european corporate governance institute

ecgi

Leviathan Inc. and Corporate Environmental Engagement

Finance Working Paper N° 256/2017
January 2021

Po-Hsuan Hsu
National Tsing Hua University

Hao Liang
Singapore Management University and ECGI

Pedro Matos
University of Virginia and ECGI

© Po-Hsuan Hsu, Hao Liang and Pedro Matos 2021. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

This paper can be downloaded without charge from:
http://ssrn.com/abstract_id=2960832

www.ecgi.global/content/working-papers

european corporate governance institute

ECGI Working Paper Series in Finance

Leviathan Inc. and Corporate Environmental Engagement

Working Paper N° 256/2017

January 2021

Po-Hsuan Hsu
Hao Liang
Pedro Matos

The authors thank Warren Bailey, Alon Brav, David Chapman, Aaron Chatterji, Rui Dai, Zhonglan Dai, Ran Duchin, Alex Dyck, Caroline Flammer, Michael Gallmeyer, Jarrad Harford, Justin Hopkins, Wei Jiang, Augustin Landier, Karl Lins, Marc Lipson, Inessa Liskovich, Alexander Ljungqvist, Paige Ouimet, Paolo Pasquariello, Ivan Png, David Reeb, Hong Ru, David Robinson, Jacob Sagi, Kelly Shue, Per Stromberg, Dimitri Vayanos, Xinxin Wang, Yanzhi Wang, George Wong, Yan Xu, Bernard Yeung, Alminas Žaldokas, and the conference and seminar participants at the Biennial Conference of Hong Kong Economic Association, the China International Conference in Finance, the CUHK, CUHK Shenzhen, Darden, Duke, AFA (Philadelphia), ECGI Global Corporate Governance Colloquium, the EFA (Mannheim), FGV-EBAPE, FMA (Boston), FMA Asia Pacific (Hong Kong), FMA Europe (Lisbon), Korea University, KAIST, Lubrafin, the NCTU International Finance Conference, PKU, the Review of Finance Shanghai Green Finance Conference, SAIF, the Santiago Finance Workshop, the SMU Brownbag and Summer Camp, the Swedish House of Finance-MFS Conference on Sustainable Finance, Tilburg, Tsinghua and UNC Chapel Hill. We also appreciate the research assistance of Chao-Jhih Liu, Yunan Liu, and Jui-Ni Lu. Hao Liang acknowledges the DBS Sustainability Fellowship from Singapore Management University. Po-Hsuan Hsu acknowledges the fellowship from the Batten Institute of Darden School of Business of the University of Virginia, and the financial support from the E.SUN Academic Award, Ministry of Science and Technology and Ministry of Education in Taiwan (MOST108-2410-H-007-099-MY2, MOST109-2628-H-007-001-MY4, MOST109-2634-F-002-045, MOE109J0321Q2, and MOE109L900202).

© Po-Hsuan Hsu, Hao Liang and Pedro Matos 2021. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Abstract

In a 2010 special report, The Economist magazine termed the resurgence of state-owned, publicly listed enterprises “Leviathan Inc.” and criticized the poor governance and low efficiency of these firms. We compile a new comprehensive dataset of state ownership of publicly listed firms in 44 countries over the period of 2004–2017 and show that state-owned enterprises are more responsive to environmental issues. The effect is more pronounced in economies lacking energy security and strong environmental regulation, and among firms with more local operations and higher domestic government ownership. We find a similar effect on corporate social engagement but not on governance quality. These results suggest a different role for “Leviathan Inc.,” especially in dealing with environmental externalities.

Keywords: State ownership, environmental engagement, sustainability, ownership structure

JEL Classifications: G32, H11, H41, Q56

Po-Hsuan Hsu
Professor
National Tsing Hua University, Department of Quantitative Finance
101, Section 2, Kuang-Fu Road
Hsinchu City , Taiwan
e-mail: pohsuan.hsu@gmail.com

Hao Liang*
Associate Professor of Finance
Singapore Management University, Lee Kong Chian School of Business
50 Stamford Road
Singapore 178899, Singapore
phone: +65 6828 0662
e-mail: hliang@smu.edu.sg

Pedro Matos
Professor of Business Administration
University of Virginia, Darden School of Business
100 Darden Boulevard
Charlottesville, VA 22903, United States
phone: +1 434 243 8998
e-mail: MatosP@darden.virginia.edu

*Corresponding Author

Leviathan Inc. and Corporate Environmental Engagement

Po-Hsuan Hsu, National Tsing Hua University

Hao Liang, Singapore Management University, ECGI

Pedro Matos, University of Virginia – Darden School of Business, ECGI

This version: December 2020

Abstract

In a 2010 special report, *The Economist* magazine termed the resurgence of state-owned, publicly listed enterprises "Leviathan Inc." and criticized the poor governance and low efficiency of these firms. We compile a new comprehensive dataset of state ownership of publicly listed firms in 44 countries over the period of 2004–2017 and show that state-owned enterprises are more responsive to environmental issues. The effect is more pronounced in economies lacking energy security and strong environmental regulation, and among firms with more local operations and higher domestic government ownership. We find a similar effect on corporate social engagement but not on governance quality. These results suggest a different role for "Leviathan Inc.," especially in dealing with environmental externalities.

Keywords: State ownership, environmental engagement, sustainability, ownership structure

JEL classification: G32, H11, H41, Q56

---

† The authors thank Warren Bailey, Alon Brav, David Chapman, Aaron Chatterji, Rui Dai, Zhonglan Dai, Ran Duchin, Alex Dyck, Caroline Flammer, Michael Gallmeyer, Jarrad Harford, Justin Hopkins, Wei Jiang, Augustin Landier, Karl Lins, Marc Lipson, Inessa Liskovich, Alexander Ljungqvist, Paige Ouimet, Paolo Pasquariello, Ivan Png, David Reeb, Hong Ru, David Robinson, Jacob Sagi, Kelly Shue, Per Stromberg, Dimitri Vayanos, Xinxin Wang, Yanzhi Wang, George Wong, Yan Xu, Bernard Yeung, Alminas Žaldokas, and the conference and seminar participants at the Biennial Conference of Hong Kong Economic Association, the China International Conference in Finance, the CUHK, CUHK Shenzhen, Darden, Duke, AFA (Philadelphia), ECGI Global Corporate Governance Colloquium, the EFA (Mannheim), FGV-EBAPE, FMA (Boston), FMA Asia Pacific (Hong Kong), FMA Europe (Lisbon), Korea University, KAIST, Lubrafin, the NCTU International Finance Conference, PKU, the Review of Finance Shanghai Green Finance Conference, SAIF, the Santiago Finance Workshop, the SMU Brownbag and Summer Camp, the Swedish House of Finance-MFS Conference on Sustainable Finance, Tilburg, Tsinghua and UNC Chapel Hill. We also appreciate the research assistance of Chao-Jhih Liu, Yunan Liu, and Jui-Ni Lu. Hao Liang acknowledges the DBS Sustainability Fellowship from Singapore Management University. Po-Hsuan Hsu acknowledges the fellowship from the Batten Institute of Darden School of Business of the University of Virginia, and the financial support from the E.SUN Academic Award, Ministry of Science and Technology and Ministry of Education in Taiwan (MOST108-2410-H-007-099-MY2, MOST109-2628-H-007-001-MY4, MOST109-2634-F-002-045, MOE109J0321Q2, and MOE109L900202). Corresponding author: hliang@smu.edu.sg.

