth funds. This pattern is contrary to that in many Western economies where large-scale privatizations in the 1980s and 1990s led to the decline in the role of the state in business. This trend has been reversed in the early 21st century, with some of the world's largest publicly listed firms originating from emerging markets being state-owned enterprises (SOEs). In fact, when we compile data on state ownership, we find that 10 of the top 30 global public companies as ranked by Forbes magazine in 2010 were SOEs (Table 1).<sup>1</sup>

*The Economist* (2010, 2014) calls these resurging state-owned mega-enterprises “Leviathan Inc.,” especially those in emerging economies, and warns about the dangers of such a state capitalism model.<sup>2</sup> This stems from a large literature on the economic inefficiency of state ownership, mostly based on the agency view (Megginson, Nash, and Randenborgh (1994), Shleifer (1998), Dewenter and Malatesta (2001)). This view argues that SOE managers have low-powered incentives and are poorly monitored by boards packed with politicians (Shleifer and Vishny (1998); La Porta and Lopez-de-Silanes (1999)). A related reason for concern is the political view, which argues that political elites who control SOEs may use these firms to seek rents from society at the expense of other stakeholders. Rent-seeking by politicians running SOEs to advance their agenda and personal goals can lead to corruption, poor resource allocation, reduced innovation and skewed wealth distribution (Shleifer, 1998). Yet other studies re-examining SOEs in emerging markets document positive effects of this “new state capitalism” in East Asia (Carney and Child (2013); Boubakri, Ghoul, Guedhami and Megginson (2017)) and Brazil (Musacchio and Lazzarini (2014); Musacchio, Lazzarini, and Aguilera (2015)). This line of research suggests that SOEs are not necessarily poorly governed, and may help emerging markets deal with market failures and externalities in a more efficient way (this is the social view).

While extant studies use profitability and stock market valuation to evaluate the efficiency implications of “Leviathan Inc.,” these metrics may not represent the sole objective for a firm whose shareholders are prosocial and care about social welfare and externalities (Hart and Zingales, 2017). One crucial way that state ownership of businesses can be a positive factor in the public interest is to address environmental issues, an increasingly important topic in public debates and span several of the United Nations Sustainable Development Goals. An

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<sup>1</sup> This marked presence of state ownership among the world's biggest companies may be understated, given that the Forbes Global 2000 covers only publicly listed companies. For example, Saudi Aramco, the biggest energy company in the world, which has been estimated to be the world's most valuable company, has been 100% owned by the Saudi Arabian government since 1980.

<sup>2</sup> “Leviathan” is something that is very large and powerful, or a sea monster in scriptural accounts. Leviathan is generally used to refer to the political state after its use in Thomas Hobbes' “Leviathan or The Matter, Forme and Power of a Common Wealth Ecclesiastical and Civil” (1651).

important goal is to tackle anthropogenic climate change (also referred to as “global warming”). While developed nations have historically been the largest contributors to global warming, the growth in new emissions is now concentrated in the recently industrialized economies. In 2010, the countries emitting the most greenhouse gases (GHG) were China (22%), the U.S. (13%), the EU-28 (10%), India (5%), and Brazil (5%), according to the EU’s EDGAR data.<sup>3</sup> In September 2016, the Hangzhou G20 Summit focused on “green finance”, and the U.S. and China ratified the 2015 Paris Agreement on climate change mitigation.<sup>4</sup> Besides reducing GHG emissions, achieving an efficient use of natural resources such as energy, water or materials and reducing environmental pollution are also increasingly important policy issues.

Governments can promote green technology by imposing carbon taxes and providing research subsidies (Laffont and Tirole (1993), Acemoglu, Akcigit, Hanley, and Kerr (2016)). For example, in the U.S., green industrial policies include laws such as the Clean Air Act, federal tax credits and state-level renewable portfolio standards. Rodrik (2014), however, concludes that these policies are “strong in theory, ambiguous in practice” (p.470). Alternatively, the state can intervene by holding ownership stakes in public corporations. State-owned firms can coordinate resources through government procurement and state funding (examples including oil or other natural resources funds and public pension funds) to support such green investment. In contrast, private firms in economies with less developed capital markets have difficulty in securing long-term financing. As companies from China and other emerging market countries transition from dirty to clean technology and reduce fossil fuel emissions to limit pollution and mitigate climate change, the role of state ownership has been important. UNEP (2016) estimates that in 2015, for the first time, the investment in renewable energies in emerging countries outweighed that in developed economies, with China contributing over a third of the world’s total.<sup>5</sup>

We conduct an international study of the impact of state ownership on a firm’s engagement in environmental, social, and governance (ESG) issues. We compile a new comprehensive dataset of the level of state ownership using several databases and combine it with measures of ESG performance of publicly listed firms in 45 countries over the period from 2004 to 2014. There is considerable cross-country variation in state ownership in our sample. State ownership is more prevalent in emerging markets (25% of publicly listed companies) than in developed economies (4%). For example, SOEs represent more than 60% of the stock market in China, close to 40% in Russia and about 20% in Brazil. In comparison, government stakes are insignificant in the U.S. and in other major

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<sup>3</sup> Emission Database for Global Atmospheric Research (EDGAR) classifies CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and F-gases as greenhouse gases (GHG). Under the United Nations Framework Convention for Climate Change (UNFCCC), countries submit their inventories of GHG. The emission time series 1990-2012 per region/country is available in <http://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012&sort=des9>. The country rankings based purely on CO<sub>2</sub> emissions for 2014 are similar: China (31%) US (22%), EU-28 (14%), India (12%), and Russia (10%). These data are available at: <http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2014&sort=des9>.

<sup>4</sup> The main aim of the Paris Agreement on climate change is to “[hold] the increase in the global average temperature to well below 2 °C above pre-industrial levels”, The U.S. President Obama accepted it by executive order in September 2016. However, in June 2017, President Trump announced that the U.S. would stop participation in the Agreement.

<sup>5</sup> UNEP/Bloomberg New Energy Finance, “Global Trends in Renewable Energy Investment” (2016).

developed economies. SOEs are more prevalent in certain industries: telecommunications, utilities, and oil and gas. We focus primarily on how state ownership is related to corporate environmental sustainability (the “E” in ESG) as it measures how a firm addresses market failures and externalities generated via its operation to the natural ecosystem.<sup>6</sup> In the baseline tests, we use Thomson Reuters’ ASSET4 environmental scores, but we find consistent results using alternative dependent variables from two other widely-used datasets: MSCI ESG Intangible Value Assessment and Sustainalytics ESG Ratings.

Our main findings are that SOEs engage more in environmental issues, especially in emission mitigation and reduction in the usage of natural resources. There is also time variation in such engagement around a significant world effort to address global warming. We show that SOEs reacted more significantly to the passage of the Copenhagen Accord in December 2009 by subsequently improving their environmental engagement (using environmental ratings) and reducing carbon dioxide (CO<sub>2</sub>) emissions as measured by actual firm-level emission data, especially in the regions of Asia Pacific and Latin America, and in countries with high CO<sub>2</sub> emission per capita. Arguably, the Copenhagen Conference raised awareness of the severity of climate change and other environmental problems, with SOEs responding more strongly to demands for corporate environmental engagement. Similarly, we find that SOEs, especially those in energy industries, react more strongly to the Fukushima nuclear disaster in March 2011.

We then explore regional differences and potential mechanisms of the above state ownership effect. First, we find that the positive association between state ownership and environmental engagement is concentrated in the subsample of companies in emerging countries and is not observed in developed countries. This is consistent with the argument that government stakes play a bigger role in the industrializing economies where the challenges of pollution and emissions growth are more pressing. Second, we document a stronger environmental engagement of SOEs in the oil and gas industries which have higher environmental footprint. Third, the effect is more pronounced for firms with local operations, in countries facing greater energy risks and those in conflict with neighboring states which have stronger incentives to preserve and develop alternative sources of energy. These results help identify the mechanisms through which state ownership is related to addressing environmental externalities. To disentangle the social view (i.e., SOEs correct market failures and externalities) from the political view (i.e., SOEs are captured by politicians to advance their agenda and electoral goals), we test the roles of a country’s political leaning and of a firm’s political connections through its CEO, but do not find them strengthening the state ownership effect. Therefore, our results are more consistent with a social view instead of a political view.

To better understand why government stakes are special, we test but fail to find a similar positive association between environmental engagement and other types of block-owners beyond the government. We interpret this as

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<sup>6</sup> We use the terms “environmental engagement” and “sustainability” interchangeably throughout.

suggesting that what we capture is not simply a mechanical effect of concentrated ownership, but it can be attributed to the state being the ultimate owner. We further document that the effect is stronger in the case of direct ownership stakes by domestic state entities in emerging economies. In contrast, we do not find an effect in stakes held by foreign governments or by sovereign wealth funds (SWFs). This is consistent with the notion that SWFs are mainly concerned with financial returns, while domestic governments are more concerned with addressing market failures, especially with regard to environmental issues.

We also touch on other corporate sustainability issues such as engagement in social issues (S) and corporate governance (G), and compare the state ownership effects on E versus the S and G dimensions to shed light on where SOEs perform better. Interestingly, we document that SOEs also engage more in social issues, but do not have better corporate governance practices (though they do not have significantly lower corporate governance scores either). We also show that SOEs' environmental engagement does not come at a cost to shareholder value in terms of Tobin's Q and long-term profitability, which does not support the agency cost view.

Our work contributes to the literature on government involvement in public companies. The classical "agency view" of SOEs has typically been framed around the conflicting financial and social objectives that these companies face (e.g., Megginson and Netter (2001), Chen, Jiang, Ljungqvist, Lu, and Zhou (2017)). Central to this literature is the argument that state-owned firms usually have weaker corporate governance and poorer financial performance (e.g., Megginson, Nash, and van Randenborgh (1994); Dewenter and Malatesta (2001); Megginson and Netter (2001); Bortolotti and Faccio (2009)). The partial privatization waves in emerging markets in the last decades, however, might have heralded the rise of a new breed of publicly-listed SOEs. Recent studies document that "Leviathans" can achieve good financial performance (e.g., Inoue, Lazzarini, and Musacchio (2013), Cuervo-Cazurra et al. (2014), Musacchio, Lazzarini, and Aguilera (2015)). In a recent investigation on publicly-listed corporations in East Asia, Boubakri, Ghoul, Guedhami, and Megginson (2017) provide evidence that government-owned firms exhibit higher market valuations than non-government-owned firms, but the relation is non-linear. Karolyi and Liao (2017) document a significant and growing amount of cross-border acquisition activities by SOEs, particularly those from emerging markets. Others find that a large part of sovereign wealth funds' investments also come from emerging markets (Dewenter, Han, and Malatesta (2010); Kotter and Lel (2011); Bortolotti, Fotak, and Megginson (2015)). With the rapid expansion of investment by emerging market SOEs and SWFs in the global arena, our findings have important policy implications.

This paper's findings are more in line with a "social view" that SOEs can be effective in addressing environmental externalities. Economic theory suggests that the private sector (the market) pursues profit maximization, while the public sector (the state) may correct market failures such as negative externalities that corporations generate to the environment (Benabou and Tirole (2010)). This dichotomy may play differently depending on the level of development of an economy. While companies in developed countries tend to exhibit better corporate governance practices and shareholder value maximization (Aggarwal, Erel, Stulz, and Williamson

(2009)), these companies do not internalize environmental (and social) costs. For example, a company might improve shareholder value by outsourcing production to developing countries with laxer environmental regulations. In contrast, non-SOEs based in developing countries may not have incentives to pursue environmentally sustainable practices and instead maximize profits by using more polluting technologies. Our results highlight the role of state ownership is more effective in dealing with environmental issues than private ownership in emerging economies. Importantly, we do not find support for alternative views of state-ownership (the agency cost view and the political view) that SOEs are managed by incapable managers and are captured by politicians to fulfill their political agenda rather than maximizing social welfare (Shleifer and Vishny (1994), Sapienza (2004)).

We also contribute to the growing literature in finance on how ownership structures affect corporate engagement in ESG issues. There has been a debate on the relation between ESG and shareholder value. Some studies document a positive association (Godfrey, Merrill, and Hansen (2009); Servaes and Tamayo (2013); Hong and Liskovich (2015); Ferrell, Liang, and Renneboog (2016); Lins, Servaes, and Tamayo (2017)) while others find that ESG engagement is related to poor corporate governance (Masulis and Reza (2015); Cheng, Hong, and Shue (2016)). In the U.S., large institutional investors have been shown to react to local sustainability preferences (Gibson-Brandon and Kruger (2016)) and yield some power in terms of shareholder proposals and voting (Del Guercio and Tran (2012)) and private engagements (Dimson, Karakas, and Li (2015)). Internationally, the literature has focused on how shareholders affect the “G” dimension. For example, foreign institutional investors seem to export better corporate governance (Aggarwal, Erel, Ferreira, and Matos (2011)). In a recent study, Dyck, Lins, Roth, and Wagner (2017) examine and find that institutional investors from certain countries also promote higher E&S standards. Hopner, Oikonomou, Sautner, Starks, and Zhou (2016) examine how ESG shareholder engagement by a large institutional investor can reduce downside risk but this tends to be concentrated in the governance dimension. To our knowledge, the role of state ownership has not been examined despite its growing importance, particularly in emerging markets. Our contribution is to show that state ownership appears to be positively correlated with E (and to some extent with S, but not with G). We also find that shareholder value is not negatively affected by such engagement in non-shareholder maximization issues by SOEs.

## **2. Sample and Summary Statistics**

In this section, we first describe how we compile the data and introduce our key variables of interest: state ownership and corporate environmental engagement. We then provide details on the sample and control variables. Finally, we examine some summary statistics.

### **2.1. Data and Variables**

#### *2.1.1. State Ownership*

The primary data on state ownership come from Orbis, a Bureau van Dijk database. This data source provides the types of ultimate owners of over 70,000 publicly listed companies around the world.<sup>7</sup> This data has previously been used to measure the frequency of SOEs in a smaller scope study by OECD (2013). An “ultimate owner” is identified by following an uninterrupted path of control rights if there is an ownership pyramid. A company is defined as state-owned if the ultimate owner is a public authority, a state, or a government entity with the percentage of voting rights exceeding 25% in every layer of the ownership pyramid. The main variable of interest in our study is *State\_own*, a dummy variable that equals one if the firm is state-owned, and zero otherwise.

The most common example of a state-owned company occurs when a government of the country in which the company is headquartered has direct ownership that exceeds 25% of all outstanding shares. The largest stakes tend to be held directly by central or federal governments (e.g., the government of China or Brazil) and related entities (e.g., the China State-Owned Assets Supervision & Administration Commission), as well as by state-level governments (e.g., the municipality of Shanghai or the state of Sao Paulo) or through a development bank (e.g., BNDES in Brazil). The second case is that a company may be owned by a foreign government; an example is Indosat in Indonesia (originally controlled by the government of Indonesia, and then by the government of Singapore from 2003 through 2007, and owned by the Government of Qatar subsequently). Instances of foreign government control typically happen when a state-owned company or a sovereign wealth fund (e.g., GIC from Singapore or the Qatar Investment Authority) acquires a majority stake in companies overseas. Third, selling a stake to a foreign state-owned firm does not necessarily imply majority-ownership by a foreign state.<sup>8</sup> Finally, some firms were initially not state-owned but ultimately become nationalized.<sup>9</sup>

Orbis properly takes into account many of the special cases of state ownership, but we manually cross-check the data for possible mismeasurement of state-owned status.<sup>10</sup> To correct for such mismeasurements of state ownership, we consult three major databases for ownership information—Orbis, FactSet/Lionshares, and Datastream—to cross-check the companies in our sample. As long as a company is identified as having a government as the ultimate owner according to our criteria in any of the three databases, we consider the company as potentially state-owned. We then further manually check that company’s annual reports and other public sources to see whether its ultimate owner is a state entity. After our manual corrections, the number of firm-year observations for SOEs (*State\_own* = 1) changes to 4,861 from 3,624. In Appendix 1, we provide some examples

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<sup>7</sup> We do not include SOEs that are not publicly listed companies so the state presence is underestimated in our study.

<sup>8</sup> For example, EDP Energias de Portugal, a company that was majority-owned by Parpublica (owned by the government of Portugal), sold its shares in 2011, with China Three Gorges becoming the largest shareholder but holding less than 25%. Thus we consider EDP Energias de Portugal as state-owned before 2012, but no longer state-owned since 2012.

<sup>9</sup> A notable example is ABN AMRO, which was nationalized in 2010 by the Dutch government.

<sup>10</sup> A more unusual SOE case occurs when firms are owned by a group of governments, such as the Scandinavian airline company SAS, which is jointly owned by the governments of Sweden, Norway, and Finland, each holding less than 25% of the company’s shares.

of our corrections for companies across different regions and covering both developed economies and emerging economies.

In robustness tests, we use an alternative measure of state ownership that is continuous and based on government-held free-floating shares (*Government\_held*), which we obtain from Datastream. This variable measures the percentage of floating shares held directly by governments via blockholdings greater than 5%. However, this variable has several shortcomings as it does not measure closely-held (non-floating) shares by governments, includes only the ownership in the first layer and does not trace up to higher levels in the case of ownership pyramids. Despite its limitations, we obtain consistent results using this alternative measure of state ownership.

### *2.1.2. Corporate Environmental (and Social and Governance) Engagement*

To evaluate corporate engagement in environmental issues (as well as in social and governance issues), we use data from Thomson Reuters' ASSET4 Environmental, Social, and Corporate Governance database (ASSET4), which has been used in previous ESG studies (e.g., Ferrell, Liang, and Renneboog (2016); Liang and Renneboog (2017)). The ASSET4 sample covers more than 4,500 global publicly listed companies that are included in major equity indices. These indices include the S&P 500, Russell 1000, NASDAQ 100, MSCI Europe, FTSE 250, ASX 300, STOXX 600, the MSCI World Index, the MSCI Emerging Market index, among other major equity indices. The ASSET4 ratings consist of more than 750 ESG sub-dimensions (data points). Data are collected from multiple sources, including: a) company reports; b) company filings; c) company websites; d) NGO websites; e) CSR Reports; and f) reputable media outlets. Every data point goes through a multi-step verification process, including a series of data entry checks, automated quality rules, and historical comparisons. These data points reflect more than 280 key performance indicators and are rated as both a normalized score (0 to 100, with 50 as the industry mean) and the actual computed value. The equally-weighted average is then normalized by ASSET4 so that each firm is given a score relative to the performance of all firms in the same industry around the world; in other words, the ratings are industry-benchmarked. All ratings are provided on a yearly basis. For all companies, at least three years of history are available, and most companies are covered from 2005 onward. Thus the effective time-series of our sample are about ten years on average. Firms are rated on the basis of their ESG compliance (regulatory requirements) and their ESG engagement (voluntary initiatives). We primarily focus on the "E" ratings.

One may raise the concern that the ASSET4 sample is biased toward certain countries such as the U.S. As in other cross-country studies, the sample is constructed by tracking major equity indices that cover the largest companies around the world. A manual check of the data confirms that most multinational corporations in the Forbes Global 2000 list are in our sample. Therefore, the results from our sample can be interpreted as environmental engagement for the world's largest companies, irrespective of their country of origin. There is a



sample bias towards larger firms but these firms are likely to have greater societal and environmental impacts. In robustness checks, we also use data from alternative ranking services (MSCI ESG Intangible Value Assessment and the Sustainalytics ESG Ratings database).