Electronic copy available at: https://ssrn.com/abstract=2960832

1. Introduction

With the rise of state capitalism around the world (*The Economist* 2010, 2014), the role of publicly traded, government-controlled enterprises has attracted new attention. In China, companies in which the state is a majority shareholder account for about two-thirds of local stock market capitalization. Other emerging market governments, such as that in Brazil or Russia, also hold majority or significant minority stakes in publicly listed companies. These stakes can be directly held by central or local governments or indirectly held through public pension funds or sovereign wealth funds. This pattern is contrary to that of many Western economies, in which large-scale privatizations in the 1980s and 1990s led to a decline in the role of the state in business ownership. But in the early 21st century, that trend has begun to reverse, with some of the world's largest publicly listed firms now being state-owned enterprises (SOEs), including some from developed economies, such as EDF Group in France and ENI in Italy. 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).[1]

The Economist (2010, 2014) termed these resurgent state-owned mega-enterprises "Leviathan Inc." and warned of the dangers of state-controlled capitalism.[2] This warning stems from a large literature on the economic inefficiency of state ownership, which 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). Rent-seeking by politicians running SOEs can lead to corruption, poor resource allocation, reduced innovation, and skewed wealth distribution (Shleifer 1998).

While studies mostly use profitability and stock market valuation to evaluate the efficiency implications of state ownership, such metrics may not represent the main objective of a firm whose shareholders care more about social welfare and externalities (Hart and Zingales 2017). Some recent studies re-examine publicly listed SOEs in emerging markets and document benefits of "state capitalism" in East Asia and Brazil (Carney and Child 2013, Boubakri et al. 2017, Musacchio and Lazzarini 2014, Musacchio et al. 2015). This line of research suggests that SOEs are not necessarily poorly governed and that their objectives differ from those of private firms. Instead, SOEs may help some economies more efficiently address market failures and externalities than private enterprises.

[1] This marked presence of state ownership among the biggest global companies may be understated, given that the Forbes Global 2000 covers only publicly listed companies. For example, Saudi Aramco, the largest energy company in the world and estimated to be the world's most valuable company, has been 100% owned by the Saudi Arabian government since 1980. It later went public on December 11, 2019.

[2] "Leviathan" is defined something that is very large and powerful (or a sea monster in scriptural accounts). "Leviathan" is generally used to refer to the political state based on its usage in Thomas Hobbes' "Leviathan or The Matter, Form and Power of a Common Wealth Ecclesiastical and Civil" (1651).

Electronic copy available at: https://ssrn.com/abstract=2960832

One crucial way that state ownership of businesses can act in the public interest is to address environmental issues (e.g., Besley and Ghatak 2001), an increasingly important topic that spans several of the United Nations Sustainable Development Goals. One key goal at present is to tackle anthropogenic climate change, commonly 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 among the recently industrialized economies. In 2010, the countries emitting the most greenhouse gases (GHG) were China (22%), the United States (13%), the European Union-28 (10%), India (5%), and Brazil (5%), according to the European Union's EDGAR data. (See Figure 1 for a more detailed visual illustration of CO_2 emissions per region over time.)[3] Nevertheless, these economies have also strived to mitigate pollution and climate change.[4] In addition to reducing GHG emissions, achieving efficient use of natural resources, such as energy, water, or materials, and reducing environmental pollution is an increasingly important policy issue.

In this paper, we conduct an international study of the impact of state ownership on firms' engagement in environmental issues. Our starting point is the idea that SOEs are created to deal with market failures and externalities, which were manifested mostly in social issues, such as employment, price stability, public transportation and infrastructure in the early days, but not much in environmental issues. However, as environmental issues become increasingly acute and pressing, governments have come to be seen as obliged to reduce pollution for the sake of public welfare (which we label as the "social view"), and politicians have become incentivized to support environmental protection so as to gain votes to remain power. The government's toolbox includes regulation and enforcement as well as SOEs. Relative to other tools, such as tax and regulations, which are often ambiguous and have significant bureaucratic costs,[5] an SOE may be a more agile option, as it allows the government to directly intervene in business decision-making. At the same time SOEs may also suffer from the well-known agency problems and political capture (Shleifer

[3] The Emission Database for Global Atmospheric Research (EDGAR) classifies CO_2, CH_4, N_2O, and F-gases as greenhouse gases (GHG). Under the United Nations Framework Convention for Climate Change (UNFCCC), countries submit their inventories of GHG emission data. 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_2 emissions for 2014 are similar: China (31%), United States (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.

[4] For example, UNEP (2016) estimates that, in 2015, for the first time, investment in renewable energies in emerging countries outweighed that in developed economies, with China contributing over a third of the world's total; see UNEP/Bloomberg New Energy Finance, "Global Trends in Renewable Energy Investment" (2016). In 2016, the Hangzhou G20 Summit focused on "green finance," and the U.S. and China ratified the 2015 Paris Agreement on climate change mitigation. The main aim of the Paris Agreement is to "[hold] the increase in the global average temperature to well below 2 °C above pre-industrial levels." 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.

[5] In terms of regulation and enforcement, governments can impose carbon taxes and provide research subsidies (Laffont and Tirole 1993, Acemoglu et al. 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).

Electronic copy available at: https://ssrn.com/abstract=2960832

1998). SOE managers may invest in environmental activities to pursue private benefits, including political capital, social reputation, and self-fulfillment (which we label as the "agency view"). On balance, we hypothesize that there is a positive effect of state ownership on firm-level environmental engagement.[6]

To empirically test this proposition, we compile a new comprehensive dataset of the level of state ownership using several databases and combine it with measures of environmental, social, and governance (ESG) performance of publicly listed firms in 44 countries from 2004 through 2017.[7] We focus primarily on how state ownership relates to corporate environmental sustainability (the "E" in ESG), as this relates to how a firm addresses market failures and externalities generated via its operations to the natural ecosystem and focuses on both inputs and outputs.[8] In the baseline tests, we use Thomson Reuters' ASSET4 environmental scores; however, we find consistent results using alternative environmental performance measures from two other widely used datasets: the MSCI ESG Intangible Value Assessment and Sustainalytics ESG Ratings.

Our main findings are that SOEs engage more in environmental issues, including emission mitigation, innovation in eco-efficient products or services, and reduction in the usage of natural resources and that they produce less total CO_2 emissions at the firm level. In a robustness check, we find that firms that were historically state-owned still perform better in environmental issues, suggesting that state ownership promotes environmental engagement, rather than governments picking and keeping "green companies" and divesting from polluters. In addition, we examine the effect of a firm being "newly state-owned" (based on a continuous variable of government ownership change by a significant amount) on the change of its environmental engagement and find consistent results. These results hold after controlling for firms' governance quality.

We conduct identification tests to enable a causal inference. In our first set of tests, we explore the time variation in environmental engagement by SOEs around significant world shocks to the awareness of climate change and other environmental problems. Using shocks that increase estimated costs of environmental problems provides a compelling test (especially for the importance of the social view), because such shocks would indicate that these environmental externalities had not been priced accurately. Therefore we first analyze the reaction of firms to the March 2011 Fukushima nuclear disaster in Japan, the

[6] Comparing these two tools in terms of their effectiveness in dealing with environmental externalities is beyond the scope of this paper. Nevertheless, through our empirical analysis, we aim to illuminate how the two tools interact.

[7] The intersection of available ownership data and environmental engagement data results in a sample of 44 countries. To mitigate the concern that some countries have only a small number of firms, we also examine the robustness of our baseline results when we only use a subsample of countries with at least 20 companies with available ESG ratings. SOEs are more prevalent in certain industries: namely, telecommunications, utilities, and oil and gas. There is considerable cross-country variation in state ownership in our sample.

[8] We use the terms "environmental engagement" and "sustainability" interchangeably throughout the paper.

Electronic copy available at: https://ssrn.com/abstract=2960832

most significant nuclear incident since the Chernobyl disaster in Ukraine in 1986. We find that SOEs, especially those in the utility industry and in countries with more nuclear power production, improved their environmental engagement after Fukushima. Second, we explore SOEs' reaction to temperature shocks, specifically abnormally high temperature, following Choi et al. (2020), and long-term drought, as both relate to "awareness" of environmental issues. We find that state-owned firms, especially those in high-polluting industries, increase their environmental engagement significantly when facing unusually high temperatures and droughts.

In our second set of tests, we examine the effect of change in the role of state ownership induced by a change in a government's political orientation. The literature has suggested that firms in more left-leaning states tend to be more environment-friendly (e.g., Di Giuli and Kostovetsky 2014). We find that SOEs become more environmentally engaged following a left-leaning change in a government's political orientation. Collectively, the two sets of identification tests provide strong evidence that firms' state ownership affects their environmental engagement.

We then explore potential mechanisms for the state ownership effect, which helps us further disentangle the social and agency views. We document a weaker environmental engagement by SOEs with more foreign activities, measured by foreign assets, foreign sales, and foreign income growth. These findings are consistent with the social view, as more domestically oriented SOEs care more about the local environment, which is the domain of the local government. We further document that the SOE effect is stronger in the case of direct ownership stakes by domestic state entities. In contrast, we do not find an effect in the case of stakes held by foreign governments or by sovereign wealth funds (SWFs). These results corroborate the findings about internationally (vis-à-vis domestically) focused SOEs and the notion that direct stakes by domestic governments are more focused in addressing market failures, especially with regard to environmental issues, whereas SWFs are more concerned with financial returns. In addition, we fail to find stronger effects of state ownership on environmental engagement in countries with weaker oversight of the government and corruption. This potentially suggests that the above results are not driven by politicians pursuing legitimacy and support from local voters (the "political view").

We also find empirical evidence for the agency view. Firm-level environmental engagement tends to be greater when the CEO is close to retirement, has a longer tenure with the company, or does not have political connections. Absent agency problems, the CEO's decision to address environmental issues should not depend on closeness to retirement and tenure with the company, unless the CEO aims to pursue a political career after retirement or is deeply entrenched. Similarly, a politically connected CEO, as an agent of the government, should invest more, rather than less, in environmental projects to more fully advance the social objectives of the SOE. These results suggest that part of corporate environmental engagement in

Electronic copy available at: https://ssrn.com/abstract=2960832

SOEs may also be driven by their CEOs' personal tastes and thus are consonant with the agency view. However, even after controlling for these agency indicators and firm-level governance, we find that state ownership still has strong explanatory power on environmental engagement, which suggests that the social view and the agency view are not mutually exclusive.

We further explore the cross-sectional variation in the effect of state ownership on firms' environmental engagement. We find that the baseline effect is more pronounced for firms in countries with greater energy risks and weaker environmental regulation. These results are again consonant with the social view that the government provides a helping hand when the institutional environment is weak.

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 blockholders beyond the government. We interpret this as suggesting that what state ownership captures is not simply a mechanical effect of concentrated ownership but can be attributed to the state as a unique type of owner.

Lastly, we examine firms' engagement in social issues and corporate governance, and compare the state ownership effects versus environmental engagement to illuminate the focus of SOEs. Interestingly, we document that SOEs also engage more in social issues but do not have better or worse corporate governance practices. These results indicate that governments indeed play a different role from other blockholders.

Our work contributes to the literature on government involvement in public companies. The classical view of SOEs has been framed around the conflicting financial and social objectives that these companies face (e.g., Megginson and Netter 2001, Chen et al. 2017). Central to this literature is the argument that state-owned firms usually have weaker corporate governance and poorer financial performance (e.g., Megginson et al. 1994, Dewenter and Malatesta 2001, Megginson and Netter 2001, Bortolotti and Faccio 2009). The partial privatization waves in many economies over the last decades, however, might have heralded the rise of a new breed of publicly listed SOEs. Recent studies document that "Leviathans" can often achieve good financial performance (e.g., Inoue et al. 2013, Cuervo-Cazurra et al. 2014, Musacchio et al. 2015), which challenges the traditional agency view. In East Asia, government-owned firms have been found to have higher market valuations than non-government-owned ones (Boubakri et al. 2017) and to produce better-quality patents in the presence of high-quality local governments (Jia et al. 2018). In the international context, other researchers have documented the growing cross-border acquisition activities by SOEs from autocratic countries targeting natural resources sectors (Karolyi and Liao 2017) as well as greater prevalence of SWF investments (Dewenter et al. 2010, Kotter and Lel 2011, Bortolotti et al. 2015). We argue that, given the urgency of climate change and other environmental problems, the role of SOEs in addressing environmental externalities is potentially more significant than ever and thus calls for additional

Electronic copy available at: https://ssrn.com/abstract=2960832

research. In many of the market economies, SOEs have undergone enormous change, spurred mostly by reforms that have swept through Europe, Latin America, and Asia (Cuervo-Cazurra et al. 2014). Given the rapid expansion of investment by SOEs and SWFs in the global arena, our findings have important policy implications.

We also contribute to the growing literature in finance examining how ownership structures affect corporate engagement in ESG issues. In the United States, large institutional investors have been shown to react to local sustainability preferences (Gibson-Brandon et al. 2020) and yield some power in terms of shareholder proposals, voting, and private engagements (Del Guercio and Tran 2012, Dimson et al. 2015). Institutional investors with better sustainability footprints also have better risk-adjusted performance (Gibson-Brandon et al. 2020). Internationally, institutional investors from certain countries that promote higher environmental and social standards (Dyck et al. 2019), especially those from prominent networks such as signatories of United Nations Principles for Responsible Investing (UNPRI), exhibit better portfolio-level ESG scores (Gibson-Brandon et al. 2020). Such ESG engagement by institutional investors can reduce downside risk (Hopner et al. 2016; Gibson-Brandon et al. 2020). In the environmental dimension specifically, institutional investors believe that climate risks have financial implications for the firms they invest and that these risks, particularly regulatory risks, already have begun to materialize (Krueger et al. 2020). To our knowledge, the role of state ownership with regard to ESG and externalities in general has not been examined, despite its growing importance. Our contribution is to show that state ownership appears to contribute positively to environmental performance (and to some extent with social performance but not with governance). Our finding of some positive roles of SOEs' ESG engagement in promoting social welfare is also consonant with the growing literature of how ESG in general contributes to firm value (Dowell et al. 2000, Servaes and Tamayo 2013, Flammer 2015, Lins et al. 2017).

2. Theoretical Framework

In this section, we present detailed discussion for the SOE effect on environmental engagement, based on a theoretical framework illustrated in Figure 2. Much of the literature tends to view SOEs as inefficient firms that are poorly managed without coherence in their strategy and resource allocation decisions, and, as a result, they are seen as are less efficient than privately owned firms. (See a review by Megginson and Netter (2001).) However, the literature largely overlooks the fact that SOEs are often created to deal with social externalities, such as infrastructure, unemployment, social stability, controlling strategic/special industries, and providing public goods. Dealing with these externalities implies that SOEs have different objective functions from other corporations and may be better at achieving particular goals. On top of this, environmental issues have recently achieved greater prominence because of climate change, so, in earlier

Electronic copy available at: https://ssrn.com/abstract=2960832

periods (which we denote as Period 0 in Figure 2), SOEs' potential and ability to address these issues may not have been fully appreciated by the public and the government.