In the main analysis, we focus on a company's overall environmental score (*ENVSCORE*), and three sub-aggregate level scores: Emission Reduction (ENER), Product Innovation (ENPI) and Resource Reduction (ENRR). *ENER* (*Emission Reduction*) measures a company's capacity to reduce air emissions, waste, water discharges and spills, or its impact on biodiversity. *ENPI* (*Product Innovation*) measures a company's research and development of eco-efficient products or services. *ENRR* (*Resource Reduction*) measures a company's ability to reduce the use of materials, energy, or water, and to find more eco-efficient solutions by improving supply chain management. In supplemental tests, we also investigate companies' engagement in social issues and corporate governance issues by analyzing data on non-environmental ESG dimensions from ASSET4. The social pillar score (*SOCScore*) measures a company's ability to generate trust and loyalty in its workforce, customers, and society, through its adoption of best management practices. The corporate governance pillar score (*CGVSCORE*) measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long-term shareholders. Appendix 2 provides detailed definitions of these variables.

### 2.1.3. Control Variables

We control for common firm-level covariates included in most corporate finance research, such as total assets, leverage, market-to-book ratios and return on assets, with data obtained from Datastream and Compustat Global. Definitions of these variables are also provided in Appendix 2. Following Dyck, Lins, Roth, and Wagner (2017), who find that a firm's ESG engagement can be driven by its institutional investors (especially foreign ones) so we also control for a company's institutional ownership (including both domestic and foreign institutional holdings). Data on institutional ownership are collected from Factset/LionShares. Moreover, given the cross-country nature of our data, we control for country-level GDP per capita obtained from the World Bank. Finally, we control for country and year fixed effects.

## 2.2. Summary Statistics

Table 1 shows that state-owned enterprises feature prominently in the Forbes Global 2000 list of top public companies as ranked by Forbes magazine in 2010.<sup>11</sup> These 10 companies, highlighted in bold, include four SOEs from China (ICBC, PetroChina, China Construction Bank, and Bank of China), two from France (GDF Suez and EDF Group) and one each from Russia (Gazprom), Brazil (Petrobras), the U.K. (Lloyds), and Italy (ENI). SOEs play an important role in both developed and emerging economies. While these SOEs score relatively well in

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<sup>11</sup> We choose 2010 to report these figures for data comparability with the figures quoted in *The Economist* (2010). The year 2010 is also in the middle of our sample period.

terms of environmental performance (*ENVSCORE*, and its sub-scores) and social performance (*SOCSCORE*), a majority of SOEs are poorly governed according to the corporate governance pillar score (*CGVSCORE*).

In Panel A of Table 2 we show the distribution of firm-year observations (and number of unique firms) across countries for the sample in our regressions. Leading the list are firms in developed markets (the U.S., Japan, the U.K., Australia, and Canada), but the sample has a reasonable coverage of firms in emerging economies, in particular the BRICS countries (Brazil, Russia, India, China, and South Africa). Overall, we have a sample of 28,890 firm-year observations (4,009 unique firms) for which data are available in 2004-2014 for all dependent and independent variables in the baseline regressions. Table IA.1 in the Internet Appendix provides the numbers of observations per year we use in our baseline regression analysis.<sup>12</sup>

Table 2 shows that the average level of state ownership (*State\_own*) of our sample is 6.6%. There is a marked difference between emerging markets (24.8%) and developed economies (4.0%). The country with the highest proportion of state-owned companies in our sample is China (65.1%) but the average levels of state ownership are also high for other emerging countries. Table 2 also provides the average of environmental pillar scores (*ENVSCORE*) in each country. The average environmental pillar score is 51.5, which is expected as all ESG scores are standardized and industry-adjusted by Thomson Reuters to get a mean score of 50. Firms in developed countries tend to score better than those in emerging countries. Except for China (26.0), the average environmental pillar scores of the BRICS countries are around the standardized mean: Brazil (53.5), India (55.0), Russia (46.5), and South Africa (53.3).<sup>13</sup>

Figure 1 provides the average percentage of state-owned firms in our sample of publicly listed companies in each country during the 2004-2014 sample period. There is considerable cross-country variation: SOEs represent 65% of the market in China, 38% in Russia, 19% in Brazil, and 12% in France, but have a trivial presence in some other countries such as the U.S.

As a first look at the relation between state ownership and environmental engagement, in Panel A of Table 2 we conduct a t-test for the equality of the environmental pillar scores *ENVSCORE* between SOEs (firms with at least 25% of control rights owned by the government) and non-SOEs. The average *ENVSCORE* for state-owned firms is 57.4 compared to 51.1 for non-SOEs and the difference is statistically significant (p-value = 0.00). When we look at each individual country, we find SOEs' environmental pillar scores are higher than that of non-SOEs in 31 of 45 countries (the difference is statistically significant in 23 countries at the 10% level).<sup>14</sup> These findings

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<sup>12</sup> We drop 2002 and 2003 from the main analysis to avoid biasing our baseline results by insufficient coverage. In untabulated results, we obtain consistent results if we include 2002 and 2003 in the sample.

<sup>13</sup> In untabulated results, the results on the relation between state ownership and environmental engagement remain consistent when we remove the five BRICS countries from the regression sample.

<sup>14</sup> Figure IA.1 in the Internet Appendix presents the time-series evolution of *ENVSCORE* in companies based in the five geographic regions. We observe that North American firms are ranked the lowest while European firms are highly ranked. Some fluctuations are observed for firms in the other three regions. Figures IA.2 and IA.3 show similar time-series evolution for *SOCSCORE* and *GOVSCORE*. Figure IA.4 shows the evolution of the proportion of state-owned firms (both equal-weighted and value-weighted) in five

provide preliminary evidence on the link between a firm's state ownership and environmental engagement. We find similar country-level results for the sub-categories of emission reduction (*ENER*), environmental product innovation (*ENPI*), and environmental resource reduction category (*ENRR*) scores. We also report the results of a t-test for the equality of these sub-scores between SOEs and non-SOEs in Table IA.2 in the Internet Appendix. SOEs receive significantly higher scores than non-SOEs do in most countries across all three sub-categories.

There is also a large cross-country variation in the average social pillar score. The SOEs' average score (*SOCSCORE*) is 61.9, significantly higher than other firms' average score of 51.4. In Table IA.2 of the Internet Appendix, we test whether SOEs have higher *SOCSCORE* than non-SOEs and find statistically significant difference in 24 countries (at the 10% significance level). Interestingly, we find the opposite correlation between state ownership and corporate governance: The SOEs' average score (*CGVSCORE*) is 41.7, significantly lower than other firms' average score of 54.2, consistent with the literature that SOEs suffer from governance problems. However, these are univariate tests and we re-examine these issues in more detail in multivariate regressions in a later section.

In Panel B of Table 2 we show the summary statistics across ten major industries. State ownership is greater in Telecommunications (31.7%), Utilities (25.6%) and Oil & Gas (12.6%). Comparing the environmental pillar scores, SOEs have higher *ENVSCORE* in seven of ten industries. Notably, the three industries in which the non-SOEs' *ENVSCORE* is higher than the SOEs' (Industrials, Consumer Goods, and Health Care) are those with fairly low state ownership (5.3%, 1.9%, and 1.0%). In industries with a stronger government presence, we find SOEs are more active in terms of environmental issues. We report sub-category scores (*ENER*, *ENPI*, and *ENRR*), *SOCSCORE*, and *CGVSCORE*, and t-test results for the equality between SOEs and non-SOEs in Table IA.3 in the Internet Appendix.

We also find that the patterns of univariate analysis documented above are persistent across time. In Table IA.4 we document that SOEs are associated with significantly higher *ENVSCORE* and *SOCSCORE* for almost every sample year from 2004 through 2014. In addition, SOEs are associated with a significantly lower *CGVSCORE* in every sample year.

Results of these univariate tests should be interpreted with caution because we have not controlled for several country- and firm-level factors. Panel A of Table 3 presents summary statistics of the key variables in the multivariate regressions we implement later in our study. Panel B of Table 3 reports Pearson correlation coefficients for all variables in the regressions. We find that state ownership is positively and significantly correlated with all environmental engagement proxies. In addition, multicollinearity is unlikely to be a concern given the correlations between *State\_own* and control variables.

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geographic regions over the sample period. In both panels, we see an increase in SOEs in emerging economies such as Asia Pacific and Latin America. At the same time, there is a decline of SOEs in Africa and Middle East in our sample. State ownership in Europe remains at relatively modest levels throughout the period, and it is virtually absent in North America.

### 3. Empirical Results on State Ownership and Environmental Engagement

We now test the relation between state ownership and corporate engagement in environmental issues using multivariate regressions. We first present results from the baseline regression and then explore several potential mechanisms that might account for such association.

#### 3.1. Baseline Regression

Our baseline regression is specified as follows:

$$\begin{aligned}
 ENV_{i,j,t} = & \beta_0 + \beta_1 State_{own_{i,j,t-1}} + \beta_2 Inst_{own_{i,j,t-1}} + \beta_3 Ln(Assets_{i,j,t-1}) + \beta_4 Leverage_{i,j,t-1} \\
 & + \beta_5 MTB_{i,j,t-1} + \beta_6 ROA_{i,j,t-1} + \beta_7 Ln(GDP_{i,t}) + \Sigma \rho * I(Country_j) + \Sigma \delta * I(Year_t) + \varepsilon_{i,j,t}, \quad (1)
 \end{aligned}$$

where  $ENV_{i,t}$  denotes the firm-level environmental engagement ( $ENVSCORE$  and sub-scores  $ENER$ ,  $ENPI$ , and  $ENRR$ ) of firm  $i$  headquartered in country  $j$  in year  $t$ . The primary explanatory variable,  $State_{own_{i,t-1}}$ , is an indicator variable that equals one if firm  $i$  is state-owned in year  $t-1$  and zero otherwise. Other control variables include the percentage of institutional ownership ( $Inst_{own_{i,t-1}}$ ), firm size ( $Ln(Assets_{i,t-1})$ ), leverage ( $Leverage_{i,t-1}$ ), market-to-book ratio ( $MTB_{i,t-1}$ ), return on assets ( $ROA_{i,t-1}$ ), and GDP per capita in logarithm ( $Ln(GDP_{i,t})$ ). All the control variables are winsorized at the 5th and 95th percentiles.  $I(Country_j)$  and  $I(Year_t)$  stand for country and year fixed effects. We do not include industry fixed effects because the dependent variables are already industry-benchmarked by Thomson Reuters, as explained earlier.<sup>15</sup> We estimate Equation (1) using an ordinary least squares (OLS) model on a panel of all firm-year observations with non-missing values in all dependent and independent variables over 2004-2014.<sup>16</sup> Standard errors are clustered at the firm level to correct for firm-specific autocorrelation in estimation errors.

Table 4 reports the estimation results for Equation (1). We first estimate the equation using only state ownership ( $State_{own}$ ) as the explanatory variable as well as country and year fixed effects (Column (1)). The point estimate of state ownership at 3.99 is statistically significant at the 1% level. Given that the dependent variable is standardized on a scale of 0-100, the coefficient can be directly interpreted as percentage. That is, state-owned firms on average receive an environmental score that is about 4% higher than non-state-owned firms. In Column (2), when we include all other control variables in the estimation, the coefficient of  $State_{own}$  is slightly reduced, but remains statistically significant at the 10% level.

<sup>15</sup> Given the relatively short period of the panel data set (and environmental investment is usually a long-term commitment), as well as the fact that environmental scores are industry-benchmarked and state ownership is quite stable over the sample period, we do not use industry-year fixed effects or country-year fixed effects in the baseline specifications due to multicollinearity concerns.

<sup>16</sup> The dependent variables are bounded between 0 and 100. In a robustness check, we regress the logarithmic value of environmental engagement proxies and obtain consistent results.

We also investigate which aspects of environmental engagement are more strongly related to state ownership by replacing the dependent variable *ENVSCORE* with its component (i.e., sub-categorical) scores *ENER*, *ENPI* and *ENRR*. One can see that the effects of the overall environmental score come from the sub-scores of emission reduction and resource reduction, but not much from that of product innovation, as the coefficients on *State\_own* in Columns (5) and (6) are not statistically significant (but still positive). This insignificance may indicate that SOEs are not more innovative in creating new products and processes. It is also worth noting that a firm's state-control status is generally quite stable over time, especially during our sample period, which is likely a legacy of post-privatization ownership structures. Therefore, our results are more in line with the idea that state ownership promotes more environmental engagement, rather than that governments as owners picking "green companies" to keep and divesting polluting firms as a political expedient.

The results in Table 4 also show that environmental engagement scores are higher in firms with greater institutional ownership, bigger in size, higher market-to-book ratios, and are more profitable. These results are consistent with findings in the literature that the presence of institutional investors promotes socially responsible corporate behavior (see Dyck, Lins, Roth, and Wagner (2017)) and the "doing well by doing good" argument that more profitable companies care more about sustainability (see Hong, Kubik, and Sheinkman (2012); Flammer (2015)).

### **3.2. Evidence from Salient Environmental Events**

Our baseline results suggest a positive association between state ownership and environmental engagement. We also explore time variation in the salience of environmental sustainability issues and investigate whether the state-controlled firms in our sample react differently to such event. We first focus on the passage of the Copenhagen Accord. The Accord was the major achievement of the United Nations Climate Change Conference held in Copenhagen in December 2009, which raised awareness of the severity of climate change and other environmental problems around the globe. It was drafted by a coalition of the BASIC countries (Brazil, South Africa, India and China) given the growth of emissions in these countries and the U.S., and was intended to succeed to the 1992 Kyoto Protocol, which was scheduled to end in 2012. The Accord is not legally binding, which actually provides a good ground for testing firms' *voluntary* engagement in environmental issues. We argue that the collective effort in the passage of the Copenhagen Accord increased state-owned firms' environmental engagement, because SOEs should be more responsive to societal demands, especially in countries with greater concerns on GHG emissions.<sup>17</sup> Although there may be confounding event around this time such as the Deepwater Horizon oil spill which happened in April 2010, we argue that it actually reinforced the global awareness of human-caused environmental issues and should work in the same direction to strengthen our results.

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<sup>17</sup> Some people have criticized the Copenhagen Accord since the emission pledges were not legally binding. We argue that this feature might actually be an advantage for our empirical setting, as it enables us to test corporations' voluntary engagement (rather than strict compliance with regulations) in environmental issues.

We estimate the following regression to examine if there is significant change in the relation between state ownership and environmental engagement after the passage of Copenhagen Accord:

$$\begin{aligned}
ENV_{i,j,t} = & \alpha_0 + \beta_0 State_{own_{i,j,t-1}} * Post\ 2009_t + \beta_1 State_{own_{i,j,t-1}} + \beta_2 Inst_{own_{i,j,t-1}} \\
& + \beta_3 Ln(Assets_{i,j,t-1}) + \beta_4 Leverage_{i,j,t-1} + \beta_5 MTB_{i,j,t-1} + \beta_6 ROA_{i,j,t-1} + \beta_7 Ln(GDP_{i,t}) \\
& + \Sigma \rho * I(Country_j) + \Sigma \delta * I(Year_t) + \varepsilon_{i,j,t},
\end{aligned} \tag{2}$$

where *Post 2009<sub>t</sub>* is an indicator variable that equals one if year *t* is from 2010 onward and zero otherwise. The interaction term *State\_own* × *Post 2009* is used to test whether state-owned firms reacted more strongly to the event and became more environmentally engaged after 2009. Due to strengthened pressure from governments and heightened attention from the public, we expect the coefficient estimate on the interaction term,  $\beta_0$ , to be significantly positive. For brevity, we report only the results based on *ENVSCORE* as the dependent variable in Table 5.

The test results are reported in Panel A of Table 5 which show significantly positive coefficients for the interaction term *State\_own* × *Post 2009*. In Column (1), we restrict the sample period to a two-year window (2008-2011) to reduce the concern that estimation of Equation (2) is affected by other confounding events. In Column (2), we use the whole sample period (2004-2014) to estimate Equation (2) and obtain similar results. The results suggest that, after the passage of the Copenhagen Accord, state-owned firms increased their efforts toward addressing environmental issues by about 2% more than non-state-owned firms.

We also provide more direct evidence by focusing on the reduction in CO<sub>2</sub> emissions and examining whether the passage of the Copenhagen Accord strengthens state-owned firms' environmental engagement. We use each firm's reported total emissions of CO<sub>2</sub> and CO<sub>2</sub> equivalents (for other greenhouse gases) in tons (variable name "ENERDP023" in the ASSET4 database) scaled by total assets as the dependent variable in Equation (2). Due to limited data availability on CO<sub>2</sub> emissions, this reduces our sample size by half. In Column (3) of Table 5, we find that state-owned firms indeed significantly reduced their CO<sub>2</sub> emissions after 2009 relative to non-SOEs. This result again supports the proactive role of government ownership in addressing the climate change challenge.

In Panel B of Table 5, we use the specification in Column (2) of Panel A and further test whether the results are robust when controlling for firm fixed effects (which we were not able to properly identify in the baseline regressions given the time-invariance of state control in most companies in our sample). The results shown in Column (1) confirm this. When we decompose our sample into two regions, (a) Asia Pacific and Latin America, (b) the rest of the world, the former of which are where the role of the state should be strongest as we argue and

test below (Section 3.3), the significance only shows up in the former subsample (Column (2)) and not in the latter sample (Column (3)).

In Panel C of Table 5, we partition our sample into two groups of countries with high- and low-CO<sub>2</sub> per capita over the narrower event window (2008-2011).<sup>18</sup> The significance only shows up in the subsample of high-CO<sub>2</sub> per capita countries, but not the other, suggesting that such SOE reaction in environmental engagement is more pronounced in countries where GHG emission is more likely to be a concern.

Finally, we explore the reactions by SOEs worldwide to another global environmental event, namely the Fukushima nuclear disaster which occurred in Japan, the most significant nuclear incident since the Chernobyl disaster. The Fukushima nuclear disaster was an energy accident at the Fukushima Daichi Nuclear Power Plant initiated by the tsunami following the Tohoku earthquake on March 11, 2011. The insufficient cooling due to the tsunami led to three nuclear meltdowns, hydrogen-air explosions, and the release of radioactive material, resulting in a massive evacuation of over 170,000 people in Japan. It also led to widespread international reactions, For example, triggered by this incident, Germany accelerated plans to close its nuclear power reactors and decided to phase the rest out by 2022. In Panel D of Table 5, we test SOEs' reaction by interacting *State\_own* with the *Post-2011* dummy. We find positive and significant coefficients of the interaction term for the whole sample (Column (1)), the subsample of energy industries (i.e., utilities) which are most sensitive to such nuclear risk (Column (2)) and the subsample of non-utilities industries (Column (3)). The magnitude of coefficient in Column (2) is twice of that in Column (3). This is further supported by the coefficient of the triple interaction term *State\_own* × *Post 2011* × *Energy* in Column (4) for the whole sample.

Overall, the results in Table 5 suggest that state-owned firms are more responsive to the pressure to act on global warming and other environmental concerns which supplement our cross-sectional evidence in Table 4. These results are not sufficient to establish causality, but they are more in line with the social view of state-ownership in dealing with externalities. To further investigate the implications of this social view, we test the cross-regional differences and a few potential channels of our baseline results in the next section.

### 3.3. Regional Differences and Channels

We first examine whether the correlation between state ownership and environmental engagement depends on economic development and geography. According to *The Economist* (2010, 2014) and Musacchio and Lazzarini (2014), the resurgence of Leviathan Inc. is particularly noticeable in emerging economies such as Brazil and China. These economies are more likely to suffer from a scarcity of long-term capital to fund environment-related projects, making government interventions more necessary. Therefore, we investigate the difference in the state-ownership effect in developed versus emerging economies. In Panel A of Table 6, we find a significantly positive

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<sup>18</sup> High CO<sub>2</sub> per capita is defined as the country's CO<sub>2</sub> emission per capita is above the 70<sup>th</sup> percentile of the global ranking, and this percentile number is chosen as it best balances the number of observations in the high- and low-groups. Partitioning the sample by the 50<sup>th</sup>, 60<sup>th</sup>, 80<sup>th</sup>, and 90<sup>th</sup> percentiles all yield similar results, but with more unbalanced distributions between the two samples.

coefficient of state ownership in the subsample of emerging countries (Column (1)) but an insignificant coefficient in the subsample of developed countries (Column (2)).<sup>19</sup> These findings confirm that the state ownership effect occurs mainly in emerging economies.