As environmental externalities have more recently become a major public concern (Period 1 in Figure 2), a government can address them with several tools. (See a review by Laffont and Tirole (1993).) It can explicitly tax polluters and provide direct subsidies for promoting resource and energy efficiency as well as limiting the pollution of companies or mandating environmentally friendly actions. A government can also support non-profits and foundations that carry out projects that reduce environmental harms. Finally, it can also choose to be the provider of the goods to society, often via an SOE.

We refer the government's use of SOEs to address environmental externalities to improve social welfare as the "social view," which centers on the ideology and political strategy of government officials regarding the ownership of particular productive assets. The government sometimes needs to rely on SOEs to speed up the development of the country due to the inability of private enterprise to achieve this. The government also needs to continue investing in SOEs to facilitate the achievement of socially desirable objectives, such as pollution reduction. Under the social view, the government expresses preferences via agents who are placed as CEOs, and, within a government, there should be no difference in preferences. In the context of environmental externalities, given that SOE managers are insulated from short-term pressures on profitability, then can actually have a long-term orientation. The government may also acquire some private firms that have arrived at solutions and nationalize them, in order to adapt or target those solutions to desired outcomes.

Compared to the other options, relying on SOE has some unique advantages. For example, privately held companies usually lack long-term incentives, and their actions are strongly influenced by the short-term expectations of the capital markets. Regulations usually cannot have enough nuances for different sectors and corporations, nor specify every possible contingency, and thus are frequently criticized for being inefficient and ambiguous in practice (Rodrik, 2014). Non-profits and foundations may often find it difficult to secure long-term funding, and thus this model often turns out to be financially unsustainable. SOEs may be able to overcome these problems, because they are specifically established by the government to deal with externalities and control strategic industries (see Lindsay 1976, Levy 1987, and a review in Lawson (1994)). As a result, SOEs are typically backed by state resources, subsidies, preferential policies, and soft-budget constraints, and thus they could fill the gap the above alternatives may be unable to fill.

The selection of the best tool (or set of tools) is usually not clear-cut and depends on the complexity of the externalities as well as the ability of the state apparatus to monitor and implement the tools. In a static state, SOEs can be a more agile option for the government compared to taxation and regulation. However,

Electronic copy available at: https://ssrn.com/abstract=2960832

governments suffer from government failures (Le Grand, 1991), which can take the form of state capture, lack of technical capacity to run firms, and crowding out, all of which can limit their ability to effectively manage SOEs. Moreover, agency costs associated with SOE managers exist (Megginson et al. 1994, Shleifer 1998, Dewenter and Malatesta 2001, Megginson 2017). Under the agency view, SOE managers have low-powered incentives and are poorly monitored by boards filled with politicians (Shleifer and Vishny 1998, La Porta and Lopez-de-Silanes 1999). These SOE managers and board members may thus pursue private benefits, rather than acting in the interest of the public, which results in forgoing financial profitability, despite the abundance of resources that SOEs possess. SOE managers may have a taste for pro-environmental policies, but they also may choose to pursue the accumulation of political capital or social reputation or the satisfaction of personal taste and self-fulfillment. For example, SOE managers may engage in environmental activities to increase their visibility and social image, which could increase their personal utility or could advance their careers in businesses or governments. As a result, the personal agendas of SOE managers might include overinvestment in workers or environmental measures at the expense of shareholders (e.g., Di Giuli and Kostovetsky 2014, Masulis and Reza 2015, Cheng et al. 2016). In addition, SOE managers might be insulated from state regulatory investigations, leading them to underinvest in environmental measures. Therefore, the government faces a cost/benefit trade-off when choosing SOEs to deal with externalities.

To better connect to our empirical tests, it is important to define what each view encompasses and what it does not in our framework. First, the social view refers to the government using SOEs to deal with externalities so as to enhance societal welfare and secure strategic resources for the country. Under this definition, politicians pursuing legitimacy and support from voters should not be considered as supporting the social view. The reason for these politicians to use SOEs to deal with environmental problems is to fulfill political agendas, rather than maximizing social welfare. Some studies in political economy consider this as a "political view" (or can be regarded as an alternative "agency view" in the government). In contrast, the agency view refers to CEOs pursuing their personal tastes and agendas, which are different from those of shareholders. Under this definition, CEOs acting in accordance to the preference of a government (as the owner of SOEs) should not be considered as an outcome of the agency view. In other words, any outcomes from CEOs' efforts to maximize what dominating shareholders (the government) want should be regarded as shareholders' choices, rather than agency problems (Hart and Zingales 2017).

Based on the above definitions, we can develop several empirical predictions from each view. Under the social view, the role of state ownership will be more prominent when the costs of environmental harm to the society are greater and other tools are relatively inefficient in dealing with environmental externalities. This happens when the country's environmental regulations and energy security are weaker,

Electronic copy available at: https://ssrn.com/abstract=2960832

and when objective information emerges regarding the costs of environmental harm. In contrast, under the agency view, the role of state ownership may be weaker, given the lack of proper incentives for SOE managers for dealing with externalities. It should be noted that the two views do not necessarily preclude each other in an SOE. As illustrated in our conceptual framework in Figure 2, both the pursuit of social welfare and the agency costs can co-exist in SOEs (just as they have co-existed in dealing with social externalities before the awareness of environmental externalities). Instead, our main point is that, on top of the well-documented agency view, the social view of SOEs cannot be neglected and SOEs exist for a reason. In our empirical sections, we will test these different predictions under the two views.

3. Sample and Summary Statistics

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

3.1. Data and variables

3.1.1. State ownership

The primary data on state ownership comes from Orbis, a Bureau van Dijk database that provides the types of ultimate owners historically for over 70,000 publicly listed companies around the world.[9] If there is an ownership pyramid, an "ultimate owner" is identified by following an uninterrupted path of control rights. A company is defined as state-owned if the ultimate owner (which owns at least 25% of voting rights in every layer of the ownership pyramid) is a public authority, a state, or one or more government entities or at least 25% of its free-floating shares are held by governments from Datastream. 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. In our robustness tests, we also define state-owned firms as those with state ownership exceeding a 50% cutoff. The ownership data from Orbis are updated over time and restored in historical DVDs through which we extracted yearly information to construct our *State_own* measure.

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 São

[9] We do not include SOEs that are not publicly listed companies, and thus the state presence is underestimated in our study. In a smaller scope study by OECD (2013), this data was used to measure the distribution of SOEs across countries.

Electronic copy available at: https://ssrn.com/abstract=2960832

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—for example, Indosat in Indonesia (originally controlled by the government of Indonesia, then by the government of Singapore from 2003 through 2007, and by the Government of Qatar subsequently). Instances of foreign government control typically occur when a state-owned company or an SWF (e.g., GIC from Singapore or the Qatar Investment Authority) acquires a majority stake in a company overseas. Third, selling a stake to a foreign state-owned firm does not necessarily imply majority-ownership by a foreign state. An example is EDP Energias de Portugal, a company that was majority-owned by Parpublica (owned by the government of Portugal) until the government sold its shares in 2011, when China Three Gorges became the largest shareholder but held less than 25%. Thus we consider EDP Energias de Portugal as state-owned before 2012 but not afterward. Finally, some firms were initially not state-owned but were nationalized. A notable example is ABN AMRO, which the Dutch government nationalized in 2010.

Orbis 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.[10] To correct for such mismeasurements of state ownership, we consult three major databases—Orbis, FactSet/Lionshares, and Datastream—to cross-check the ownership information of 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 proceed to manually check a company's annual report and other public sources to determine whether its ultimate owner is a state entity. After these manual corrections, the number of firm-year observations for SOEs (*State_own* = 1) increased by about a third. In other words, the Orbis database may underestimate a third of public companies with regard to their state ownership. In Appendix 1, we provide some examples of these corrections for companies across different 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***) that we obtain from Datastream. Our *Government_held* 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 pyramid. Despite its limitations, we obtain consistent results using this alternative measure of state ownership.

3.1.2. Corporate environmental (and social and governance) engagement

[10] 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

To evaluate corporate engagement in environmental issues (as well as social and governance issues), we use data from Thomson Reuters' ASSET4 Environmental, Social, and Corporate Governance database (ASSET4) that has been used in previous ESG studies (e.g., Ferrell et al. 2016, Liang and Renneboog 2017, Dyck et al. 2019). The ASSET4 sample covers more than 7,000 global publicly listed companies included in major equity indices, such as the S&P 500, Russell 1000, NASDAQ 100, MSCI Europe, FTSE 250, ASX 300, STOXX 600, the MSCI World Index, and the MSCI Emerging Market index, among others.[11] 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 using 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 each year; in other words, the ratings are industry-benchmarked based on 136 unique industries defined by the Thomson Reuters Business Classification (TRBC). 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 10 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 United States. 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. There is a sample bias toward larger firms, but such firms are likely to have greater societal and environmental impact. In robustness checks, we also use data from alternative ranking services (the MSCI ESG Intangible Value Assessment and the Sustainalytics ESG Ratings databases).

In our main analysis, we focus on a company's overall environmental score (*ENVSCORE*) and three sub-scores: emissions reduction (*ENER*), product innovation (*ENPI*), and resource reduction (*ENRR*). *ENER* measures a company's commitment and effectiveness in reducing air emissions, waste, water discharges and spills or its impact on biodiversity. *ENPI* measures a company's research and development on eco-efficient products or services. *ENRR* measures a company's ability to reduce the use of materials,

[11] When we first extracted the ASSET4 data, there were about 4,500 companies covered in the dataset, which also defines our sample coverage.

Electronic copy available at: https://ssrn.com/abstract=2960832

energy, or water and to find more eco-efficient solutions by improving supply chain management. In addition, we introduce a variable measuring firm-level CO_2 and CO_2 equivalent emissions (for other greenhouse gases) in tons (variable name "ENERDP023" in the ASSET4 database), scaled by total assets, and then take a logarithm of the scaled variable to normalize it (*Ln(CO2/Assets)*, which is winsorized at 1% and 99%). This is arguably a more concrete measure of a firm's environmental impact, compared to normalized ratings. Another advantage of tests using CO_2 emissions is that it is less subject to manipulation.[12] On the other hand, the CO_2 variable only focuses on greenhouse gas emissions and does not reflect other environmental dimensions, such as water pollution and natural resource exhaustion. Appendix 2 provides detailed definitions of these variables.

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 among its workers, 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 board members and executives act in the best interests of long-term shareholders. These two variables are also defined in Appendix 2.

3.1.3. Control variables

We control for common firm-level covariates included in most corporate finance research, such as market value in logarithm, leverage, market-to-book ratios (*MTB*), and return on assets (*ROA*), with data obtained from Datastream and Compustat Global. Definitions of these variables are also provided in Appendix 2. We also control for a company's institutional ownership (including both domestic and foreign institutional holdings), as Dyck et al. (2019) find that institutional investors (especially foreign ones) could drive a firm's ESG engagement. Data on institutional ownership are collected from Factset/LionShares. In addition, we have included industry concentration measured by the Herfindahl-Hirschman index (HHI) of sales of all firms in the same industry. Moreover, given the cross-country nature of our data, we control for country-level GDP per capita obtained from the World Bank. Finally, to maintain consistency with the industry benchmarking of ESG ratings we control for country fixed effects and industry-year fixed effects using the TRBC industry definitions.

3.2. Summary statistics

[12] To address the concern that state-owned companies obtain preferential treatment from regulators or could fudge environmental indicators or avoid costly compliance measures (e.g., Fisman and Wang 2015), we performed robustness tests controlling for corruption indices from Transparency International and World Bank. The untabulated results show no relation between environmental indicators and measures of corruption. The variable, however, is only available for about 40% of our sample firms.

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 1 shows that state-owned enterprises (SOEs) feature prominently in the Forbes Global 2000 list of top public companies as ranked by *Forbes* magazine in 2010.[13] These 10 SOEs, highlighted in bold, include four companies 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 United Kingdom (Lloyds), and Italy (ENI). SOEs play an important role in both developed and emerging economies. While these SOEs score relatively well in 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 used in our regressions. Although leading the list are firms in developed markets (the United States, Japan, the United Kingdom, Australia, and Canada), the sample also has 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 33,122 firm-year observations (3,902 unique firms) for which data are available in 2004–2017 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.[14]

Table 2 shows that the average level of state ownership (*State_own*) of our sample of publicly listed companies is 7.8%. The country with the highest proportion of state-owned companies in our sample is China, but the average levels of state ownership are also high for other emerging economies and some developed economies, such as Norway and New Zealand. Figure 3 provides the average percentage of state-owned firms in each country during our sample period. There is considerable cross-country variation: SOEs represent 73% of the market in China, 47% in Russia, 17% in Brazil, and 14% in France, but they also have a modest presence in some other countries. Table 2 also provides the average of environmental pillar scores (*ENVSCORE*) in each country. The average environmental pillar score is 53.5, which is expected as all ESG scores are standardized and industry-adjusted by Thomson Reuters to get a mean score of 50. With the exception of China (29.9), the average environmental pillar scores of the BRICS countries are around the standardized mean: Brazil (43.4), India (60.0), Russia (52.6), and South Africa (58.7).[15]

[13] 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.
[14] We drop 2002 and 2003 from the main analysis to avoid biasing our baseline results by insufficient coverage. However, in untabulated results, we obtain consistent results if we include 2002 and 2003 in the sample.
[15] 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 sample.

Electronic copy available at: https://ssrn.com/abstract=2960832

As a first look at the relation between state ownership and environmental engagement, we plot the average *ENVSCORE* for SOEs (firms with at least 25% of control rights or shares owned by the government) and non-SOEs in each country in Figure 4. We observe a general pattern that SOEs' *ENVSCORE* is higher than non-SOEs in most countries. For a formal test, in Panel A of Table 2, we conduct a t-test for the equality of the environmental pillar scores *ENVSCORE* between SOEs and non-SOEs. The average *ENVSCORE* for state-owned firms is 59.3 compared to 53.0 for non-SOEs, and the difference is statistically significant (p-value = 0.00). When we examine each individual country, we find that SOEs' environmental pillar scores are higher than that of non-SOEs in 35 of 44 countries. (The difference is statistically significant in 30 countries at the 10% level.)[16] These findings 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 of the internet appendix. SOEs receive significantly higher scores than non-SOEs in most countries across all three sub-categories.[17]

In Panel B of Table 2, we show the summary statistics of firms classified based on the 10 industries in the broad Industry Classification Benchmark (ICBIN) taxonomy.[18] State ownership is greater in telecommunications (38.1%), utilities (29.2%), and oil and gas (13.5%). Comparing the environmental pillar scores, SOEs have higher *ENVSCORE* in six of 10 industries. Notably, the three industries in which the non-SOEs' *ENVSCORE* is much higher than the SOEs' (industrials, consumer goods, and healthcare) are those with fairly low state ownership (6.5%, 2.6%, and 1.7%). Their high *ENVSCORE* may be explained by factors other than ownership, such as reputation and social image. In industries with a stronger government presence, we find that 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 of the internet appendix.