In a similar vein, we report the results for subsamples of firms based in each of the aforementioned five geographic regions in Panel B of Table 6. We find that the state-ownership effects are mainly in the subsamples of Asia Pacific and Latin America (Columns (2) and (4)). Arguably, these countries may rely more on state ownership to mitigate environmental externalities due to a lack of incentives in the private sector. The coefficient estimates of state ownership are insignificant in other regions.

In Table 7, we investigate several potential channels underlying the link between a firm's state ownership and its environmental engagement. More specifically, we focus on the scope of a firm's operations, as well as the political and regulatory environment of the country where it is based. These tests also allow us to distinguish the "social view" and "political view" on governments' involvement in corporate environmental activities.

First, if state ownership works in the public interest to deal with environmental externalities, we expect the effect to be more pronounced in industries that are more sensitive to pollution and other environmental concerns, such as the oil and gas industry in which even major environmental disasters (e.g. the Deepwater Horizon oil spill) happen frequently. In Column (1) of Table 7, we test this conjecture by interacting the *State\_own* dummy with the dummy variable *Oil & Gas* that equals one if the firm is in the oil and gas industry. The coefficient estimate of the interaction term  $State\_own \times Oil \& Gas$  is statistically significant at the 5% level, suggesting a stronger relation between state ownership and environmental engagement in energy-related firms. This finding again highlights SOEs' role in dealing with externalities in industries that are more sensitive to environmental concerns.

Second, if a firm has more foreign operations, the role of the domestic government in influencing its environmental practices may be attenuated. Therefore, we test whether the effect of state ownership on environmental engagement is weaker for firms that have a higher fraction of revenues coming from abroad by interacting the *State\_own* dummy with the ratio of the firm's foreign sales to total sales. This is a proxy for the geographical area of the impact of the firm's operations. As shown in Column (2) of Table 7, the coefficient on the interaction term  $State\_own \times Foreign\ sales$  is negative and statistically significant, suggesting that the state-ownership effect is indeed weaker in firms' with more overseas revenues. This finding further supports the interpretation that the government's intervention is more limited if the environmental externalities do not occur within the country's borders.

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<sup>19</sup> Following the MSCI Global Index, we define the following countries as "developed": Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Singapore, the U.K., and the U.S. All the remaining countries in the sample are categorized as emerging economies.



Third, if a country is highly energy dependent, the state may have a stronger incentive to engage in activities and technologies that improve its energy efficiency. Energy sources are a primary area of environmental concern. We test whether the state-ownership effect is stronger in these countries by interacting the *State\_own* dummy with a country-level energy security risk index (*Energy security risk*) obtained from the U.S. Chamber of Commerce's Institute for 21<sup>st</sup> Century Energy. As in Column (3) of Table 7, the interaction term  $State\_own \times Energy\ security\ risk$  is positive and statistically significant, implying that concerns on a country's natural resources may indeed be a motivation for the state to pressure companies to be more energy efficient.

Fourth, if a country is in conflict with its neighboring countries, its government may have stronger incentives to improve energy efficiency to counter potential instability in energy supply. We test this conjecture by interacting the *State\_own* dummy with a country-level neighboring country conflicts index (*Neighboring countries conflict*), which is obtained from the Global Conflict Risk Index (GCRI) of the European Commission's Joint Research Center. Column (4) of Table 7 shows that the interaction term  $State\_own \times Neighboring\ countries\ conflict$  is positive and statistically significant. This suggests that neighboring conflicts may be another reason for the local government to push for more efficient usage of resources by the firms it owns.

Fifth, we examine whether state ownership and regulations are substitutive or complementary tools that the government can use to address negative environmental externalities. In particular, we test whether the role of state ownership is stronger or weaker in countries that lack strong environmental regulations and strict enforcement by interacting the *State\_own* dummy with a country-level environmental regulation index constructed by Esty and Porter (2001). The index represents a summary performance measure of the quality of the environmental regulatory system (in terms of regulatory stringency, structure, subsidies, and enforcement) in a country. Since the index values are measured as of 2000 and therefore time-invariant, we do not include country fixed effects in this regression. Column (5) of Table 7 shows that the coefficient on the interaction term  $State\_own \times Environmental\ regulation$  is statistically insignificant. On the other hand, the coefficient on *State\_own* remains significantly positive. These findings indicate that state-ownership effect and environmental regulatory policies are not likely substitutes or complements, and instead suggest a unique role of state ownership (irrespective of the government's regulatory regime) in driving firms' environmental engagement.

Sixth, we examine the role of the government's political orientation in a country, which help us disentangle the "political view" from our proposed social view on government involvement in business. Specifically, if a country's ruling party is more left-leaning, its government may pursue a stronger role in controlling economic life (Mullainathan and Shleifer (2005)). We test this by interacting the *State\_own* dummy with a political variable that takes a value of 1, 2, and 3 if the government is right-, center-, and left-wing, respectively. Data on ruling parties' political orientation are obtained from the World Bank's Database of Political Institutions (DPI) and vary across countries and years. Column (6) of Table 7 shows that the coefficient of the interaction term  $State\_own \times Political\ orientation$  is statistically insignificant. Therefore, we conclude that a government's political orientation

is not likely a key driver of state-owned firms' engagement in environmental issues to fulfill politicians' agenda, as implied by the political view.

Finally, we consider whether SOEs with politically-connected CEOs are more environmentally engaged. According to the political view, a CEO with political connection may benefit privately from engaging in environmental issues as part of her political agenda or career advancement. To test this channel, we interact the *State\_own* dummy with *Political connection of CEO*, which is a dummy that equals one if the CEO is politically connected by manually collecting information from BoardEx and other online news sources such as Bloomberg Businessweek.<sup>20</sup> Column (7) of Table 7 shows that the coefficient on the interaction term *State\_own* × *Political connection of CEO* is insignificant and the coefficient on *State\_own* remains significantly positive. These findings suggest that our baseline findings cannot be simply attributed to the political agenda or career objectives of politically appointed CEOs, again inconsistent with the political view.

Overall, the results in Table 7 reveal some interesting cross-sectional variations on the role of state ownership in a firm's environmental engagement, and are more in line with the "social view". Such a role is stronger in energy-related and locally operated firms and in countries where governments are concerned over the stability of energy and natural resources. The evidence is not consistent with the "political view" as the results appear not to be driven by CEOs' political connection or the ruling party's political orientation.

### 3.4. Are Government Stakes Special?

We conduct further tests to explore what is special about government ownership by employing an alternative proxy of state ownership, comparing the effect of the state's blockholdings to other types of blockholders, and exploring further the different types of government stakes.

We first consider an alternative proxy of state ownership and replace the binary variable *State\_own* (where the ultimate owner is the central government, a state or a public authority) with the continuous variable *Government\_held*. Data for this variable come from Datastream and identify the percentage of free-floating shares held by the government, if those blockholdings exceed 5%. In Column (1) in Panel A of Table 8, we rerun the analysis using this alternative measure of state ownership. Our results still hold: Firms with greater government blockholdings score more highly in environmental engagement.

Second, we ask whether the effects we document above are unique to government ownership, or instead may be simply related to the presence of any blockholder (i.e., a blockholder effect rather than a state ownership effect). To further address this concern, we use data from Datastream on the percentage of total shares held by different types of strategic blockholders. These include block holdings of 5% or more by foreign investors (*Foreign holdings*), other industrial companies (*Cross holdings*), pension funds (*Pension fund held*), investment

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<sup>20</sup> We define "Political connection of CEO" as that the CEO worked in the government, political party committee or military, or is/was a member of the congress.

companies (*Investment co held*), employees (*Employee held*), other investors (*Other holdings*), and total holdings by all these blockholders (*Strategic holdings*).

In our baseline tests, we already control for ownership by institutional investors (*Inst\_own*) which are frequent blockholders in firms (both domestic and foreign). Data from Factset/Lionshares also allow us to identify the percentage of all outstanding shares (both traded and non-traded) owned by domestic institutional investors (*Domestic inst. held*) and by foreign institutional investors (*Foreign inst. held*) (see Aggarwal, Erel, Ferreira, and Matos (2011) and Dyck, Lins, Roth, and Wagner (2017)). We use these data to supplement our results from Datastream free-float blockholding data.

Panel A of Table 8 presents the regression results for each of the above blockholder variables.<sup>21</sup> We find that almost all other types of blockholdings are either uncorrelated (foreign holdings, cross holdings, other holdings, and domestic institutional holdings) or negatively correlated with environmental engagement (pension fund holdings, investment company holdings, employee holdings, and strategic holdings). The only exception is a positive loading on foreign institutional ownership, which is consistent with the findings in Dyck et al. (2017). Similar to those authors, we find that foreign institutional investors, especially those from developed countries with higher environmental standards, are more concerned about environmental issues, possibly because of reputational concerns or moral pressure from their own investors. Nevertheless, we note that foreign institutional investors and governments are fairly orthogonal to each other. Overall, the findings reported in Table 8 suggest that the link between state ownership and environmental engagement is special compared to other types of block holdings.<sup>22</sup>

Third, we explore the role of different types of government stakes. Does the effect of government stakes occur because domestic (not foreign) government owns a company? Does it matter whether a company is held directly by the state or held through an investment vehicle of sovereign wealth fund (SWF, such as the Norges Bank of Norway or Temasek of Singapore)? Answering these questions can further shed light on the mechanisms through which government ownership is related to corporate environmental engagement. According to the social view, the effect should mainly take place through direct ownership stakes by a domestic government that cares more about public goods within its own borders (local environmental protection), rather than investment by SWF in foreign businesses which may focus more on financial returns. We test this by distinguishing between domestic and foreign state ownership, and between direct government stakes and investment by SWF.

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<sup>21</sup> Again, to save space, we present results for only ENVSCORE as the dependent variable. Results are similar using other sub-dimensional environmental scores as dependent variables, and are available upon request.

<sup>22</sup> When we conduct the same tests of other blockholder types on subsamples of developed economies, emerging economies, and the five geographical regions, our conclusions remain unchanged that government ownership effects mainly appear in Asia-Pacific and developing economies, whereas other blockholders do not matter in any of the subsamples.

The results are reported in Panel B of Table 8. In Column (1), the dummy variable *Domestic State\_own* equals 1 if the company's ultimate owner is the domestic government, and 0 otherwise.<sup>23</sup> Its coefficient is positive and statistically significant, and similar in magnitude to that in the baseline regressions (about 4%). In Columns (2) and (3), we interact the *State\_own* dummy with a dummy variable *Domestic\_own*, which takes a value of 1 if the company has a domestic ultimate owner (regardless of the owner type), and 0 otherwise. The difference between the two columns is that in Column (2) we run the regression on the subsample of developed countries, whereas in Column (3) the analysis is performed on the subsample of emerging countries. The coefficient of the interaction term  $State\_own \times Domestic\_own$  is only significant in the subsample of emerging countries (Column 3) but not for developed countries (Column 2), which reinforces our earlier argument that the role of state ownership is stronger in emerging economies. In addition, the coefficient of *Domestic\_own* is negative and significant (-0.73), but its negative effect is almost offset by the interaction term (0.68), suggesting that domestic companies in emerging markets indeed engage less in environmental efforts, potentially due to lack of incentives and long-term financing, and the government plays a greater role in promoting environmental engagement through state ownership. Finally, we test the difference between direct state ownership and ownership through investment by sovereign wealth funds. In Column (4) we include *State\_own* and a dummy variable indicating whether the company is invested by a sovereign wealth fund (*SWF*) in the same regression,<sup>24</sup> and find that the effect comes mostly from *State\_own* rather than *SWF*, suggesting that it is direct government ownership that matters for corporate environmental engagement. This is consistent with the notion that SWFs are mainly concerned with financial returns, while domestic government may be more concerned about solving externalities and market failures with regard to environmental issues.

### 3.5. Alternative Measures of Environmental Engagement

There has been some concern with the reliability of a single ESG dataset so it is recommended to cross-validate the results with several alternative ESG samples from different data sources (Chatterji, Durand, Levine & Touboul, 2016). To cross-validate our results based on the ASSET4 sample and the Environmental Pillar Score, we replace the dependent variable with two alternative measures of firm-level environmental engagement using two other data sources: MSCI ESG Intangible Value Assessment ("MSCI") and Sustainalytics ESG Ratings ("Sustainalytics"). We take the environment-related ratings from each database: the *Environmental Pillar Score* from MSCI (ranging between 0 and 10) and the *Environmental Score* from Sustainalytics (ranging between 0 and 100). Both ratings measure how well companies proactively manage the environmental issues that are the most material to their business and provide an assessment on companies' ability to mitigate risks and capitalize on

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<sup>23</sup> This is defined similarly to our main variable *State\_own*, except that we require that the ultimate owner be the domestic government, rather than a state in general. The control group in this case consists of companies that are either owned by a foreign government or not owned by any government at all.

<sup>24</sup> We obtain SWF holding data from Factset and consider a company as being invested by a SWF (either domestic or foreign) if its Security Holder Type is classified as "Institutions – Sovereign Wealth Manager" by Factset.

opportunities.<sup>25</sup> Similar to ASSET4, these two alternative ratings are also industry-adjusted, that is, companies are rated on their environmental engagement (both voluntary initiatives and mandatory compliance) relative to their industry peers (a “best-of-sector” methodology to compare companies within a given sector to industry best practices) on a global scale. Firm coverage is also mostly the constituents of major global equity indices. The MSCI sample covers 1,625 companies and each company is given only one score on a scale of 0 to 10, based on its most recent year’s (i.e., 2016) environmental performance. The Sustainalytics data covers 8,060 companies over the years 2010-2017, and each company is scored on a scale of 0 to 100.

Since the MSCI data we access is available only for 2016, we conduct cross-sectional ordinary least squared (OLS) estimations and regress each firm’s *Environmental Pillar Score* in 2016 on *State\_own* and other variables in 2015. There are total 1,383 unique firms in the cross-sectional regression. As shown in Column 1 in Table 9, the coefficient on *State\_own* is positive and statistically significant. The economic magnitude is also comparable to our baseline results using ASSET4: on average, state-owned firms score 7% higher than non-state-owned firms, as the coefficient of *State\_own* is 0.712 (on a scale of 10) for MSCI *Environmental Pillar Score*.

Column 2 in Table 9 presents the results when we estimate Equation (1) using the *Environmental Score* from Sustainalytics as the dependent variable on a sample of 14,891 firm-year observations (3,300 unique firms after merging with other datasets). We again find a significantly positive coefficient on *State\_own* (2.045), which suggests that state-owned firms score 2% higher than non-state-owned firms (as *Environmental Score* is on a scale of 100). Given that these two alternative measures are compiled by different data providers, our consistent results suggest that the correlation between corporate environmental engagement and state ownership is not likely driven by the peculiarity of the ASSET4 data.

#### **4. State Ownership and Shareholder Value, Social Engagement, and Corporate Governance**

An important question at this point is whether the state-ownership effects we document are unique to environmental engagement by a company, or whether state-owned firms are superior both in dealing with other externalities and in maximizing shareholder value. Some authors find that state-owned firms care more about social issues such as employment and community engagement (Liang and Renneboog, 2017). In contrast, Shleifer and Vishny (1998) argue that, due to incentive problems, state-owned firms may engage in rent-seeking activities at the cost of society at large. Others find that state-owned firms usually have weaker corporate governance and consequently poorer financial performance (e.g., Megginson, Nash, and Van Randenborgh (1994); Dewenter and Malatesta (2001); Megginson and Netter (2001); Bortolotti and Faccio (2009)). Musacchio, Lazzarini, and

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<sup>25</sup> For MSCI data, refer to the description of Liang and Renneboog (2017). For Sustainalytics data, the assessment of a company’s environmental engagement is structured into four dimensions: (1) Preparedness; (2) Disclosure; (3) Quantitative Performance; (4) Qualitative Performance.

Aguilera (2015) argue that the new form of state ownership (“Leviathan Inc.”) has mixed implications for governance and firm performance. We address these issues in this section.

In Table 10, we start by investigating the shareholder value implications of such environmental engagement by state-owned firms. For this purpose, we first regress Tobin’s Q (measured by *MTB*, the Market-To-Book ratio of assets) on the interaction between state ownership (*State\_own*) and the aggregate environment engagement score (*ENVSCORE*) in Column (1). The control variables are similar to those tested before, except that we do not include *MTB* on both sides of the equation. Several interesting observations can be made. First, the coefficient on *State\_own* is statistically insignificant, suggesting that SOEs do not have higher (or lower) shareholder value. Second, *ENVSCORE* is positively and significantly correlated with Tobin’s Q, consistent with the “doing well by doing good” hypothesis (see Hong, Kubik, and Sheinkman (2012); Flammer (2015)) and the empirical evidence that corporate environmental engagement is related to better firm performance and higher value (Dowell, Hart, and Yeung (2000)). Third, and more important, the coefficient of the interaction term *State\_own* × *ENVSCORE* is insignificant, suggesting that environmental engagement by state-owned firms is not associated with lower shareholder value. Column (2) of Table 10 reports the results from regressing firms’ forward five-year average ROA on the interaction between state ownership and engagement with environment. We again find an insignificant coefficient on *State\_own*, a positive and significant coefficient on *ENVSCORE*, and also an insignificant coefficient on their interaction, all consistent with the Tobin’s Q results. These findings do not support the agency view of state ownership.

These results should be interpreted with caution regarding whether environmental engagement by SOEs comes at a cost for other shareholders. We do not refute the possibility that environmental engagement such as emission reduction can be costly to shareholders, but such costs may be offset by the benefits from the engagement, such as avoidance of future penalties, better reputation and greater support by other stakeholders (e.g., Hong and Liskovich, 2015). In addition, SOEs may stand to gain access to government contracts and other public benefits. Overall, Table 10 suggests that a greater engagement in environmental issues of state-owned companies has zero *net effect* on shareholder value, at least as reflected in market valuation and profitability, but may have welfare implications for society at large as suggested by the social view. In fact, government itself as an important controlling shareholder may represent the interests of broader group of stakeholders and maximize their welfares, which is not necessarily reflected in market value (Hart and Zingales, 2017).

We then examine the role of state ownership in the bigger picture of ESG, namely, how SOEs fare in terms of social and corporate governance issues. We address this question using the aggregate social (“S”) and corporate governance (“G”) pillar scores of ESG ratings from the ASSET4 database. The first measures a company’s overall engagement in social issues (*SOCSCORE*), or how firms care about customers, suppliers, employees, community, and human rights. The second measures corporate governance quality (*CGVSCORE*) with regard to board functions and board structure, compensation policy for executives, integrated vision and strategy, and

shareholder rights. In Figures IA.2 and IA.3 of the Internet Appendix we show the time series of the average social and corporate governance pillar scores. While we find that European firms are ranked highest in terms of social scores, North American firms (mainly US firms) rank highest in terms of corporate governance, consistent with the extant literature.

The evidence in Table 11 indicates that state-owned firms also engage more in social issues, as is evident by the coefficient on *State\_own* in Column (1) (although significant only at the 10% level), but they do not have better/worse corporate governance performance, as the coefficient on *State\_own* is insignificant in Column (2). These results further confirm that state-owned firms may engage more in terms of non-financial issues and dealing with externalities, but they are no better (and no worse) in corporate governance. This echoes our results in Table 10 that SOEs do not produce higher shareholder value. Overall, state-control is related to greater welfare of stakeholders at large, without necessarily sacrificing shareholder interests.

## 5. Conclusion

The role of the state in organizing economic life has been a long debated topic. A major trend characterizing the beginning of the 21st century is the resurgence of state-owned enterprises (SOEs, or “Leviathan Inc.”), especially in emerging market economies. This period has also witnessed increasing attention paid to global warming, pollution and other sustainability issues. Governments can address environmental sustainability not just through taxation, subsidies, and regulations, but also directly via state-owned firms. It is commonly thought, however, that governments can be captured by rent-seeking politicians and that ultimately SOEs cannot be managed effectively.

Our paper examines the role of state ownership of publicly listed companies in dealing with environmental issues around the world over the last decade. We find that SOEs tend to be more engaged in environmental issues, and such a pattern is not present for other block-owners from the private sector. The effect comes mainly from domestic ownership stakes by the government in local firms, rather than from holdings by foreign governments or sovereign wealth funds. We document that the role of SOEs in environmental engagement is more pronounced for energy firms (e.g., oil and gas industries), firms with more local operations, and firms located in emerging economies, in countries lacking energy resources and in conflict with neighboring countries. These effects are not likely driven by the political orientation of the ruling government or the political connection of the CEO, which refutes a political view of government ownership in this context. Further supporting our results is the finding that SOEs reacted more than non-state-owned firms to the 2009 Copenhagen Accord and the 2011 Fukushima nuclear disaster. Interestingly, SOEs are also more engaged with social issues, but they do not have better corporate governance performance.

We believe these findings have important policy implications. As economies worldwide embraced pro-market reforms in the last quarter of the 20th century, many prototypical SOEs were transformed. Partial privatization may have resulted in changes, but it did not spell the end of state ownership of companies. Our findings show that modern SOEs have emerged to be more effective than their private counterparts in dealing with market failures—especially in the case of environmental externalities—without significantly sacrificing shareholder returns.



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## Appendix 1. Examples of Corrections of ORBIS's State-Owned Status Data

Region	Ownership type	Company	Original data in ORBIS	Correction
Asia Pacific	Domestic state owned	Zijin Mining, China	2002-2014 non-state-owned	Majority owned (>25%) by Minxi Xinghang State-Owned Assets Investment Co. Ltd., which is a private company controlled by the Chinese government. <a href="http://www.hkexnews.hk/listedco/listconews/SEHK/2013/0425/LTN201304251235.pdf">http://www.hkexnews.hk/listedco/listconews/SEHK/2013/0425/LTN201304251235.pdf</a>
	Domestic state owned	Weicai Power, China	No information	State-owned until 2007. Since 2008 the total state ownership fell below 25%. <a href="http://www.hkexnews.hk/listedco/listconews/SEHK/2008/0430/LTN20080430625.pdf">http://www.hkexnews.hk/listedco/listconews/SEHK/2008/0430/LTN20080430625.pdf</a>
	Domestic state owned	Tsingtao Brewery, China	No information	Always state-owned. The controlling shareholder is Tsingtao Brewery Group Company Limited, which is wholly owned subsidiary of SASACQ (青岛国资委). <a href="http://www.hkexnews.hk/listedco/listconews/SEHK/2009/0429/LTN200904291779.pdf">http://www.hkexnews.hk/listedco/listconews/SEHK/2009/0429/LTN200904291779.pdf</a> <a href="http://www.hkexnews.hk/listedco/listconews/SEHK/2014/0423/LTN20140423394.pdf">http://www.hkexnews.hk/listedco/listconews/SEHK/2014/0423/LTN20140423394.pdf</a> , and also from Wind
	Domestic state owned	Woori Bank, South Korea	No information	Always state-owned. The Korean Deposit Insurance Company controls the majority stock of its parent firm Woori Finance Holding. <a href="https://spot.wooribank.com/pot/Dream?withyou=ENENG0662">https://spot.wooribank.com/pot/Dream?withyou=ENENG0662</a> ; <a href="http://blogs.wsj.com/moneybeat/2014/07/09/south-koreas-woori-privatization-still-faces-biggest-hurdle-suitors-for-woori-bank/">http://blogs.wsj.com/moneybeat/2014/07/09/south-koreas-woori-privatization-still-faces-biggest-hurdle-suitors-for-woori-bank/</a>
	Foreign state owned	S-Oil Corporation, South Korea	2002-2010 non-state-owned; 2011-2014 state-owned	Always state-owned but by the Saudi Arabian government. Its largest shareholder has always been Aramco Overseas Company which is state-owned by Saudi Arabian state. <a href="http://www.bloomberg.com/news/articles/2014-01-10/saudi-aramco-to-buy-2-billion-stake-in-s-oil-official-says">http://www.bloomberg.com/news/articles/2014-01-10/saudi-aramco-to-buy-2-billion-stake-in-s-oil-official-says</a>
	Owned by sovereign wealth fund	Singapore Post, Singapore	2002-2007 & 2014- non-state-owned; 2008-2013 state-owned	State-owned before 2014 by Temasek. In 2014, Temasek's ultimately shares owned drops to less than 25%. Hence, by our standard, we classify it as non state-owned in 2014. <a href="http://www.singpost.com/download/ar201415.pdf">http://www.singpost.com/download/ar201415.pdf</a>
	Owned by sovereign wealth fund	Singapore Telecom, Singapore	2002-2007 & 2010 non-state-owned; 2008-2009 & 2011-2014 state-owned	Always state-owned. Temasek owns over 50% nearly all the time. <a href="http://info.singtel.com/about-us/investor-relations/annual-reports?dispatcher=302">http://info.singtel.com/about-us/investor-relations/annual-reports?dispatcher=302</a>
	Owned by sovereign wealth fund	Singapore Airlines, Singapore	2002-2007 non-state-owned;	Always state-owned. Temasek owns over 50% all the time. <a href="https://www.singaporeair.com/en_UK/us/about-us/information-for-investors/annual-report/">https://www.singaporeair.com/en_UK/us/about-us/information-for-investors/annual-report/</a>
		Singapore IRPC, Thailand	2008-2014 state-owned	
			2002-2009 & 2013-2014 state-owned;	Always state-owned. The controlling shareholder is PTT Plc which is controlled by Thailand Ministry of Finance. <a href="http://irpc.listedcompany.com/ar.html">http://irpc.listedcompany.com/ar.html</a>
		2010-2012 non-state-owned		
		2002-2012 state-owned;	Always state-owned. The controlling shareholder has always been Crown Property Bureau, which can be seen as Thailand sovereign fund. <a href="http://scc.listedcompany.com/misc/ar/20150223-scc-ar-2014-en.pdf">http://scc.listedcompany.com/misc/ar/20150223-scc-ar-2014-en.pdf</a> ; <a href="http://www.scg.co.th/en/04investor_governance/07_annual_report_sustainability_report.html">http://www.scg.co.th/en/04investor_governance/07_annual_report_sustainability_report.html</a>	
		2013-2014 non-state-owned		

## Appendix 1. (continued)

Region	Ownership type	Company	Original data in ORBIS	Correction
Latin America	Domestic state owned	Companhia Energetica de Sao Paulo (CESP), Brazil	No information	Always state-owned. The State of São Paulo is the controlling shareholder. <a href="http://quicktake.morningstar.com/stocknet/secdocuments.aspx?symbol=cesdy">http://quicktake.morningstar.com/stocknet/secdocuments.aspx?symbol=cesdy</a>
	Domestic state owned	VALE, Brazil	2002-2014 non-state-owned (preferred shares)	Always state-owned. ORBIS only records its ordinary shares, whereas ASSET4 sample only records its preferred shares.
	Domestic state owned	Cielo S.A., Brazil	2002-2011 non-state-owned; 2012-2014 state-owned	State-owned since 2010, as the state-owned company Banco do Brasil increased its stake from 23.5% to 28.6% and retain such position afterwards. <a href="http://extapps.mz-ir.com/cielo/rao2009/eng/ra/07.htm">http://extapps.mz-ir.com/cielo/rao2009/eng/ra/07.htm</a>
	Foreign state owned	Aguas Andinas, Chile	2008-2010 & 2012: state-owned; other years non-state-owned	State-owned since 2008. Aguas Andinas is fully owned by Inversiones Aguas, whose controlling shareholder ‘Sociedad General de Aguas de Barcelona (SGAB)’ was acquired by Suez and Caixabank in 2008, and 35% of Suez is controlled by the French government.
Europe	Domestic state owned	CEZ, Czech	2002-2005 state-owned; 2006-2014 non-state-owned	Always state owned. Before 2006, the controlling shareholder is national property fund, which is also state-owned. <a href="https://www.cez.cz/en/investors/financial-reports/annual-reports.html">https://www.cez.cz/en/investors/financial-reports/annual-reports.html</a>
	Domestic state owned	Verbund, Austria	2002-2005 non-state-owned; 2006-2014 state-owned	Always state owned. Over 50% of shares have been owned by Republic of Austria even before 2006. <a href="https://www.zonebourse.com/VERBUND-AG-6491294/pdf/32124/VERBUND%20AG_Rapport-annuel.pdf">https://www.zonebourse.com/VERBUND-AG-6491294/pdf/32124/VERBUND%20AG_Rapport-annuel.pdf</a>
	Foreign state owned	EDP Renovaveis, Spain	Only identified as state-owned in 2012	State-owned until 2011. Its parent company is Energias de Portugal which is controlled by Parpública (state-owned by Portugal) before until 2011. From 2012, China Three Gorges becomes the largest shareholder of EDP, but holding less than 25% shares. <a href="http://www.edp.pt/en/Investidores/publicacoes/relatorioecontas/Pages/RelatorioeContas.aspx">http://www.edp.pt/en/Investidores/publicacoes/relatorioecontas/Pages/RelatorioeContas.aspx</a>
	Domestic state owned	France Telecom (ORANGE), France	2002-2008 state-owned; 2008-2014 non-state-owned	Always state-owned. After 2009 until 2014, the French government still control over 25% of ORANGE. However, now part of the stake is owned indirectly through FSI (state-owned).
	Domestic state owned	OJSC Rostelecom, Russia	Only identified as state-owned in 2006 and 2014	Always state-owned. The Russian government maintain over 50% of its shareholding mainly through Svyazinvest, also a state-owned enterprise. <a href="http://www.rostelecom.ru/en/ir/results_and_presentations/ar/">http://www.rostelecom.ru/en/ir/results_and_presentations/ar/</a>
	Foreign state owned	VIMPELCOM, Russia	Always non-state-owned	Always state-owned but by Norwegian state. Telenor (controlled by Norway government) has always maintain an over 25% stake in the company since 2002. <a href="https://www.telenor.com/media/in-focus/vimpelcom-ltd/historical-background/">https://www.telenor.com/media/in-focus/vimpelcom-ltd/historical-background/</a>
	Domestic state owned	OC Rosneft, Russia	2002-2008 non-state-owned; 2009-2014 state-owned	Always state-owned. The controlling shareholder has always been ROSNEFTEGAZ, which is state-owned. <a href="https://www.rosneft.com/Investors/Reports_and_presentations/Annual_reports/">https://www.rosneft.com/Investors/Reports_and_presentations/Annual_reports/</a>

## Appendix 2: List of Variables and Data Sources

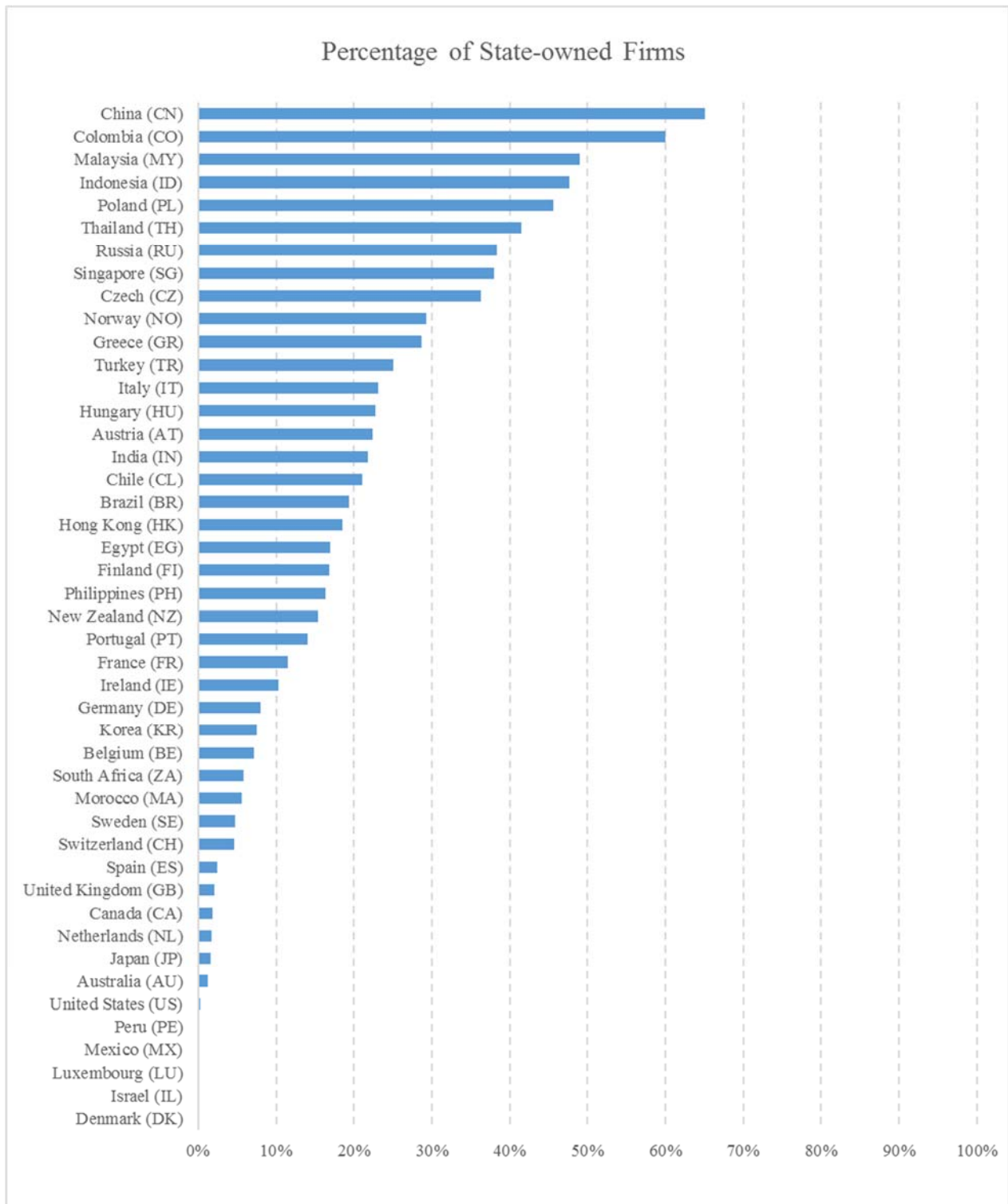
Variable	Description
<i>ENVSCORE</i>	The environmental pillar (ENVSCORE) measures a company’s impact on living and non-living natural systems, including the air, land, and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long-term shareholder value. The environmental pillar is an equally weighted score of the sub-dimensional scores: Emission Reduction, Product Innovation, and Resource Reduction. Source: Thomson Reuters ASSET4 database.
<i>ENER</i>	Emission Reduction, measures a company’s management commitment to and effectiveness in reducing environmental emission in production and operational processes. It reflects a company’s capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx, Sox, etc.), waste, hazardous waste, water discharges, and spills, or its impacts on biodiversity, and to partner with environmental organizations to reduce the environmental impact of the company in the local or broader community. Source: Thomson Reuters ASSET4 database.
<i>ENPI</i>	Product Innovation measures a company’s management commitment to and effectiveness in supporting the research and development of eco-efficient products or services. It reflects a company’s capacity to reduce environmental costs and burdens for its customers, and thereby create new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability. Source: Thomson Reuters ASSET4 database.
<i>ENRR</i>	Resource Reduction measures a company’s management commitment to and effectiveness in achieving an efficient use of natural resources in the production process. It reflects a company’s capacity to reduce the use of materials, energy, or water, and to find more eco-efficient solutions by improving supply chain management. Source: Thomson Reuters ASSET4 database.
<i>SOCSCORE</i>	The social pillar measures a company’s capacity to generate trust and loyalty its workforce, customers, and society, through (SOCSCORE) its use of best management practices. It is a reflection of the company’s reputation and the health of its license to operate, which are key factors in determining its ability to generate long-term shareholder value. The social pillar is an equally weighted score of the sub-dimensional scores: Customer/ Product Responsibility, Society/ Human Rights, Workforce/ Diversity and Opportunity, Workforce/ Employment Quality, Workforce/ Health & Safety, Workforce/ Training & Development. Source: Thomson Reuters ASSET4 database.
<i>CGVSCORE</i>	The corporate governance pillar (CGVSCORE) measures a company’s systems and processes, which ensure that its board members and executives act in the best interests of its long-term shareholders. It reflects a company’s capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long-term shareholder value. The corporate governance pillar is an equally weighted score of the sub-dimensional scores: Board of Directors/ Board Functions, Board of Directors/ Board Structure, Board of Directors/ Compensation Policy, Integration/ Vision and Strategy, Shareholder/ Shareholder Rights. Source: Thomson Reuters ASSET4 database.
<i>MSCI Environmental Pillar Score</i>	The Environmental Pillar Score includes the following issues: carbon emissions, product carbon footprint, energy efficiency, insuring climate change risk, water stress, biodiversity and land use, raw material sourcing, financing environmental impact, toxic emissions and waste, packaging material and waste, electronic waste, opportunities in clean tech, opportunities in green building, opportunities in renewable energy, etc. The data is then converted to a relative score, by allocating the company with the best performance within its industry sector in a given category a 10, the top score, giving the company with the worst performance a 0, the lowest, and scoring the remainder pro-rata between 10 and 0. Source: MSCI Intangible Value Assessment.
<i>Sustainalytics Environmental Score</i>	The Sustainalytics Environmental Score addresses a broad range of macro-level environmental issues and trends that have a significant, and in some cases material, impact on industries and companies, creating both risks and opportunities for investors. The score is based on a company’s environmental engagement based on four dimensions: (1) Preparedness, which refers to assessments of company management systems and policies designed to manage material environmental risks; (2) Disclosure, which refers to assessments of whether company reporting meets international best practice standards and is transparent with respect to most material ESG issues; (3) Quantitative Performance, which refers to assessments of company ESG performance based on quantitative

metrics such as carbon intensity; (4) Qualitative Performance – assessments of company ESG performance based on the analysis of controversial incidents that the company may be involved in. Underlying each industry group template is a customized weight matrix designed to further highlight the key environmental issues faced by each sector, and companies are also assessed for their level of involvement in major controversies and the associated business risks they face from such involvement. The ratings are given on a scale of 0-100 using the “best-of-sector” methodology to compare companies within a given sector to industry best practices. Source: Sustainalytics ESG Ratings.