[16] Figure IA.1 of 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 the five 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 the 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.

[17] There is also a large cross-country variation in the average social pillar score. The SOEs' average score (*SOCSCORE*) is 63.3, significantly higher than other firms' average score of 53.9. In Table IA.2 of the internet appendix, we test whether SOEs have a higher *SOCSCORE* than non-SOEs and find a statistically significant difference in 28 countries (at the 10% significance level). Interestingly, we find the opposite correlation between state ownership and corporate governance: The SOEs' average score (*CGVSCORE*) is 43.5, significantly lower than other firms' average score of 54.7, consistent with the literature that argues SOEs suffer from governance problems.

[18] The ICBIN 10-industry classification is coarser than the TRBC (136 industries) used by ASSET4 in their proprietary scoring. Therefore, while the global average *ENVSCORE* is close to 50, it does not have to be for each ICBIN group.

Electronic copy available at: https://ssrn.com/abstract=2960832

We also find that the patterns of univariate analysis previously documented persist. In Table IA.4 of the internet appendix, we document that SOEs are associated with significantly higher *ENVSCORE* and *SOCSCORE* for most sample years from 2004 through 2017. In addition, SOEs are associated with a significantly lower *CGVSCORE* in every sample year.

Results of these univariate tests should be interpreted with caution, as 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 subsequently implement. Panel B of Table 3 reports the Pearson correlation coefficients for all variables in the baseline 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 modest correlations between *State_own* and control variables.

4. Empirical Results on State Ownership and Environmental Engagement

4.1. Baseline regression

Our baseline regression is specified as follows.

$$ENVSCORE_{i,k,j,t} = \beta_0 + \beta_1 State\_own_{i,k,j,t-1} + \beta_2 Inst\_own_{i,k,j,t-1} + \beta_3 Ln\left(MarketCap_{i,k,j,t-1}\right) + \beta_4 Leverage_{i,k,j,t-1} + \beta_5 MTB_{i,k,j,t-1} + \beta_6 ROA_{i,k,j,t-1} + \beta_7 Ln(GDP_{j,t}) + \beta_8 Industry\ HHI_{i,t} + \Sigma\, \boldsymbol{\rho} * I(Country_j) + \sum \boldsymbol{\delta} * I(Ind\_Year_{k,t}) + \varepsilon_{i,k,j,t}, \quad (1)$$

where $ENVSCORE_{i,k,j,t}$ denotes the firm-level environmental engagement of firm *i* in industry *k* and headquartered in country *j* in year *t*. We also consider sub-scores—*ENER*, *ENPI*, and *ENRR* as well as a measure of firm-level CO_2 emission scaled by total assets, *Ln(CO₂/Assets)*—of firm *i* in industry *k* and headquartered in country *j* in year *t* as dependent variables. The primary explanatory variable, $State\_own_{i,k,j,t-1}$, 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 ($Inst\_own_{i,k,j,t-1}$), firm size ($Ln(MarketCap_{i,k,j,t-1})$), leverage ($Leverage_{i,k,j,t-1}$), market-to-book ratio ($MTB_{i,k,j,t-1}$), return on assets ($ROA_{i,k,j,t-1}$), GDP per capita in logarithm ($Ln(GDP_{j,t})$), and the Herfindahl-Hirschman Index of a firm's industry within its own country ($Industry\ HHI_{i,t}$).[19] All the control variables are winsorized at the fifth and 95th percentiles, except for *Ln(GDP)* and *Industry HHI*. $I(Country_j)$ and $I(Ind\_Year_{k,t})$ represent country and industry-year fixed effects based on 136 TRBC industries.[20] Controlling for industry-year fixed effects is crucial, as this addresses the Gormley and Matsa (2014) critique to using the industry-demeaned

[19] We use Fama-French 48-industry classifications to ensure sufficient numbers of firms within each industry for us to calculate meaningful Herfindahl-Hirschman Index.

[20] In unreported robustness checks, we have also controlled for country-year fixed effects and find consistent results.

Electronic copy available at: https://ssrn.com/abstract=2960832

dependent variable (e.g., ASSET4 industry-adjusted ESG scores). 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 the period of 2004–2017.[21] Standard errors are clustered at the firm level to correct for firm-specific autocorrelation in estimation errors.

Panel A of 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 industry-year fixed effects (Column (1)). The point estimate of state ownership at 7.584 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 8% higher than nonstate-owned firms. In Column (2), when we include all other control variables in the estimation, the coefficient of *State_own* is reduced to 3.316 but remains statistically significant at the 5% level. This means SOEs' improved environmental performance makes them rank 3.3 percentiles higher, relative to their industry peers from around the world.

We also investigate which aspects of environmental engagement relate to state ownership by replacing the dependent variable *ENVSCORE* with its component scores *ENER* (Columns (3)–(4)), *ENPI* (Columns (5)–(6)) and *ENRR* (Columns (7)–(8)). The results suggest that a firm's state-control status is strongly correlated with higher scores across these different dimensions, except for Column (4), in which we include all control variables for the *ENER* regression. In addition, we find that state-owned firms have, on average, a lower CO_2 emissions-to-assets ratio (Columns (9)–(10)), a measure that speaks directly to climate change issues. Due to limited data availability on CO_2 emissions, this reduces our sample size by more than half, but the results are consistent when we use *ENVSCORE* and its sub-scores. Moreover, we do not find significant difference in coefficient when we partition our sample into large and sample firms in an unreported test, suggesting that our results are not driven by a size effect.

When we replace the dependent variables with the changes of the environmental scores (defined as these scores in year t minus their values in year $t-1$ or their averages in year $t-1$ to year $t-3$), we obtain similar results in Table IA.5 of the internet appendix. This finding suggests that state ownership explains not only the cross section but also the time-series variation of environmental engagement.

Note that the state-control status of public companies is generally quite stable during our sample period (although the state's political leaning and objectives may change), since this control is likely a legacy of

[21] Our regression sample for firm-level environmental engagement (CO_2 emission) includes 33,122 (15,931) firm-year observations. The dependent variables (*ENVSCORE*, *ENER*, *ENPI*, and *ENRR*) are bounded between 0 and 100. In an unreported robustness check, we regress the logarithmic value of environmental engagement proxies as well as use a fractional response model to account for the issue of limited dependent variable and obtain consistent results.

Electronic copy available at: https://ssrn.com/abstract=2960832

post-privatization ownership structures. State-owned firms were formed before our sample period for reasons typically unrelated to environmental concerns, which tend to be more recent. Therefore, we use the long-lag information of our sample by regressing *ENVSCORE* on long-lagged *State_own* and report the results in Panel B of Table 4. We took four different approaches to lag the *State_own* variable: (1) using the predetermined *State_own* levels as of 2004 (the start of our sample period); (2) taking a five-year lag (*L5.State_own*) for the subsample period after 2009 (if there are fewer than five years, the observation is omitted); (3) taking a five-year lag (*L5.State_own*) for the full sample period (if there are fewer than five years, the observation is omitted); and (4) averaging each firm's *ENVSCORE* scores over the 2009–2017 period, averaging the value of *State_own* over the same period, and running a single cross-sectional regression of the averaged *ENVSCORE* score on the averaged *State_own*. Overall, our results suggest that a firm's history of being state-owned is significantly and positively associated with a higher *ENVSCORE*. Therefore our results are more in line with the idea that state ownership promotes more environmental engagement, rather than governments as owners picking and keeping "green companies" and divesting from polluting firms. Nevertheless, we acknowledge this does not preclude that the government may acquire some private firms that have arrived at good environmental solutions, in order to adapt or target those solutions to desired outcomes. This is consistent with the notion that SOEs, even they are newly nationalized, can be a more efficient tool for the government to deal with environmental externalities.

One may also be concerned that, independent of state ownership, SOEs in our sample also happen to be less sensitive to competition and market vagaries in general, creating weaker incentives for managers. This allows for more managerial extraction of private benefits, which could include excessive spending on social and environmental goals rather than positive-NPV projects. Our inclusion of institutional ownership and country-by-industry HHI to some extend addresses this concern. Nevertheless, to further alleviate potential omitted variable biases, we additionally control for firm-level corporate governance using ASSET4's aggregate corporate governance score (*CGVSCORE*) in Table IA.6 of the internet appendix. While the inclusion of these variables potentially introduces multicollinearity (*ENVSCORE* and *CGVSCORE* are highly correlated), we find quantitatively similar results. [22]

4.2. Evidence from salient environmental events

We explore time variation in the salience of environmental sustainability issues and investigate whether state-controlled firms react differently to these events. For this purpose, we estimate the following

[22] In untabulated results, we further include idiosyncratic volatility as an additional control variable, and our main results remain significant. We choose not to control for idiosyncratic volatility in our baseline model due to reduced sample size as a result of data availability of idiosyncratic volatility from the source we obtained.

Electronic copy available at: https://ssrn.com/abstract=2960832

regression to examine whether there is a significant change in the relation between state ownership and environmental engagement after an event.

$$ENVSCORE_{i,k,j,t} = \alpha_0 + \beta_0 State\_own_{i,k,j,t-1} \times Post_t + \beta_1 State\_own_{i,k,j,t-1} + \Sigma\, \boldsymbol{\gamma} * (Controls_{i/j,t-1/t}) + \Sigma\, \boldsymbol{\rho} * I(Country_j) + \Sigma\, \boldsymbol{\delta} * I(Ind\_Year_{k,t}) + \varepsilon_{i,k,j,t}, \quad (2)$$

where $Post_t$ is an indicator variable that equals one if year t is after the event and zero otherwise. The interaction term *State_own* × *Post* is used to test whether state-owned firms reacted more strongly to the event compared with nonstate-owned firms. $Controls_{i/j,t-1/t}$ denotes all other control variables used in Equation (1).

We first explore the reactions by SOEs worldwide to a global environmental shock, namely the Fukushima nuclear disaster that occurred in Japan on March 11, 2011—the most significant nuclear incident since the 1986 Chernobyl disaster.[23] The disaster also led to widespread international reactions. For example, triggered by this incident, Germany accelerated plans to close its nuclear power reactors, phasing them out by 2022. To properly capture the effect of the incident over a reasonable timeframe, we restrict the sample to the period of three years before and three years after the incident (2009–2014). We then estimate Equation (2) by letting *Post* be one for 2012–2014 (*Post_2011*). We expect the coefficient estimate on the interaction term, β_0, to be significantly positive, because SOEs should be under more pressure from governments and the public. As shown in Column (1) in Panel A of Table 5, we find a positive and significant coefficient of the interaction term, indicating that SOEs increased their efforts toward addressing environmental issues by about 3.3% more than nonstate-owned firms after the Fukushima incidence. In addition, as the Fukushima incidence primarily affected the utility industry, we run a similar test as in Equation (2) but introduce a triple interaction term, *State_own* × *Post_2011* × *Utilities*. In Column (2), we find that the coefficient on the triple interaction is positive and significant, suggesting that the effect is stronger for utility companies that were most sensitive to nuclear risk. This is also consonant with the view that a secular increase in concerns regarding climate change might causes SOEs, especially those in the utility sector, to engage more in environmental issues.

As the Fukushima effect involved nuclear power stations located in the earthquake/tsunami-prone areas, it might have been less of a shock at nuclear power stations in other countries that are not prone to this risk. To further exploit this cross-country variation based on nuclear power provision, we partition our sample into two groups based on whether the country has a significant number of nuclear power stations

[23] This disaster was an energy accident at the Fukushima Daichi Nuclear Power Plant initiated by the tsunami following the Tohoku earthquake. Insufficient cooling, due to the tsunami, led to three nuclear meltdowns, hydrogen-air explosions, and the release of radioactive material, resulting in an evacuation of over 170,000 people in Japan.

Electronic copy available at: https://ssrn.com/abstract=2960832

and thus is more prone to the risk. We define a country as "nuclear-heavy" if it has more than 10 operational nuclear reactors (e.g., Canada, China, France, India, Japan, Russia, South Korea, United Kingdom, United States, etc.)[24] and "nuclear-light" if this number is below 10. We then run the same tests as in Column (2) in the two subsamples and report the results in Columns (3) and (4), respectively. The significance of triple interaction term only shows up in the subsample of nuclear-heavy countries, consistent with the notion that SOEs in the utilities industry in countries more prone to the nuclear risk will react more strongly in improving their environmental engagement.[25]

We also conduct placebo tests for the two environmental shocks. In Panel B, we test the coefficient of the triple interaction term including a dummy variable *Industry* representing each of the other nine ICBIN industries (i.e., excluding the utility industry) following the Fukushima incidence. We find that except for the oil & gas industry, none of the coefficients for other industries is positive and significant. Similar to the utility industry, the oil & gas industry is also sensitive to environmental issues, and SOEs are likely to play an active role in dealing with these issues. This indicates that the effects we identify in Columns (1) and (2) in Panel A are unique to the environmentally sensitive industries, and SOEs in these industries are also more responsive to a secular increase in concerns regarding environmental issues by improving their environmental performance.

Second, we explore the effect of how different countries react to abnormal temperature shocks and drought events by using data on abnormal temperature, as do Choi et al. (2020), and data on drought, as do Hong et al. (2019). For the first shock, abnormal temperature refers to the case in which a city's temperature is significantly higher than the historical average temperature at the same point of the year. This is done by decomposing local monthly temperature of country *j* in month *m* into three components that account for predictable, seasonal, and abnormal patterns (i.e., $Temperature_{j,m} = Aver\_Temp_{j,m} + Mon\_Temp_{j,m} + Ab\_Temp_{j,m}$). We extract the $Ab\_Temp_{j,m}$ partly because this is arguably unpredictable. We then aggregate the previous year's 12-month $Ab\_Temp_{j,m}$ of the capital city or the city of major stock exchanges (e.g., Frankfurt and New York City) of the country in which our focal firm is located and create a dummy of *Abnormal temperature* taking the value of 1 if country *j*'s aggregated annual abnormal temperature is above the sample median and 0 otherwise in year *t*. In Column (1) of Panel C of Table 5, we focus on the

[24] See: https://en.wikipedia.org/wiki/Nuclear_power_by_country.

[25] When we focus on a small sample of nuclear firms (53 in total) and partition this sample into public nuclear firms and private nuclear firms, we do not find significant difference between the two groups. In addition, we argue that whether a country is nuclear-heavy or not is usually determined by historical reasons (e.g., out of the concern for energy security) and is not adjustable in a short period. Thus, governments would mainly improve utility firms' environmental engagement as a response to the increasing secular concern regarding environmental issues, rather than shutting them down. Moreover, while some may argue that nuclear energy as "clean energy" might actually address climate change. Nevertheless, we would like to point out that our dependent variable *ENVSCORE* aims to comprehensively capture a company's effort in improving its environmental stewardship. This may include adopting safer and more secured nuclear energies. In other words, SOEs can respond to nuclear disaster by adopting alternative nuclear technologies that are safer, which is reflected in the improvement of the overall *ENVSCORE*.