<i>State_own</i>	A dummy variable that equals one if the ultimate owner is the state, the government, or a public authority, and zero otherwise. Ultimate owner is defined as the shareholder holding the percentage of direct voting rights, identified by following the path of uninterrupted control rights (at 25%) throughout the ownership pyramid. Source: Orbis.
<i>Domestic_own</i>	A dummy variable that equals one if the ultimate owner is from the same country of the firm, and zero otherwise. Ultimate owner is defined as the shareholder of direct voting rights owned by this shareholder who is identified by following the path of uninterrupted control rights (at 25%) throughout the ownership pyramid. Source: Orbis.
<i>Domestic state_own</i>	A dummy variable that equals one if the ultimate owner is the state, the government, or a public authority of the company’s country, and zero otherwise. Ultimate owner is defined as the shareholder direct voting rights owned by this shareholder who is identified by following the path of uninterrupted control rights (at 25%) throughout the ownership pyramid. Source: Orbis.
<i>SWF</i>	A dummy variable that equals one if the company has shares owned by a sovereign wealth fund (SWF), and zero otherwise. Source: Factset.
<i>Inst_own</i>	Holdings (end-of-year) by all institutions as a fraction of market capitalization. Source: FactSet/LionShares.
<i>Market-to-book (MTB)</i>	Calculated as the ratio of the market value of total assets to the replacement value of total assets of the company (the sum of book value of equity and book value of liabilities), winsorized at the 5% level. Source: Datastream.
<i>Return on assets (ROA)</i>	Calculated as the ratio of net income to the book value of total assets of the company. Source: Datastream and Compustat.
<i>Firm size</i>	The logarithm of the company’s total assets. Source: Datastream and Compustat.
<i>Leverage</i>	The ratio of total liabilities to total assets of the company, winsorized at 5% level. Source: Datastream and Compustat.
<i>GDP per capita</i>	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Source: World Bank database.
<i>Government held</i>	The percentage of total shares in issue of holdings of 5% or more held by a government or government institution. Source: Datastream.
<i>Foreign holdings</i>	The percentage of total shares in holdings of 5% or more held by an institution domiciled in a country other than that of the issuer. Note: Before March 1 <sup>st</sup> , 2005, this datatype was calculated as a separate strategic component. Since that date NOSHFR has represented the foreign held holdings of 5% or more included in the total strategic holdings datatype NOSHST. Source: Datastream.
<i>Cross holdings</i>	The percentage of total shares in holdings of 5% or more held by one company in another. Source: Datastream.
<i>Pension fund held</i>	The percentage of total shares in holdings of 5% or more held by pension funds or endowment funds. Source: Datastream.
<i>Investment co held</i>	The percentage of total shares in holdings of 5% or more held as long term strategic holdings by investment banks or institutions seeking a long term return. Note that holdings by Hedge Funds are not included. Source: Datastream.
<i>Employee held</i>	The percentage of total shares in holdings of 5% or more held by employees, or by those with a substantial position in a company that provides significant voting power at an annual general meeting, (typically family members). Source: Datastream.

<i>Other holdings</i>	The percentage of total shares in holdings of 5% or more held strategically, and outside one of the above categories. Source: Datastream.
<i>Strategic holdings</i>	The percentage of total shares in holdings of 5% or more held strategically and not available to ordinary investors. Note that holdings of 5% or more held by hedge fund owners or investment advisor/hedge fund owners are regarded as very active, and not counted as strategic. Source: Datastream.
<i>Domestic inst. held</i>	Holdings (end-of-year) by institutions located in the same country where the stock is listed as a fraction of market capitalization. Source: FactSet/LionShares.
<i>Foreign inst. held</i>	Holdings (end-of-year) by institutions located in a different country from the country where the stock is listed as a fraction of market capitalization. Source: FactSet/LionShares.
<i>CO<sub>2</sub></i>	CO <sub>2</sub> and CO <sub>2</sub> equivalents emission in tonnes. Source: ASSET4 (ENERDP023).
<i>Foreign sales</i>	The percentage of foreign sales over total net sales revenue of the company. Source: Datastream/Worldscope.
<i>Energy security risk</i>	Scores for the country-level energy security risk are reported in relation to an average reference index measuring risks for OECD member countries. The OECD average risk index is calibrated to a 1980 base year figure of 1,000. It includes: (1) Global fuels, which measures the reliability and diversity of global reserves and supplies of oil, natural gas, and coal; (2) Fuel imports, which measure the exposure of national economies to unreliable and concentrated supplies of oil and natural gas, and coal; (3) Energy expenditures, which measures the magnitude of energy costs to national economies and the exposure of consumers to price shocks; (4) Price and market volatility, which measures the susceptibility of national economies to large swings in energy prices; (5) Energy use intensity, which measures energy use in relation to population and economic output; (6) Energy power sector, which measures indirectly the reliability of electricity generating capacity; (7) Transportation sector, which measures efficiency of energy use in the transport sector per unit of GDP and population; (8) Environmental, which measures the exposure of national economies to national and international greenhouse gas emission reduction mandates. Lower emissions of carbon dioxide from energy indicate a less of risk to energy security. Source: International Index of Energy Security Risk of the US Chamber of Commerce's Institute for 21 <sup>st</sup> Century Energy ( <a href="http://www.energyxxi.org">www.energyxxi.org</a> ).
<i>Neighboring country conflicts</i>	The neighboring country conflicts index is an index of the statistical risk of violent conflict in the next 1-4 years and is exclusively based on quantitative indicators from open sources. With the assumption that structural conditions in a country are linked to the occurrence of violent conflict, the GCRI collects 25 variables in 5 dimensions (social, economic, security, political, geographic/environmental) and uses statistical regression models to calculate the probability and intensity of violent conflict. Source: Global Conflict Risk Index (GCRI) of the European Commission's Joint Research Center ( <a href="http://conflictrisk.jrc.ec.europa.eu/">http://conflictrisk.jrc.ec.europa.eu/</a> )
<i>Environmental regulation</i>	The environmental regulatory regime index consists of absolute rankings of country-level regulatory stringency, structure, subsidies, and enforcement of environment-related laws and regulations, It represents a summary performance measure of the quality of the environmental regulatory system in a country. The index is reported in Table 8 of Esty and Porter (2001) and is a ranking as of 2000. Source: Esty and Porter (2001).
<i>Political orientation</i>	Political orientation of the Executive Branch, which measures party orientation with respect to economic policy, coded based on the description of the party in the sources, 1=Right; 3=Left; 2=Center. Right: Parties that are defined as conservative, Christian democratic, or right-wing. Left: Parties that are defined as communist, socialist, social democratic, or left-wing. Center: Parties that are defined as centrist or when party position can best be described as centrist (e.g., party advocates strengthening private enterprise in a social-liberal context). <i>Not</i> described as centrist if competing factions "average out" to a centrist position (e.g., a party of "right-wing Muslims and Beijing-oriented Marxists"). 0: All cases that do not fit into category (i.e., party platform does not focus on economic issues, or there are competing wings), or no information. Source: Database of Political Institutions (DPI) from World Bank
<i>Political connection of CEO</i>	Political connection of CEO is a dummy variable that equals one if the CEO of the company worked in the government, political party committee, or military, or is/was a member of the Congress, and zero otherwise. Source: BoardEx and online search (e.g., Bloomberg Businessweek).





**Figure 1. Average State Ownership of Publicly-listed Firms, per Country**

This figure presents the proportion of state-owned firms among all firms in our sample in each country. Countries are sorted based on the pooled average of *State\_own* in the sample period from 2004 to 2014. We require the firm-year to have non-missing values in the following variables (used in our regression analyses) to be included in the sample: *ENVSCORE*, *State\_own*, institutional ownership, total assets, leverage, market-to-book ratio, ROA, and GDP per capita.

**Table 1. Forbes Top-Ranked Global Companies, 2010**

This table presents the average values of state ownership (*State\_own*), the environmental pillar scores (*ENVSCORE* and sub-categories scores: emission reduction *ENER*, product innovation *ENPI*, resource reduction *ENRR*), social pillar scores (*SOCSCORE*), and corporate governance pillar scores (*CGVSCORE*) of the top publicly listed companies in the Forbes Global 2000 list for 2010. The top 10 state-owned enterprises are highlighted in boldface. Country abbreviations are described in Figure 1.

Forbes Rank 2010	Country	<i>State_own</i>	<i>ENVSCORE</i>	<i>ENVSCORE</i>			<i>SOCSCORE</i>	<i>CGVSCORE</i>
				<i>ENER</i>	<i>ENPI</i>	<i>ENRR</i>		
1. JPMorgan Chase	US	0	92.50	76.57	97.25	87.06	66.48	72.70
2. General Electric	US	0	95.06	94.53	97.69	95.05	90.78	94.49
3. Bank of America	US	0	77.54	48.28	86.94	80.64	67.41	82.06
4. ExxonMobil	US	0	94.19	92.48	94.75	93.17	91.67	86.78
<b>5. ICBC</b>	<b>CN</b>	<b>1</b>	<b>87.86</b>	<b>72.09</b>	<b>95.19</b>	<b>85.65</b>	<b>78.27</b>	<b>78.98</b>
6. Banco Santander	ES	0	93.21	92.03	87.77	93.30	95.23	89.16
7. Wells Fargo	US	0	91.92	93.11	88.13	84.08	59.39	82.47
8. HSBC Holdings	GB	0	93.40	93.63	87.41	93.41	86.73	84.91
9. Royal Dutch Shell	GB	0	89.69	79.54	89.40	92.34	78.23	87.56
10. BP	GB	0	89.86	89.45	75.50	89.25	87.12	83.28
11. BNP Paribas	FR	0	93.04	87.99	97.34	90.84	94.07	90.89
<b>12. PetroChina</b>	<b>CN</b>	<b>1</b>	<b>57.50</b>	<b>64.25</b>	<b>15.44</b>	<b>75.30</b>	<b>81.13</b>	<b>19.74</b>
13. AT&T	US	0	92.71	93.39	88.22	88.37	79.26	91.63
14. Wal-Mart Stores	US	0	86.55	69.81	71.89	88.95	75.46	94.06
15. Berkshire Hathaway	US	0	9.36	9.39	14.92	8.92	3.75	63.05
<b>16. Gazprom</b>	<b>RU</b>	<b>1</b>	<b>81.95</b>	<b>91.28</b>	<b>53.11</b>	<b>79.10</b>	<b>76.46</b>	<b>6.99</b>
<b>17. China Construction Bank</b>	<b>CN</b>	<b>1</b>	<b>53.33</b>	<b>34.44</b>	<b>87.36</b>	<b>35.94</b>	<b>81.45</b>	<b>28.92</b>
<b>18. Petrobras</b>	<b>BR</b>	<b>1</b>	<b>91.67</b>	<b>90.93</b>	<b>84.42</b>	<b>88.34</b>	<b>93.80</b>	<b>34.01</b>
19. Total	FR	0	89.70	77.73	87.75	83.24	83.63	65.24
20. Chevron	US	0	90.42	86.96	87.89	82.06	63.51	77.78
21. Barclays	GB	0	94.11	90.95	94.89	92.44	93.23	86.60
<b>22. Bank of China</b>	<b>CN</b>	<b>1</b>	<b>79.61</b>	<b>37.93</b>	<b>95.50</b>	<b>88.15</b>	<b>82.44</b>	<b>49.77</b>
23. Allianz	DE	0	93.50	93.66	88.13	93.40	93.40	78.88
<b>24. GDF Suez</b>	<b>FR</b>	<b>1</b>	<b>90.06</b>	<b>92.34</b>	<b>88.28</b>	<b>78.89</b>	<b>95.71</b>	<b>76.96</b>
25. E ON	DE	0	91.60	94.91	85.84	84.94	96.59	29.78
26. Goldman Sachs	US	0	92.12	78.15	87.37	93.51	53.77	74.37
<b>27. EDF Group</b>	<b>FR</b>	<b>1</b>	<b>92.86</b>	<b>84.90</b>	<b>97.53</b>	<b>88.77</b>	<b>96.13</b>	<b>33.16</b>
28. AXA Group	FR	0	93.39	85.18	95.44	93.31	94.37	82.90
<b>29. Lloyds</b>	<b>GB</b>	<b>1</b>	<b>90.01</b>	<b>92.48</b>	<b>69.86</b>	<b>92.90</b>	<b>93.20</b>	<b>73.90</b>
30. Procter & Gamble	US	0	94.69	92.76	97.41	93.50	92.54	81.51
<b>31. ENI</b>	<b>IT</b>	<b>1</b>	<b>89.02</b>	<b>83.41</b>	<b>81.75</b>	<b>84.79</b>	<b>96.11</b>	<b>59.61</b>

**Table 2. Univariate Tests of State Ownership and Environmental Performance**

This table shows the averages of state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE*, and sub-scores: emission reduction *ENER*, product innovation *ENPI* and resource reduction *ENRR*), social pillar score (*SOCSCORE*), and corporate governance pillar score (*CGVSCORE*). \*, \*\*, \*\*\* denote statistical significance at the 1%, 5%, and 10% level, respectively. Country abbreviations are described in Figure 1.

Panel A: Univariate Tests by Country													
Country	Unique firm no.	Obs	<i>State_own</i>	<i>ENVSCORE</i>	<i>State_own</i> =1	<i>State_own</i> =0	<i>p</i> - value (1 - 0)	<i>ENER</i>	<i>ENPI</i>	<i>ENRR</i>	<i>SOCSCORE</i>	<i>CGVSCORE</i>	
Total	4,009	28,890	0.066	51.51	57.40	51.13	0.00	51.45	49.16	51.72	52.07	53.36	
Emerging		3,558	0.248	49.20	50.94	48.58	0.00	**	50.08	45.09	50.81	55.50	29.05
Developed		25,332	0.040	51.83	62.94	51.41	0.00	***	51.64	49.73	51.85	51.59	56.77
AT	18	167	0.224	56.65	78.42	49.88	0.00	***	54.98	55.25	53.66	56.08	33.32
AU	350	1,855	0.012	36.91	47.95	36.80	0.07	*	40.15	34.69	39.16	39.30	63.42
BE	27	237	0.072	56.50	64.10	56.13	0.34		56.53	50.74	56.67	52.96	50.56
BR	83	401	0.194	53.51	68.79	49.78	0.00	***	52.50	46.89	56.34	64.11	27.24
CA	265	1,635	0.018	39.01	33.81	38.98	0.27		42.09	36.23	40.45	39.72	73.74
CH	66	485	0.046	58.41	67.57	57.95	0.15		57.15	54.97	58.25	56.61	47.10
CL	20	115	0.211	40.19	39.81	40.54	0.91		39.43	39.81	43.05	44.91	9.26
CN	44	218	0.651	26.01	28.92	20.58	0.00	***	24.39	38.47	23.13	25.40	24.59
CO	7	26	0.600	48.77	59.70	33.50	0.02	**	54.64	38.17	50.86	71.34	28.21
CZ	3	22	0.364	51.00	61.92	44.76	0.00	***	46.32	51.33	51.43	70.32	18.27
DE	89	734	0.079	67.38	69.65	67.11	0.45		64.75	65.09	66.30	68.48	34.59
DK	24	227	0.000	57.10		56.94			54.92	54.79	58.09	54.07	38.02
EG	11	55	0.170	19.55	10.55	21.15	0.00		21.37	25.05	20.67	27.24	8.64
ES	55	420	0.024	71.90	87.47	71.75	0.00	***	71.62	60.63	72.95	78.12	50.24
FI	27	244	0.169	76.11	88.02	73.94	0.00	***	69.22	78.39	71.03	70.35	60.87
FR	99	901	0.116	76.93	79.53	76.67	0.24		74.56	70.22	76.66	78.17	55.07
GB	361	2,893	0.020	60.14	63.34	60.10	0.39		62.80	48.16	62.88	63.31	73.89
GR	22	192	0.287	50.25	69.69	42.92	0.00	***	53.39	37.45	55.32	50.69	17.72
HK	142	920	0.185	34.69	40.49	33.78	0.00	***	33.12	36.85	37.07	35.98	36.48
HU	4	22	0.227	75.69	35.23	87.58	0.00		76.63	70.86	71.43	78.51	41.16
ID	31	139	0.477	46.41	46.58	46.82	0.96		51.94	37.26	48.70	62.82	26.03
IE	14	117	0.103	44.03	72.69	40.76	0.00	***	45.64	41.01	45.12	36.74	64.48
IL	14	82	0.000	42.73		42.34			37.24	40.99	49.35	45.73	37.17
IN	75	362	0.218	54.98	52.61	55.62	0.44		54.42	48.83	59.16	58.84	29.11
IT	48	426	0.231	55.00	81.41	46.84	0.00	***	53.93	52.84	56.28	64.23	43.97
JP	416	3,939	0.016	62.23	70.17	62.12	0.03	**	61.94	63.09	57.26	47.32	11.96
KR	109	564	0.075	61.73	65.77	61.34	0.31		61.18	63.98	56.14	57.05	13.79
LU	3	18	0.000	60.19		60.19			52.85	57.76	60.94	50.93	58.92
MA	3	19	0.056	27.30	54.56	23.33	-		25.57	27.54	33.38	54.64	5.45
MX	24	115	0.000	43.00		42.73			45.33	34.56	47.50	45.06	13.16
MY	44	207	0.490	40.12	51.97	29.13	0.00	***	44.71	37.32	40.53	49.12	46.94
NL	37	286	0.017	69.67	85.72	69.38	0.00	***	67.06	63.14	70.53	77.46	64.51
NO	18	174	0.293	66.21	85.57	58.19	0.00	***	63.98	64.62	61.74	69.81	63.62
NZ	9	65	0.154	44.31	76.07	38.54	0.00	***	43.31	45.98	41.67	41.47	62.47
PE	1	7	0.000	27.40		27.40			41.28	18.82	33.43	31.99	51.66
PH	14	63	0.164	44.86	42.04	46.01	0.68		42.42	43.30	48.75	45.31	28.78
PL	26	128	0.457	35.39	44.60	27.94	0.00	***	38.78	34.78	34.85	42.30	23.24
PT	12	103	0.140	67.44	78.67	65.14	0.04	**	69.26	56.18	67.15	76.88	56.78
RU	34	187	0.384	46.48	56.83	40.14	0.00	***	49.90	34.90	52.53	54.68	28.74
SE	50	454	0.047	67.71	82.53	66.92	0.00	***	64.58	66.35	64.50	64.94	54.29
SG	49	414	0.380	36.98	45.66	32.19	0.00	***	37.82	35.14	40.67	40.79	43.78
TH	30	136	0.415	49.30	68.88	35.19	0.00	***	48.04	47.37	50.58	59.71	45.53
TR	24	135	0.250	51.04	34.88	55.89	0.00		51.49	51.33	49.65	55.79	22.47
US	1086	8,536	0.003	44.23	19.42	44.31	0.00		42.95	45.00	44.82	47.61	74.15
ZA	121	445	0.058	53.33	59.25	52.54	0.14		55.27	40.54	60.46	71.34	60.76

**Table 2. (continued)**

Panel B: Univariate Tests by Major Industry								
Industry	Obs.	<i>State_own</i>	<i>ENVSCORE</i>			p-value (1 - 0)	<i>SOCSCORE</i>	<i>CGVSCORE</i>
			All	<i>State own=1</i>	<i>State own=0</i>			
Basic Materials	3,015	0.056	55.58	59.84	55.40	0.07	53.39	54.89
Consumer Goods	3,370	0.019	61.55	47.15	61.90	0.00	57.76	46.95
Consumer Services	3,992	0.023	41.05	52.56	40.79	0.00	46.35	53.55
Financials	5,059	0.069	43.23	46.36	43.04	0.06	46.02	49.99
Health Care	1,633	0.010	43.79	20.76	44.06	0.00	50.63	55.82
Industrials	5,610	0.053	59.08	53.83	59.38	0.00	55.40	52.47
Oil & Gas	2,061	0.126	45.48	64.61	42.69	0.00	48.52	63.62
Technology	1,960	0.021	51.69	63.00	51.46	0.03	51.53	58.82
Telecommunications	771	0.317	55.43	63.37	51.95	0.00	62.53	52.13
Utilities	1405	0.256	63.53	64.80	63.32	0.36	62.40	55.66
Total	28,876	0.066	51.52	57.40	51.14	0.00	52.08	53.36

**Table 3. Summary Statistics**

Panel A presents summary statistics for variables in the sample period 2004-2014. The main variables of interest include state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE*, and sub-scores: emission reduction *ENER*, product innovation *ENPI* and resource reduction *ENRR*), social pillar score (*SOCSCORE*), and corporate governance pillar score (*CGVSCORE*). Variable definitions and data sources are described in Appendix 2. All control variables are winsorized at the 5th and 95th percentiles. Summary statistics in Panel A include mean, standard deviation (S.D.), minimum (Min), first quartile (0.25), median, third percentile (0.75), and maximum (Max). Panel B presents Pearson correlation coefficients for all variables.

Panel A. Descriptive Statistics								
	Obs	Mean	S.D.	Min	0.25	Median	0.75	Max
<i>State_own</i>	28,890	0.06	0.25	0.00	0.00	0.00	0.00	1.00
<i>ENVSCORE</i>	28,890	51.51	31.96	8.48	18.00	51.19	85.17	97.50
<i>ENER</i>	28,890	51.45	32.00	7.29	18.46	50.34	85.45	98.04
<i>ENPI</i>	28,890	49.16	31.21	8.35	19.30	35.78	82.49	99.68
<i>ENRR</i>	28,890	51.72	31.99	6.31	18.20	54.58	84.48	97.69
<i>SOCSCORE</i>	28,890	52.07	30.59	3.43	22.43	52.81	82.37	98.88
<i>CGVSCORE</i>	28,881	53.36	30.06	1.09	24.21	61.29	79.71	97.55
<i>Inst_own</i>	28,890	0.39	0.31	0.02	0.14	0.28	0.68	0.96
<i>Ln(Assets)</i>	28,890	15.57	1.53	11.81	14.54	15.49	16.63	18.31
<i>Leverage</i>	28,890	23.46	16.83	0.00	9.34	22.21	34.88	59.54
<i>MTB</i>	28,890	2.48	1.83	0.54	1.19	1.89	3.11	7.60
<i>ROA</i>	28,890	6.13	6.27	-7.55	2.05	5.39	9.55	20.39
<i>Ln(GDP)</i>	28,890	10.51	0.59	8.05	10.50	10.70	10.82	10.96

Panel B: Correlation Coefficients													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) <i>State_own</i>	1												
(2) <i>ENVSCORE</i>	0.049	1											
(3) <i>ENER</i>	0.062	0.925	1										
(4) <i>ENPI</i>	0.016	0.825	0.638	1									
(5) <i>ENRR</i>	0.048	0.922	0.838	0.626	1								
(6) <i>SOCSCORE</i>	0.085	0.781	0.756	0.568	0.772	1							
(7) <i>CGVSCORE</i>	-0.103	0.170	0.177	0.068	0.204	0.295	1						
(8) <i>Inst_own</i>	-0.198	-0.094	-0.116	-0.062	-0.077	-0.025	0.560	1					
(9) <i>Ln(Assets)</i>	0.125	0.399	0.381	0.326	0.374	0.398	0.031	0.030	1				
(10) <i>Leverage</i>	0.039	0.102	0.112	0.065	0.088	0.074	0.007	-0.030	0.190	1			
(11) <i>MTB</i>	-0.054	-0.080	-0.090	-0.079	-0.046	0.002	0.136	0.177	-0.260	-0.047	1		
(12) <i>ROA</i>	0.002	-0.030	-0.031	-0.051	-0.002	0.040	0.078	0.104	-0.225	-0.150	0.457	1	
(13) <i>Ln(GDP)</i>	-0.277	0.013	0.004	0.042	-0.005	-0.051	0.331	0.353	-0.045	-0.026	-0.009	-0.091	1

**Table 4. Baseline Regressions**

This table reports the regression results from regressing environmental pillar score (*ENVSCORE*, and its sub-scores) on a state ownership dummy (*State\_own*), other control variables, country fixed effects, and year fixed effects. Control variables include the ratio of institutional ownership (*Inst\_own*), total assets in logarithm (*Ln(Assets)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), and GDP per capita in logarithm (*Ln(GDP)*). All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. *State\_own* and other control variables (except *Ln(GDP)*) are lagged by one year. The sample period is 2004-2014. Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

Dependent variable:	(1) <i>ENVSCORE</i>	(2) <i>ENVSCORE</i>	(3) <i>ENER</i>	(4) <i>ENER</i>	(5) <i>ENPI</i>	(6) <i>ENPI</i>	(7) <i>ENRR</i>	(8) <i>ENRR</i>
<i>State_own</i>	3.991*** (1.524)	2.507* (1.410)	4.385*** (1.472)	2.857** (1.384)	2.606 (1.670)	1.306 (1.603)	4.703*** (1.511)	2.702* (1.397)
<i>Inst_own</i>		3.323* (1.896)		2.906 (1.953)		3.665* (2.052)		3.808* (2.007)
<i>Ln(Assets)</i>		6.334*** (0.310)		6.608*** (0.291)		4.074*** (0.305)		6.916*** (0.328)
<i>Leverage</i>		0.0230 (0.0175)		0.0298* (0.0180)		-0.00714 (0.0186)		0.0288 (0.0181)
<i>MTB</i>		0.248** (0.113)		0.276** (0.112)		0.127 (0.127)		0.342*** (0.123)
<i>ROA</i>		0.0915*** (0.0268)		0.0975*** (0.0277)		0.0560* (0.0307)		0.139*** (0.0298)
<i>Ln(GDP)</i>		2.536 (1.735)		1.191 (1.804)		0.0704 (2.034)		4.322** (1.987)
Observations	28,890	28,890	28,890	28,890	28,890	28,890	28,890	28,890
Number of firms	4,009	4,009	4,009	4,009	4,009	4,009	4,009	4,009
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 5. SOEs' Responses to Salient Events Environmental Events**

This table reports the results from regressing environmental pillar score (*ENVSCORE*) in year *t* or total CO<sub>2</sub> emissions in tons (*CO<sub>2</sub>* as in Column (3) of Panel A) in year *t*, on state ownership dummy (*State\_own*) in year *t-1*, and *State\_own* interacted with an indicator variable *Post 2009* (or *Post 2011*) that equals one if the year is from 2010 (or 2012) onward, and zero otherwise to capture the effect of the Copenhagen Agreement signed in December 2009 (Panels A, B & C) or the Fukushima nuclear disaster happened in March 2011 (Panel D), control variables, country fixed effects, and year fixed effects. In Panel A, the tests are conducted on all countries with narrower event window (2008-2011) and with the whole sample period. In Panel B, all tests are conducted using the fixed effects model (firm fixed effects) and on the whole sample, the Asia-Pacific & Latin America sample, and the sample of the rest of the world. In Panel C, the same models are run on two subsamples of high- and low-CO<sub>2</sub> emission per capita countries, respectively. In Panel D, the first three columns report the interaction tests on the whole sample, the subsample of energy (i.e., utilities) industries, and the subsample of other industries, respectively, and the fourth column reports the result of triple interaction *State\_own* × *Post 2011* × *Energy*. Control variables in all tests include the ratio of institutional ownership (*Inst\_own*), total assets in logarithm (*Ln(Assets)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), and GDP per capita in logarithm (*Ln(GDP)*). All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles, and are in year *t-1* (except for *Ln(GDP)* that is in year *t*). Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote p<0.01, p<0.05, and p<0.1, respectively.

<i>Panel A. 2009 Copenhagen Agreement: All Countries</i>			
	(1)	(2)	(3)
Dependent variable	<i>ENVSCORE</i>		<i>CO<sub>2</sub></i>
	Narrower window (2008-2011)	Whole sample	Whole sample
<i>State_own</i> × <i>Post 2009</i>	2.081** (0.859)	2.428* (1.406)	-0.059* (0.034)
<i>State_own</i>	2.073 (1.375)	0.814 (1.819)	0.031 (0.037)
Observations	12,612	28,890	13,245
Number of firms	3,648	4,009	2,304
Control variables	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes
<i>Panel B. Copenhagen Agreement: Firm Fixed Effects and Regional Subsamples</i>			
<i>Dependent variable = ENVSCORE</i>	(1)	(2)	(3)
<i>State_own</i> × <i>Post 2009</i>	2.419** (1.105)	7.512*** (2.311)	-2.429 (1.686)
<i>State_own</i>	-1.352 (2.275)	-1.577 (3.920)	-2.566 (2.895)
Observations	28,890	9,546	19,344
Number of firms	4,009	1,448	2,561
Control variables	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes
<b><i>Firm FE</i></b>	<b><i>Yes</i></b>	<b><i>Yes</i></b>	<b><i>Yes</i></b>
Country coverage	All countries	Asia Pacific & Latin America	North America, Europe, & Middle East

**Table 5 (Continued)**

<i>Panel C. Copenhagen Agreement: Subsample Analysis Based on CO<sub>2</sub> Emission Per Capita</i>				
	(1)		(2)	
	High CO <sub>2</sub> Per Capita Country		Low CO <sub>2</sub> Per Capita Country	
State_own × Post 2009	3.254**		0.714	
	(1.598)		(1.826)	
State_own	3.990*		1.245	
	-2.138		(2.023)	
Observations	8,263		3,340	
Number of firms	2,583		1,149	
Control variables	Yes		Yes	
Country FE	Yes		Yes	
Year FE	Yes		Yes	
Event window	2008-2011		2008-2011	
<i>Panel D. Fukushima Nuclear Disaster</i>				
	(1)	(2)	(3)	(4)
	Whole sample	Energy	Non-utilities	Whole sample
State_own × Post 2011	2.866***	6.233***	3.118***	2.947***
	(0.912)	(2.156)	(1.030)	(1.029)
State_own	1.207	0.707	0.296	0.550
	(1.504)	(3.644)	(1.694)	(1.680)
Energy				10.33***
				(1.878)
State_own × Energy				-0.380
				(3.489)
Energy × Post 2011				-6.232***
				(1.491)
State_own × Post 2011 × Energy				4.129*
				(2.495)
Observations	28,441	1,405	27,036	28,890
Number of firms	3,943	188	3,755	4,009
Control variables	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes



**Table 6. Cross-Country Variation**

This table reports the regression results from regressing environmental pillar score (*ENVSCORE*) on state ownership dummy (*State\_own*), other control variables, country fixed effects, and year fixed effects for the sub-sample of firms: located in emerging and developed markets (Panel A) and in each of five regions (Panel B). Footnote 19 provides the definition of emerging vs. developed countries. Control variables are defined in Appendix 2. We omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. *State\_own* and other control variables (except *Ln(GDP)*) are lagged by one year. The sample period is 2004-2014. Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

<i>Panel A. By Level of Economic Development</i>					
	(1)	(2)			
	Emerging Markets	Developed Countries			
State_own	3.976** (1.806)	1.592 (1.937)			
Observations	3,558	25,332			
Number of firms	730	3,279			
Control variables	Yes	Yes			
Country FE	Yes	Yes			
Year FE	Yes	Yes			
<i>Panel B. By Region<sup>26</sup></i>					
Region	(1)	(2)	(3)	(4)	(5)
	Africa & Middle East	Asia Pacific	Europe	Latin America	North America
State_own	-0.984 (5.236)	5.238** (2.383)	0.283 (2.152)	6.851* (3.805)	-3.900 (3.719)
Observations	736	8,882	8,437	664	10,171
Number of firms	173	1,313	1,037	135	1,351
Control variables	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

<sup>26</sup> The regions consist of Africa and Middle East (Egypt, Israel, Morocco, Turkey, and South Africa); Asia Pacific (Australia, China, Hong Kong, India, Indonesia, Japan, Philippines, Malaysia, New Zealand, South Korea, Thailand, and Singapore); Europe (Austria, Belgium, The Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, and the U.K.); Latin America (Brazil, Chile, Colombia, Mexico, and Peru); and North America (Canada and the U.S.).

**Table 7. Channels for the State Ownership Effect**

This table reports the results from regressing environmental pillar score (*ENVSCORE*) on lagged state ownership dummy (*State\_own*), conditional variables and interaction terms of *State\_own* and conditional variables, as well as other control variables, country fixed effects, and year fixed effects. *Oil & Gas* is a firm-level dummy indicator that equals one if the firm is in Oil & Gas industries and zero otherwise. *Foreign sales* is the percentage of foreign sales over total net sales revenue of the company. *Energy security risk* is the country-level index on energy security risk as assessed by the U.S. Chamber of Commerce. *Neighboring countries conflict* is the country-level index measuring a country's tensions with its neighboring countries as assessed by Global Conflict Risk Index (GCRI). *Environmental regulation* is a dummy that equals one if the country's environmental regulation index value (as calculated by Esty and Porter (2001)) is above sample median and zero otherwise. *Political orientation* is the variable EXECRLC in the Database of Political Institutions that takes a value of 1, 2, or 3 if the government is right, central, and left. *Political connection of CEO* is a dummy that equals one if the CEOs are politically connected and zero otherwise. All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. *State\_own* and other control variables (except *Ln(GDP)*) are lagged by one year. We omit the coefficients of the control variables for brevity. The sample period is 2004-2014. Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
State_own	1.720 (1.475)	4.602** (1.636)	1.438 (1.828)	3.524** (1.681)	3.374* (1.770)	3.175** (1.544)	2.371* (1.367)
Oil & Gas	-3.859*** (1.454)						
State_own × Oil & Gas	10.90** (5.406)						
Foreign sales		0.054*** (0.010)					
State_own × Foreign sales		-0.043* (0.026)					
Energy security risk			-0.0149*** (0.00382)				
State_own × Energy security risk			0.0118*** (0.00422)				
Neighboring countries conflict				-8.042*** (2.400)			
State_own × Neighboring countries conflict				13.72*** (3.580)			
Environmental regulation					6.880*** (1.314)		
State_own × Environmental regulation					1.930 (1.660)		
Political orientation						1.236*** (0.239)	
State_own × Political orientation						-0.0111 (0.0126)	
Political connection of CEO							0.222 (0.807)
State_own × Political connection of CEO							0.800 (2.244)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,890	24,795	24,819	21,493	27,798	27,970	28,890
Number of firms	4,009	3,797	3,826	3,688	3,837	3,867	4,009
Country FE	Yes	Yes	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 8. State Versus Other Types of Block-ownership**

This table reports the results from regressing environmental pillar score (*ENVSCORE*) on the variables for other ownership types, other control variables, country fixed effects, and year fixed effects. In Panel A, the state ownership (*Government held*) measures the percentage of free-float shares held by the government if they are above 5% threshold. Proxies for other block-ownership types include the ratios of floating shares owned by foreign investors (*Foreign holdings*), by other corporations (*Cross holdings*), by pension funds (*Pension fund held*), by investment companies (*Investment co held*), by employees (*Employee held*), by other investors (*Other holdings*), by strategic investors (*Strategic holdings*), and the ratios of shares owned by domestic institutional investors (*Domestic inst. held*) and by foreign institutional investors (*Foreign inst. held*). Control variables are included in the regressions but estimated coefficients are not shown. In Panel B, *Domestic State\_own* is a dummy variable that equals one if the ultimate owner is the state of the company's country and zero otherwise. *State\_own* is a dummy variable that equals one if the ultimate owner is the state and zero otherwise. *Domestic\_own* is a dummy variable that equals one if the ultimate owner is an entity in the company's country and zero otherwise. *SWF* is a dummy variable that equals one if the firm has at least one sovereign wealth fund investor (defined by Factset/LionShares) and zero otherwise. The sample period is 2004-2014. Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

<b>Panel A. Government versus Other Types of Block-owners</b>										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Government held	0.063**									
	(0.027)									
Foreign holdings		0.0017								
		(1.488)								
Cross holdings			-0.007							
			(0.014)							
Pension fund held				-0.314***						
				(0.076)						
Investment co held					-0.038**					
					(0.016)					
Employee held						-0.097***				
						(0.018)				
Other holdings							0.002			
							(0.031)			
Strategic holdings								-0.0424***		
								(0.010)		
Domestic inst. held									-1.537	
									(2.310)	
Foreign inst. held										7.585***
										(2.419)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,721	28,659	28,724	28,724	28,724	28,724	28,724	28,724	28,890	28,890
Number of firms	4,174	4,004	4,006	4,006	4,006	4,006	4,006	4,006	4,009	4,009
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 8. State Versus Other Types of Block-ownership (continued)**

<b>Panel B. Different Forms of State Ownership</b>				
	(1)	(2)	(3)	(4)
Domestic State_own	4.056** (1.896)			
State_own		-0.310 (2.790)	0.560 (2.811)	2.502* (1.411)
Domestic_own		0.736 (1.083)	-7.310*** (2.279)	
State_own × Domestic_own		3.845 (3.807)	6.812* (3.696)	
SWF				0.456 (1.437)
Observations	28,890	25,124	3,766	28,890
Control variables	Yes	Yes	Yes	Yes
Country & Year FE	Yes	Yes	Yes	Yes
Sample	Full Sample	Developed Countries	Emerging Countries	Full Sample

**Table 9. Alternative Measures of Environmental Engagement**

This table reports the results from regressing the environmental scores using two alternative sources—the Environmental Pillar Score from MSCI and the Environmental Score from Sustainalytics—on a state ownership dummy (*State\_own*), other control variables and country fixed effects using OLS. All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Robust standard errors are clustered at the country-level in Column (1) and the firm level in Column (2), and are reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

Dependent variable:	(1) <i>MSCI Environmental Pillar Score</i>	(2) <i>Sustainalytics Environmental Score</i>
State_own	0.712** (0.332)	2.045* (1.101)
Inst_own	-0.375 (0.400)	5.813*** (1.912)
Ln(Assets)	0.343*** (0.0580)	2.074*** (0.413)
Leverage	0.139* (0.0801)	0.017 (0.013)
MTB	0.426 (0.335)	0.374* (0.215)
ROA	0.0658*** (0.0157)	0.099 (0.061)
Ln(GDP)	41.73 (115.2)	5.111* (3.036)
Observations	1,383	14,891
Number of firms	1,383	3,300
R-squared	0.119	0.204
Country FE	Yes	Yes
Model	Cross-section OLS	OLS

**Table 10. Shareholder Value and Firm Performance**

This table reports the regression results from regressing current Tobin's Q (or Market-to-Book ratio of assets, *MTB*) or future five-year average ROA, winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles, on state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE*), the interaction effect, other control variables, country fixed effects, and year fixed effects. Control variables are defined in Appendix 2. All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. *State\_own* and other control variables (except *Ln(GDP)*) are lagged by one year. The sample period is 2004-2014. Robust standard errors are clustered at the firm-level and reported in parentheses. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

Dependent variable:	(1)	(2)
	Market-to-Book Ratio	5-year ROA
State_own	-0.0088 (0.0993)	0.310 (0.499)
ENVSCORE	0.0024*** (0.0006)	0.0046*** (0.0016)
State_own × ENVSCORE	-0.0015 (0.0014)	-0.0043 (0.0053)
Inst_own	0.588*** (0.149)	-0.0293 (0.431)
Ln(Assets)	-0.360*** (0.0200)	-1.029*** (0.078)
Leverage	0.0035** (0.0014)	0.0161*** (0.0042)
ROA	0.0495*** -0.0029	0.0414*** (0.0078)
Ln(GDP)	0.0127 (0.123)	-1.370*** (0.408)
Observations	26,163	11,969
Number of firm_id	3,954	2,696
Country FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes

**Table 11. Other Pillars: Social and Corporate Governance Performance**

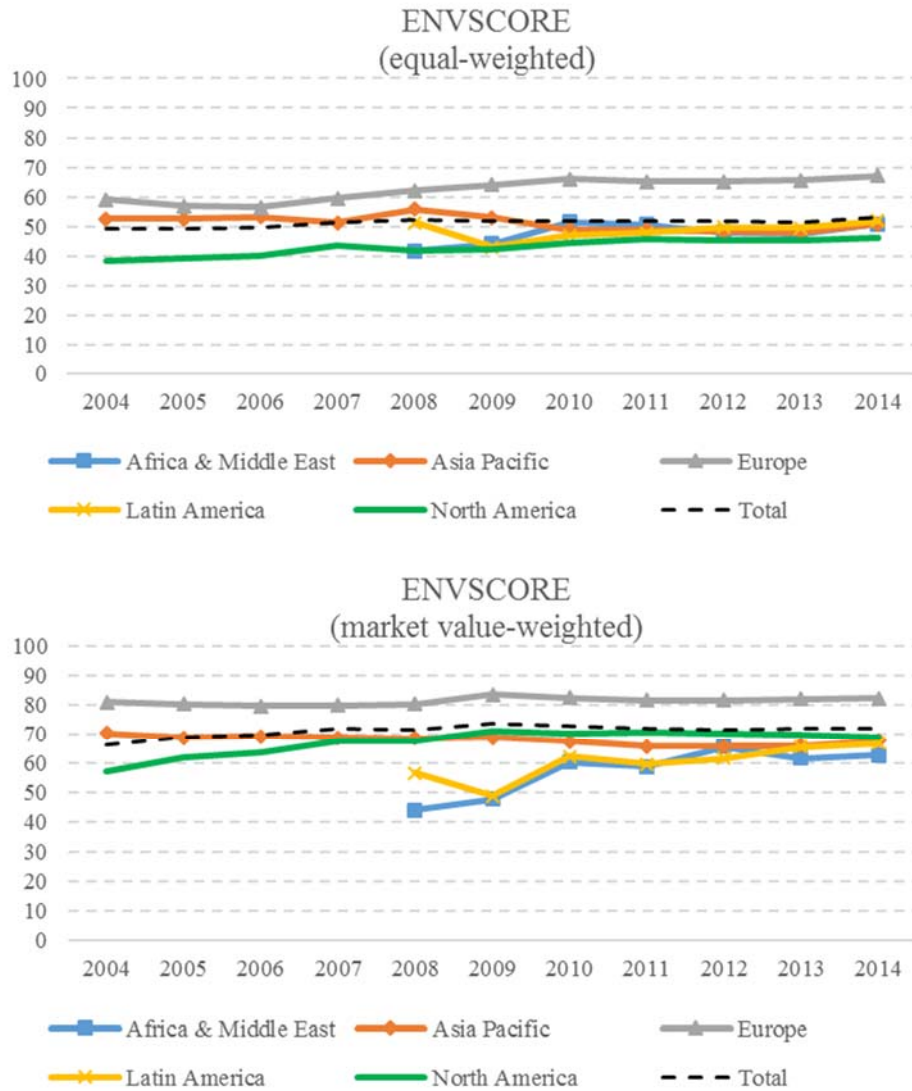
This table reports the regression results from regressing social pillar score (*SOCSCORE*) and corporate governance pillar score (*CGVSCORE*) on state ownership dummy (*State\_own*), other control variables, country fixed effects, and year fixed effects. Control variables include total assets in logarithm (*Ln(Assets)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), and GDP per capita in logarithm (*Ln(GDP)*). All control variables are winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles. *State\_own* and other control variables (except *Ln(GDP)*) are lagged by one year. The sample period is 2004-2014. \*\*\*, \*\*, and \* denote  $p < 0.01$ ,  $p < 0.05$ , and  $p < 0.1$ , respectively.

Dependent variable:	(1) <i>SOCSCORE</i>	(2) <i>CGVSCORE</i>
State_own	2.233* (1.284)	0.917 (1.099)
Inst_own	4.856*** (1.753)	11.59*** (1.434)
Ln(Assets)	6.690*** (0.303)	3.330*** (0.191)
Leverage	-0.0176 (0.0164)	0.0116 (0.0120)
MTB	0.364*** (0.103)	0.108 (0.0872)
ROA	0.117*** (0.0252)	0.0129 (0.0213)
Ln(GDP)	5.139*** (1.691)	5.827*** (1.440)
Observations	28,890	28,881
Number of firms	4,009	4,009
Country FE	Yes	Yes
Year FE	Yes	Yes

**Internet Appendix for**

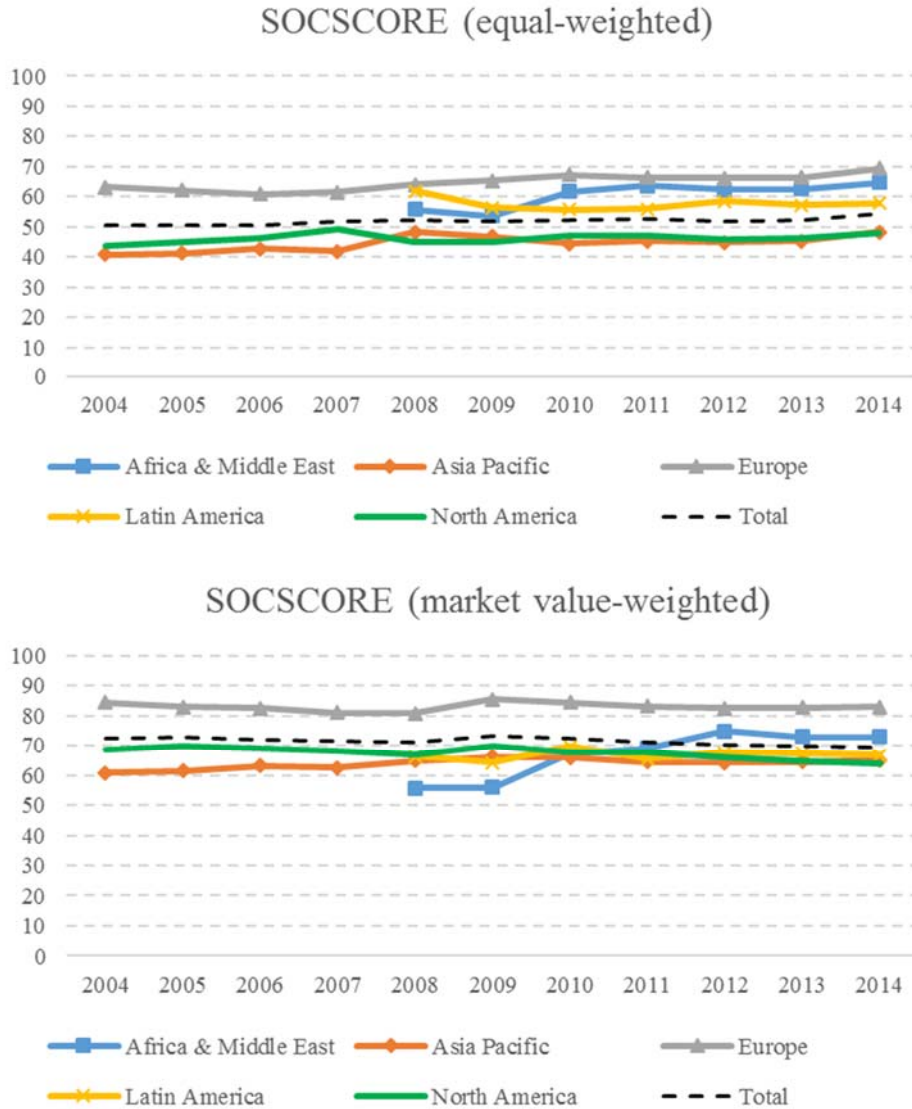
**Leviathan Inc. and Corporate Environmental Engagement**



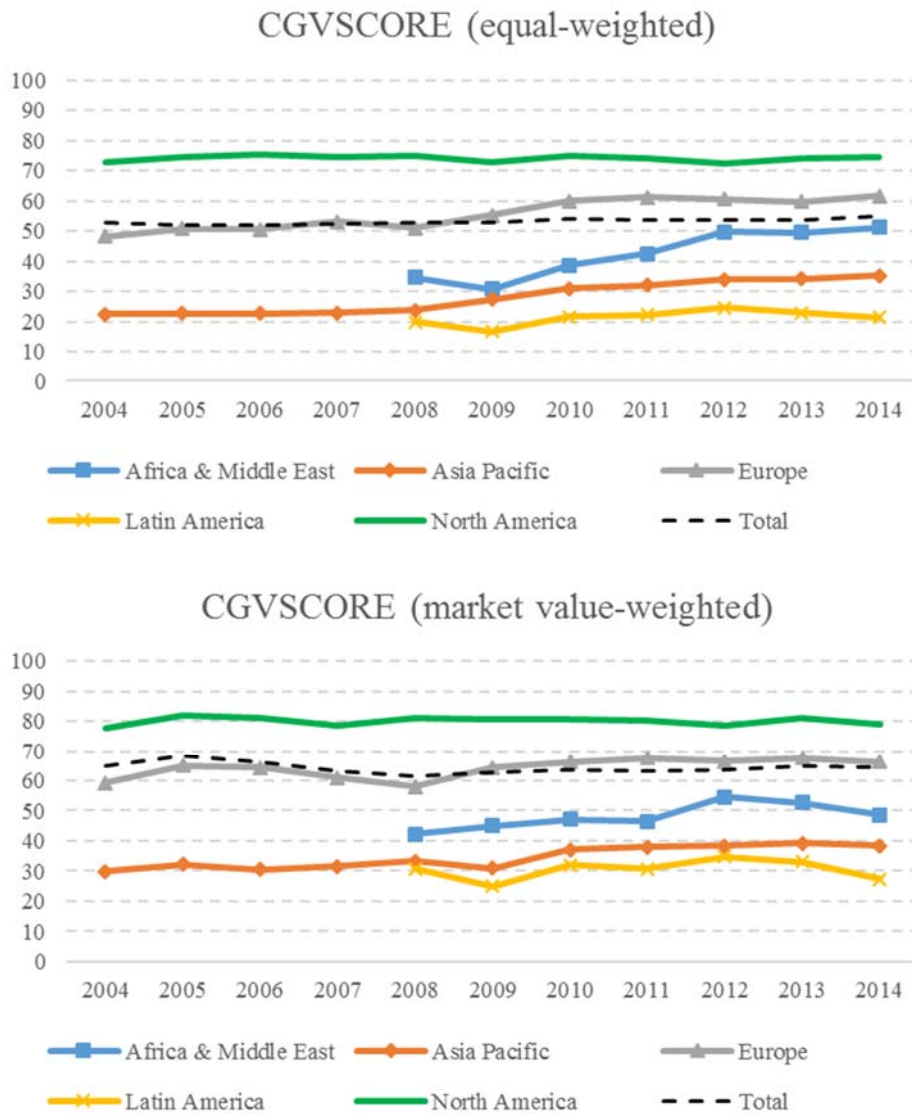


**Figure IA.1 Average Environmental Engagement of Publicly-listed Firms, per Geographic Region and Year**

This figure presents the time series patterns of the average of the ASSET4 environmental pillar scores (*ENVSCORE*) of public firms in the five geographical regions. The sample period is from 2004 to 2014. Panel A presents equal-weighted averages, calculated with the pooled average score of public firms in a region in each year. Panel B shows value-weighted scores, in which we calculate the average scores of public firms in a region in each year, weighted by the lagged market capitalization.

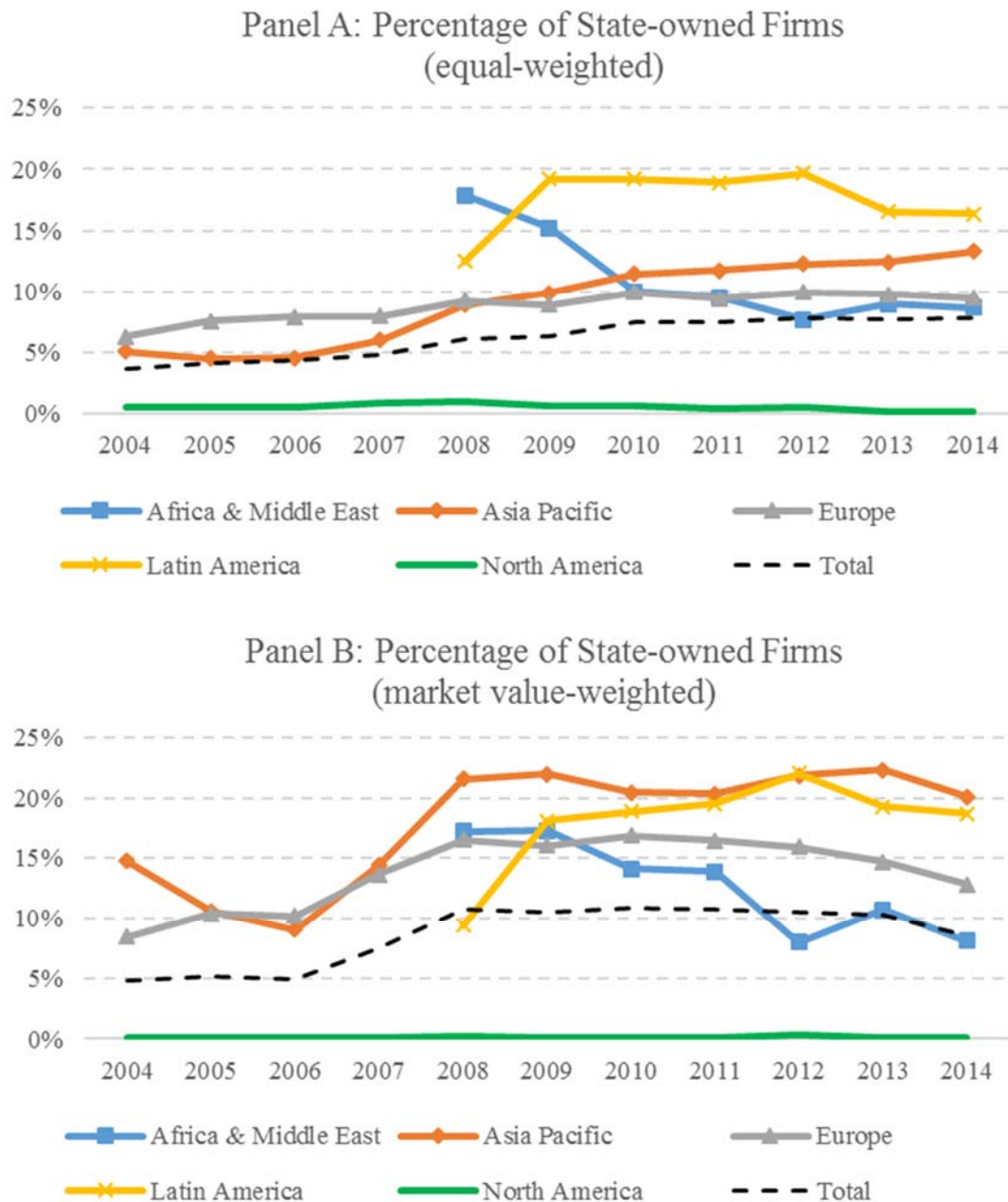


**Figure IA.2 Average Social Scores of Publicly-listed Firms, per Geographic Regions and Years**  
 This figure presents the time series patterns of the average of social pillar scores (*SOCSCORE*) of public firms in the five geographical regions. The sample period is from 2004 to 2014. Panel A presents equal-weighted averages, calculated with the simple average score of public firms in a region in each year. Panel B shows value-weighted scores, in which we calculate the average scores of public firms in a region in each year, weighted by the lagged market capitalization.



**Figure IA.3 Average Corporate Governance Scores of Publicly-listed Firms, per Geographic Regions and Years**

This figure presents the time series patterns of the average of corporate governance pillar scores (*CGVSCORE*) of public firms in the five geographical regions. The sample period is from 2004 to 2014. Panel A presents equal-weighted averages, calculated with the simple average score of public firms in a region in each year. Panel B shows value-weighted scores, in which we calculate the average scores of public firms in a region in each year, weighted by the lagged market capitalization.



**Figure IA. 4. Average State Ownership of Publicly-listed Firms, per Geographic Region and Year**

This figure presents the time series patterns of the proportion of state-owned public firms in the five different regions. The sample period is from 2004 to 2014. Panel A presents equal-weighted averages, in which we calculate the ratio of the number of state-owned firms among all public firms in a region in each year in our sample. Panel B shows value-weighted averages, in which we calculate the average ratios of state-owned firms among all public firms in a region in each year in our sample, weighted by the lagged market capitalization.

**Table IA.1. Sample Data Distribution Across Years**

This table presents the number of firm-year observations with available data on state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE* and sub-scores: emission reduction *ENER*, product innovation *ENPI*, resource reduction *ENRR*) across the sample years (2002-2014).

Year	<i>State_own</i>	<i>ENVSCORE</i>	<i>ENER</i>	<i>ENPI</i>	<i>ENRR</i>	Observations used in regressions
2004	4,592	1,819	1,827	1,827	1,827	1,463
2005	4,592	2,235	2,244	2,244	2,244	1,829
2006	4,567	2,248	2,257	2,257	2,257	1,858
2007	4,557	2,425	2,436	2,436	2,436	2,005
2008	4,546	2,918	2,929	2,929	2,929	2,395
2009	4,536	3,347	3,360	3,360	3,360	2,764
2010	4,523	3,958	3,978	3,978	3,978	3,174
2011	4,496	4,048	4,070	4,070	4,070	3,270
2012	4,472	4,128	4,150	4,150	4,150	3,404
2013	4,410	4,225	4,246	4,246	4,246	3,473
2014	4,278	4,130	4,131	4,131	4,131	3,255
Total	58,748	37,402	37,561	37,561	37,561	28,890

**Table IA.2. Comparisons by Countries**

In this table, we present the averages of state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE* and sub-scores: emission reduction *ENER*, product innovation *ENPI*, resource reduction *ENRR*), social pillar score (*SOCSCORE*), and corporate governance pillar score (*CGVSCORE*). We also conduct t-tests for the difference in averages across state-owned and non-state-owned firms and report the p-value based on unequal variance. In Morocco (MA), we only have one observation in *State\_own*=1 and the p-value cannot be calculated.

Country	Obs	<i>State_own</i>	<i>ENVSCORE</i>			p-value (1 - 0)	<i>ENER</i>			p-value (1 - 0)
			All	<i>State_own</i> =1	<i>State_own</i> =0		All	<i>State_own</i> =1	<i>State_own</i> =0	
Total	28,890	0.066	51.51	57.40	51.13	0.00	51.45	58.81	50.96	0.00
AT	167	0.224	56.65	78.42	49.88	0.00	54.98	80.90	47.12	0.00
AU	1,855	0.012	36.91	47.95	36.80	0.07	40.15	51.70	40.01	0.04
BE	237	0.072	56.50	64.10	56.13	0.34	56.53	61.02	56.39	0.61
BR	401	0.194	53.51	68.79	49.78	0.00	52.50	65.42	49.26	0.00
CA	1,635	0.018	39.01	33.81	38.98	0.27	42.09	44.06	41.93	0.68
CH	485	0.046	58.41	67.57	57.95	0.15	57.15	69.85	56.54	0.02
CL	115	0.211	40.19	39.81	40.54	0.91	39.43	42.18	38.93	0.61
CN	218	0.651	26.01	28.92	20.58	0.00	24.39	28.61	16.49	0.00
CO	26	0.600	48.77	59.70	33.50	0.02	54.64	64.40	43.08	0.08
CZ	22	0.364	51.00	61.92	44.76	0.00	46.32	86.10	23.59	0.00
DE	734	0.079	67.38	69.65	67.11	0.45	64.75	68.73	64.40	0.25
DK	227	0.000	57.10		56.94		54.92		54.76	
EG	55	0.170	19.55	10.55	21.15	0.00	21.37	11.33	23.11	0.00
ES	420	0.024	71.90	87.47	71.75	0.00	71.62	86.56	71.44	0.01
FI	244	0.169	76.11	88.02	73.94	0.00	69.22	88.12	65.66	0.00
FR	901	0.116	76.93	79.53	76.67	0.24	74.56	79.25	73.99	0.03
GB	2,893	0.020	60.14	63.34	60.10	0.39	62.80	69.50	62.67	0.08
GR	192	0.287	50.25	69.69	42.92	0.00	53.39	74.83	45.21	0.00
HK	920	0.185	34.69	40.49	33.78	0.00	33.12	37.89	32.49	0.02
HU	22	0.227	75.69	35.23	87.58	0.00	76.63	51.58	84.00	0.00
ID	139	0.477	46.41	46.58	46.82	0.96	51.94	53.08	51.80	0.79
IE	117	0.103	44.03	72.69	40.76	0.00	45.64	71.13	42.73	0.00
IL	82	0.000	42.73		42.34		37.24		36.66	
IN	362	0.218	54.98	52.61	55.62	0.44	54.42	55.70	54.15	0.71
IT	426	0.231	55.00	81.41	46.84	0.00	53.93	81.50	45.42	0.00
JP	3,939	0.016	62.23	70.17	62.12	0.03	61.94	72.24	61.80	0.00
KR	564	0.075	61.73	65.77	61.34	0.31	61.18	69.18	60.43	0.06
LU	18	0.000	60.19		60.19		52.85		52.85	
MA	19	0.056	27.30	54.56	23.33	-	25.57	61.80	23.06	-
MX	115	0.000	43.00		42.73		45.33		44.92	
MY	207	0.490	40.12	51.97	29.13	0.00	44.71	54.10	35.94	0.00
NL	286	0.017	69.67	85.72	69.38	0.00	67.06	68.86	67.02	0.86
NO	174	0.293	66.21	85.57	58.19	0.00	63.98	82.11	56.47	0.00
NZ	65	0.154	44.31	76.07	38.54	0.00	43.31	71.02	38.27	0.00
PE	7	0.000	27.40		27.40		41.28		41.28	
PH	63	0.164	44.86	42.04	46.01	0.68	42.42	48.10	41.42	0.57
PL	128	0.457	35.39	44.60	27.94	0.00	38.78	50.98	28.92	0.00
PT	103	0.140	67.44	78.67	65.14	0.04	69.26	84.03	66.12	0.02
RU	187	0.384	46.48	56.83	40.14	0.00	49.90	57.82	45.11	0.00
SE	454	0.047	67.71	82.53	66.92	0.00	64.58	83.88	63.57	0.00
SG	414	0.380	36.98	45.66	32.19	0.00	37.82	46.77	32.87	0.00
TH	136	0.415	49.30	68.88	35.19	0.00	48.04	73.11	30.53	0.00
TR	135	0.250	51.04	34.88	55.89	0.00	51.49	37.08	55.55	0.00
US	8,536	0.003	44.23	19.42	44.31	0.00	42.95	24.79	43.00	0.00
ZA	445	0.058	53.33	59.25	52.54	0.14	55.27	56.69	54.86	0.74

**Table IA.2. (continued)**

Country	<i>ENPI</i> All	<i>ENPI</i> <i>State own=1</i>	<i>ENPI</i> <i>State own=0</i>	p-value (1 - 0)	<i>ENRR</i> All	<i>ENRR</i> <i>State own=1</i>	<i>ENRR</i> <i>State own=0</i>	p-value (1 - 0)
Total	49.16	51.16	49.07	0.00	51.72	57.41	51.34	0.00
AT	55.25	67.03	51.33	0.00	53.66	74.65	47.16	0.00
AU	34.69	33.59	34.74	0.85	39.16	60.32	38.92	0.00
BE	50.74	61.85	50.04	0.09	56.67	64.84	56.25	0.32
BR	46.89	56.61	44.57	0.00	56.34	71.56	52.67	0.00
CA	36.23	27.63	36.35	0.02	40.45	34.56	40.39	0.24
CH	54.97	65.89	54.39	0.08	58.25	62.62	58.05	0.54
CL	39.81	42.56	39.30	0.61	43.05	37.62	44.63	0.27
CN	38.47	37.28	40.69	0.37	23.13	27.40	15.14	0.00
CO	38.17	46.24	28.07	0.05	50.86	60.28	34.02	0.02
CZ	51.33	33.56	61.49	0.00	51.43	53.90	50.02	0.54
DE	65.09	57.89	65.69	0.04	66.30	71.60	65.71	0.10
DK	54.79		54.62		58.09		57.94	
EG	25.05	18.63	26.66	0.00	20.67	10.07	22.22	0.00
ES	60.63	85.49	60.20	0.00	72.95	78.94	73.07	0.09
FI	78.39	84.05	77.30	0.05	71.03	77.77	69.92	0.02
FR	70.22	71.47	70.19	0.68	76.66	77.95	76.52	0.55
GB	48.16	45.96	48.26	0.57	62.88	67.62	62.78	0.20
GR	37.45	45.89	34.21	0.01	55.32	76.57	47.39	0.00
HK	36.85	42.61	35.57	0.00	37.07	42.58	36.35	0.01
HU	70.86	28.00	83.46	0.00	71.43	34.58	82.27	0.00
ID	37.26	37.58	36.66	0.84	48.70	46.25	51.62	0.26
IE	41.01	70.06	37.69	0.00	45.12	63.80	42.99	0.00
IL	40.99		40.92		49.35		48.95	
IN	48.83	42.24	50.62	0.02	59.16	55.29	60.21	0.20
IT	52.84	73.52	46.38	0.00	56.28	77.78	49.66	0.00
JP	63.09	66.64	63.04	0.32	57.26	65.52	57.14	0.05
KR	63.98	61.64	64.20	0.56	56.14	58.05	55.90	0.62
LU	57.76		57.76		60.94		60.94	
MA	27.54	19.15	24.40	-	33.38	75.92	29.03	-
MX	34.56		34.69		47.50		47.13	
MY	37.32	48.88	26.60	0.00	40.53	50.09	31.63	0.00
NL	63.14	85.12	62.75	0.00	70.53	85.43	70.27	0.01
NO	64.62	82.94	57.03	0.00	61.74	78.55	54.78	0.00
NZ	45.98	84.61	38.96	0.00	41.67	60.42	38.26	0.00
PE	18.82		18.82		33.43		33.43	
PH	43.30	30.37	46.54	0.03	48.75	46.97	49.78	0.68
PL	34.78	34.52	34.90	0.91	34.85	46.91	25.09	0.00
PT	56.18	59.68	56.06	0.57	67.15	79.06	64.54	0.02
RU	34.90	42.22	30.37	0.00	52.53	63.43	45.83	0.00
SE	66.35	68.01	66.15	0.74	64.50	79.00	63.73	0.00
SG	35.14	37.99	33.60	0.11	40.67	51.22	34.88	0.00
TH	47.37	61.70	36.62	0.00	50.58	61.63	42.60	0.00
TR	51.33	41.18	54.22	0.03	49.65	29.56	56.31	0.00
US	45.00	21.92	45.09	0.00	44.82	21.37	44.88	0.00
ZA	40.54	41.20	40.04	0.81	60.46	72.73	59.42	0.00

**Table IA.2. (continued)**

Country	<i>SOCSCORE</i>	<i>SOCSCORE</i>	<i>SOCSCORE</i>	p-value (1 - 0)	<i>CGVSCORE</i>	<i>CGVSCORE</i>	<i>CGVSCORE</i>	p-value (1 - 0)
	All	<i>State own=1</i>	<i>State own=0</i>		All	<i>State own=1</i>	<i>State own=0</i>	
Total	52.07	61.88	51.41	0.00	53.36	41.67	54.24	0.00
AT	56.08	87.38	46.75	0.00	33.32	48.26	28.71	0.00
AU	39.30	52.69	39.24	0.04	63.42	71.81	63.44	0.10
BE	52.96	67.52	52.04	0.09	50.56	52.84	50.49	0.59
BR	64.11	86.21	58.72	0.00	27.24	28.04	27.11	0.67
CA	39.72	26.66	39.90	0.00	73.74	73.80	73.75	0.99
CH	56.61	56.39	56.61	0.97	47.10	39.11	47.62	0.11
CL	44.91	44.76	45.29	0.95	9.26	9.33	9.31	0.99
CN	25.40	30.71	15.48	0.00	24.59	26.33	21.33	0.05
CO	71.34	77.48	62.04	0.24	28.21	32.82	22.20	0.23
CZ	70.32	75.72	67.23	0.02	18.27	24.79	14.55	0.00
DE	68.48	67.05	68.53	0.67	34.59	30.44	34.97	0.07
DK	54.07		53.88		38.02		37.85	
EG	27.24	12.45	29.99	0.00	8.64	2.30	9.77	0.00
ES	78.12	94.15	77.98	0.00	50.24	55.75	50.15	0.24
FI	70.35	85.47	67.44	0.00	60.87	63.32	60.51	0.32
FR	78.17	81.77	77.74	0.06	55.07	51.64	55.55	0.12
GB	63.31	67.70	63.25	0.22	73.89	65.51	74.08	0.00
GR	50.69	67.35	44.55	0.00	17.72	23.84	15.49	0.00
HK	35.98	38.76	35.82	0.23	36.48	41.96	35.11	0.00
HU	78.51	34.34	91.50	0.00	41.16	34.47	43.12	0.11
ID	62.82	71.48	56.43	0.00	26.03	35.39	18.78	0.00
IE	36.74	50.74	35.14	0.01	64.48	65.43	64.37	0.83
IL	45.73		45.08		37.17		36.88	
IN	58.84	61.23	58.25	0.38	29.11	14.91	32.89	0.00
IT	64.23	86.13	57.51	0.00	43.97	53.81	41.01	0.00
JP	47.32	57.70	47.16	0.02	11.96	13.77	11.94	0.30
KR	57.05	72.12	55.70	0.00	13.79	10.21	14.09	0.00
LU	50.93		50.93		58.92		58.92	
MA	54.64	87.75	50.62	-	5.45	14.80	4.82	-
MX	45.06		44.64		13.16		13.16	
MY	49.12	64.32	34.62	0.00	46.94	58.28	35.29	0.00
NL	77.46	90.48	77.23	0.00	64.51	74.15	64.34	0.00
NO	69.81	89.97	61.45	0.00	63.62	71.78	60.24	0.00
NZ	41.47	46.59	40.54	0.54	62.47	66.47	61.74	0.31
PE	31.99		31.99		51.66		51.66	
PH	45.31	57.02	43.73	0.15	28.78	27.42	29.15	0.76
PL	42.30	55.41	31.83	0.00	23.24	27.09	20.18	0.02
PT	76.88	88.50	74.62	0.00	56.78	46.00	58.71	0.13
RU	54.68	62.50	49.59	0.00	28.74	28.03	29.40	0.64
SE	64.94	85.60	63.74	0.00	54.29	64.16	53.80	0.01
SG	40.79	52.71	34.38	0.00	43.78	53.16	38.97	0.00
TH	59.71	73.89	49.45	0.00	45.53	48.97	42.73	0.11
TR	55.79	38.17	61.65	0.00	22.47	19.94	23.09	0.29
US	47.61	23.52	47.68	0.00	74.15	71.84	74.17	0.30
ZA	71.34	72.29	71.15	0.83	60.76	63.94	60.15	0.31



**Table IA.3. Comparisons by Industries**

This table presents the averages of state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE*) and sub-scores: emission reduction *ENER*, product innovation *ENPI*, resource reduction *ENRR*, social pillar score (*SOCSCORE*), and corporate governance pillar score (*CGVSCORE*) in ten different industries: Basic Materials, Consumer Goods, Consumer Services, Financials, Health Care, Industrials, Oil & Gas, Technology, Telecommunications, and Utilities. We also conduct t-tests for the difference in averages across state-owned and non-state-owned firms and report the p-value based on unequal variance.

Industry	Obs	<i>State_own</i>	<i>ENVSCORE</i>			p-value	<i>ENER</i>			p-value
			All	<i>State_own</i> =1	<i>State_own</i> =0		(1 - 0)	All	<i>State_own</i> =1	
Basic Materials	3015	0.056	55.58	59.84	55.40	0.07	58.38	62.94	58.16	0.05
Consumer Goods	3,370	0.019	61.55	47.15	61.90	0.00	59.96	48.85	60.26	0.00
Consumer Services	3,992	0.023	41.05	52.56	40.79	0.00	41.00	58.37	40.59	0.00
Financials	5,059	0.069	43.23	46.36	43.04	0.06	41.47	40.42	41.60	0.50
Health Care	1,633	0.010	43.79	20.76	44.06	0.00	44.24	27.83	44.43	0.04
Industrials	5,610	0.053	59.08	53.83	59.38	0.00	57.31	56.64	57.35	0.70
Oil & Gas	2,061	0.126	45.48	64.61	42.69	0.00	51.42	68.79	48.86	0.00
Technology	1,960	0.021	51.69	63.00	51.46	0.03	48.05	61.04	47.79	0.01
Telecommunications	771	0.317	55.43	63.37	51.95	0.00	54.71	62.69	51.13	0.00
Utilities	1405	0.256	63.53	64.80	63.32	0.36	69.93	69.70	70.23	0.73
Total	28,876	0.066	51.52	57.40	51.14	0.00	51.46	58.81	50.97	0.00

Industry	<i>ENPI</i>	<i>ENRR</i>			p-value	<i>ENRR</i>	<i>ENRR</i>			p-value
		All	<i>State_own</i> =1	<i>State_own</i> =0			(1 - 0)	All	<i>State_own</i> =1	
Basic Materials	49.57	51.01	49.59	0.58	55.14	59.51	54.92	0.06		
Consumer Goods	59.38	41.96	59.78	0.00	60.85	48.94	61.14	0.00		
Consumer Services	36.90	36.17	36.96	0.77	46.01	57.66	45.74	0.00		
Financials	42.89	50.33	42.37	0.00	45.26	47.01	45.16	0.32		
Health Care	39.91	23.61	40.13	0.02	47.33	21.12	47.59	0.00		
Industrials	59.43	47.52	60.11	0.00	56.19	54.50	56.29	0.33		
Oil & Gas	40.69	53.47	38.81	0.00	44.08	63.28	41.27	0.00		
Technology	55.58	63.88	55.42	0.10	50.57	64.41	50.28	0.01		
Telecommunications	51.54	56.74	49.26	0.00	56.74	64.96	53.09	0.00		
Utilities	53.16	54.94	52.68	0.19	59.50	61.85	58.91	0.07		
Total	49.16	51.16	49.07	0.01	51.73	57.41	51.36	0.00		

Industry	<i>SOCSCORE</i>	<i>SOCSCORE</i>			p-value	<i>CGVSCORE</i>	<i>CGVSCORE</i>			p-value
		All	<i>State_own</i> =1	<i>State_own</i> =0			(1 - 0)	All	<i>State_own</i> =1	
Basic Materials	53.39	63.75	52.79	0.00	54.89	53.80	55.03	0.62		
Consumer Goods	57.76	44.97	58.06	0.00	46.95	38.20	47.21	0.02		
Consumer Services	46.35	54.08	46.17	0.01	53.55	43.93	53.82	0.00		
Financials	46.02	54.30	45.49	0.00	49.99	37.60	50.98	0.00		
Health Care	50.63	26.25	50.91	0.00	55.82	29.47	56.15	0.00		
Industrials	55.40	55.26	55.41	0.93	52.47	41.08	53.13	0.00		
Oil & Gas	48.52	67.23	45.80	0.00	63.62	41.12	66.86	0.00		
Technology	51.53	60.40	51.32	0.06	58.82	48.78	59.13	0.03		
Telecommunications	62.53	69.97	59.15	0.00	52.13	48.34	54.09	0.01		
Utilities	62.40	71.35	59.56	0.00	55.66	36.14	62.43	0.00		
Total	52.08	61.88	51.42	0.00	53.36	41.67	54.24	0.00		

**Table IA.4. Comparisons by Sample Years**

This table presents the averages of state ownership dummy (*State\_own*), environmental pillar score (*ENVSCORE* and sub-scores: emission reduction *ENER*, product innovation *ENPI*, resource reduction *ENRR*), social pillar score (*SOCSCORE*), and corporate governance pillar score (*CGVSCORE*) in each year from 2004 to 2014. We also conduct t-tests for the difference in averages across state-owned and non-state-owned firms and report the p-value based on unequal variance.

Year	Obs	<i>State_own</i>	<i>ENVSCORE</i> All	<i>ENVSCORE</i> <i>State_own</i> =1	<i>ENVSCORE</i> <i>State_own</i> =0	p-value (1 - 0)	<i>ENER</i> All	<i>ENER</i> <i>State_own</i> =1	<i>ENER</i> <i>State_own</i> =0	p-value (1 - 0)
2004	1,463	0.037	49.26	59.41	48.87	0.02	48.87	58.13	48.52	0.03
2005	1,829	0.042	49.38	59.31	48.95	0.00	49.10	59.43	48.65	0.00
2006	1,858	0.043	49.71	56.96	49.43	0.04	49.43	56.24	49.19	0.05
2007	2,005	0.048	51.46	59.37	51.06	0.01	51.25	60.31	50.77	0.00
2008	2,395	0.060	52.05	58.77	51.64	0.01	51.75	60.93	51.18	0.00
2009	2,764	0.063	51.77	55.25	51.54	0.14	51.68	57.92	51.28	0.01
2010	3,174	0.075	51.96	55.91	51.59	0.05	51.88	57.45	51.39	0.01
2011	3,270	0.075	51.99	56.54	51.65	0.02	52.00	58.32	51.52	0.00
2012	3,404	0.078	51.60	56.69	51.12	0.01	51.70	58.43	51.08	0.00
2013	3,473	0.077	51.54	58.34	51.14	0.00	51.76	59.60	51.25	0.00
2014	3,255	0.079	53.10	58.51	52.85	0.01	53.19	59.76	52.81	0.00
Total	28,890	0.066	51.51	57.40	51.13	0.00	51.45	58.81	50.96	0.00
Year			<i>ENPI</i> All	<i>ENPI</i> <i>State_own</i> =1	<i>ENPI</i> <i>State_own</i> =0	p-value (1 - 0)	<i>ENRR</i> All	<i>ENRR</i> <i>State_own</i> =1	<i>ENRR</i> <i>State_own</i> =0	p-value (1 - 0)
2004			46.66	53.60	46.39	0.06	48.72	59.32	48.31	0.01
2005			46.73	45.97	46.77	0.81	48.93	63.15	48.31	0.00
2006			47.22	45.61	47.36	0.60	49.57	60.40	49.07	0.00
2007			49.35	53.46	49.15	0.19	51.50	58.81	51.13	0.02
2008			50.23	54.04	50.02	0.15	52.24	57.03	51.94	0.07
2009			49.84	49.66	49.85	0.94	51.81	55.12	51.60	0.16
2010			49.56	50.92	49.41	0.47	52.22	54.86	51.96	0.18
2011			49.55	50.71	49.47	0.56	52.41	56.62	52.09	0.03
2012			49.26	50.55	49.14	0.49	52.26	57.08	51.80	0.01
2013			49.17	52.63	49.05	0.08	52.04	58.16	51.67	0.00
2014			50.40	52.18	50.46	0.41	53.48	58.31	53.22	0.01
Total			49.16	51.16	49.07	0.01	51.72	57.41	51.34	0.00
Year			<i>SOCSCORE</i> All	<i>SOCSCORE</i> <i>State_own</i> =1	<i>SOCSCORE</i> <i>State_own</i> =0	p-value (1 - 0)	<i>CGVSCORE</i> All	<i>CGVSCORE</i> <i>State_own</i> =1	<i>CGVSCORE</i> <i>State_own</i> =0	p-value (1 - 0)
2004			50.50	60.96	50.10	0.01	52.64	41.29	53.08	0.01
2005			50.32	62.22	49.80	0.00	51.86	44.41	52.19	0.03
2006			50.67	62.17	50.13	0.00	51.95	42.40	52.43	0.00
2007			51.74	60.83	51.26	0.00	52.21	44.70	52.60	0.01
2008			52.36	61.31	51.79	0.00	52.78	38.62	53.70	0.00
2009			51.83	60.41	51.27	0.00	52.88	36.72	54.01	0.00
2010			52.25	60.69	51.54	0.00	53.93	38.51	55.13	0.00
2011			52.45	62.17	51.70	0.00	53.80	40.37	54.95	0.00
2012			51.95	61.55	51.10	0.00	53.78	44.93	54.61	0.00
2013			52.12	62.88	51.37	0.00	53.86	42.35	55.04	0.00
2014			54.27	63.75	53.66	0.00	54.91	44.85	55.94	0.00
Total			52.07	61.88	51.41	0.00	53.36	41.67	54.24	0.00