Electronic copy available at: https://ssrn.com/abstract=2960832

coefficient on a triple interaction term *State_own* × *Emission industry* × *Abnormal temperature*, together with industry-year fixed effects to take into account the fact that certain industries have both strong state presence and concerns regarding GHG emissions. *Emission industry* is defined as a dummy variable that equals 1 if a firm's industry emission intensity is above the sample industry median and 0 if it's below. For industry emission intensity, we use the U.S. Environmental Protection Agency's (EPA) toxic release inventory (TRI) database to measure the magnitude of hazardous substances (Currie et al. 2015).[26] We then calculate the median weight of total hazardous substances produced by all factories in each SIC two-digit code in the TRI database and use this value as a proxy of industry emission intensity. We find a significant and positive coefficient of the interaction term, *State_own* × *Emission industry*× *Abnormal temperature*, in Column (1). This result indicates that SOEs, particularly in high-emission industries, strengthen their environmental engagement more than non-SOEs following unexpectedly high abnormal temperatures, consonant with the notion that SOEs take immediate action in addressing the climate change challenge following salient temperature shocks.

For the second temperature shock, we exploit that the trend increase in global temperatures exacerbates the risks of droughts, generating dispersion across countries with many potentially harmed. Following Hong et al. (2019), we use the Palmer Drought Severity Index (PDSI), a widely used monthly metric estimating drought time trends in climate studies. PDSI combines information, such as temperature and the amount of moisture in the soil, to measure drought intensity. Greater values are associated with drier conditions. We average monthly country-level PDSI to the yearly level and match them to our sample countries and create a dummy variable *Drought* if a firm's country PDSI is above the sample median. We then create a triple interaction term, *State_own* × *Emission industry* × *Drought*, as well as constitutive terms, similar to what we do with abnormal temperatures with the same definition of *Emission industry*, and report the estimation results in Column (2). We again find a significant and positive coefficient on the triple interaction, corroborating our results in Column (1). This also suggests that SOEs, particularly in high-emission industries, have greater environmental engagement in countries with worse droughts.

Overall, the results in Table 5 suggest that state-owned firms respond more to the pressure to act on global warming and other environmental concerns, which supplements our evidence in Table 4. The results are stronger for the Fukushima incident and for the extreme weather setting, which seems reasonable, as the government may respond more to disasters or significant changes that attract the public's attention. These results not only help with causal interpretation but also comport with the social view of state-ownership in dealing with externalities.

[26] The TRI database was established in response to the 1986 Emergency Planning and Community Right-to-Know Act (EPCRA) that requires firms to report their factories' locations as well as their storage, use, and releases of hazardous substances.

Electronic copy available at: https://ssrn.com/abstract=2960832

4.3. Evidence from changes in governments' policy orientation and nationalization

While the change in state control status itself is infrequent in our sample period, we examine variation induced by a change in a government's political orientation. 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). In the context of corporate environmental engagement, Di Giuli and Kostovetsky (2014) find that the political leaning of the government in different U.S. states can shape firm-level ESG policies and firms in more left-leaning states tend to invest significantly more in ESG (including environmental) issues. We use international data on ruling governments' political orientation from the World Bank's Database of Political Institutions (DPI), which varies across countries and years. Therefore we create two year-related dummies: *Government leaning right* is a dummy that represents the year in which the government (or the largest government party) changed from a left orientation to a center or right orientation in the political spectrum with regard to economic policy. *Government leaning left* is a dummy representing the year in which the government changed from a center or right orientation to a left orientation. The correlation between *Government leaning left* and an environmental regulatory change index (to be discussed later) is 22%. We then interact these two dummies with the *State_own* dummy and test the interaction effects on the change of a firm's *ENVSCORE* (Δ*ENVSCORE*) in the next year, because government changes may occur closer to year-end. To this end, we test the effect of government orientation change on the firm-level environmental policy change. (Both sides of the regression equation are about *changes*.) We thus estimate the following model.

$$\Delta ENVSCORE_{i,k,j,t} = \alpha_0 + \beta_0 State\_own_{i,k,j,t-1} \times Government\ leaning_{j,t-1} + \beta_1 State\_own_{i,k,j,t-1} + \beta_2 Government\ leaning_{j,t-1} + \Sigma\, \boldsymbol{\gamma} * (Controls_{i/j,t-1/t}) + \Sigma\, \boldsymbol{\rho} * I(Country_j) + \Sigma\, \boldsymbol{\delta} * I(Ind\_Year_{k,t}) + \varepsilon_{i,k,j,t}, \quad (3)$$

where *Government leaning*$_{j,t-1}$ denotes *Government leaning left* in Column (1) and *Government leaning right* in Column (2) in Table 6. In Column (1), *Government leaning left* is an indicator variable that equals one if the government changed from a center or right orientation to a left orientation in year *t-1*. In Column (2), *Government leaning right* is an indicator variable that equals one if the government changed from a left orientation to a center or right orientation in year *t-1*. In Column (3), we include both *Government leaning left* and *Government leaning right* in the same regression. The interaction term *State_own* × *Government leaning* is used to test whether state-owned firms react more strongly to the event in comparison with nonstate-owned ones. Equation (3) is essentially a difference-in-differences analysis, except that instead of interacting with a "post-event" dummy covering all years after an event, we only focus on the year after a government political-orientation change to capture the different immediate

Electronic copy available at: https://ssrn.com/abstract=2960832

reactions of SOEs and private firms, which is expected to be greater than later adjustments in subsequent years.[27]

The results are reported in Table 6. The coefficients on *State_own* × *Government leaning left* are positive and significant at 10% in Columns (1) and (3), indicating that, when the government leans left, the positive effect of state ownership on firm environmental engagement becomes stronger, consistent with our previous results. The economic effects (4.081 and 4.033) are bigger than that in the baseline results, considering that we are capturing a change effect. In contrast, the coefficients on *State_own* × *Government leaning right* in Columns (2) and (3) are insignificant, indicating that, when the government leans right, the role of state ownership does not change much. This can be explained by the increasing awareness of environmental issues around the world, and thus even a right-wing government is unlikely to dramatically cut policies and spending on environment after gaining power. Also, reduction in environmental engagement is subject to significant adjustment costs, such as the dismantling of production lines for renewable energy products, and shifting input materials, which are very difficult once a firm adopts certain clean technology. Redefining *Government leaning right (left)* as government change from center or left orientation to the right orientation (from the right orientation to center or left orientation) yields very similar results.[28]

To further triangulate the analysis based on governments' changes on political orientation, we also test whether a significant change in SOEs' government ownership will affect the change in the firm's *ENVSCORE*. To this end, we use an alternative proxy of state ownership, *Government_held*, which is a continuous variable from Datastream that identifies the percentage of free-floating shares held by the government, if those blockholdings exceed 5%. This variable allows us to exploit time series variation in state ownership. We then define "substantial increase in state shares" as a dummy variable that equals 1 if *Government_held* increases by at least 25% (our threshold for defining *State_own*) in the previous year and 0 otherwise. This variable captures whether a company is newly state-owned or the government suddenly increases its ownership stakes substantially. We then regress Δ*ENVSCORE* on this dummy as well as a

[27] In an unreported test, we show that it becomes more difficult for a firm to improve its *ENVSCORE* once it has performed well. Specifically, we regress change in *ENVSCORE* on the interaction between lagged *ENVSCORE* and a dummy for above-median *ENVSCORE* and find a significantly negative coefficient.

[28] In these tests, we focus on the change-on-change effect over one year. The choice of the relatively short event window is motivated by the notion that a new government may pressure state-owned enterprises (especially those established ones) to react to environmental issues more dramatically in the first few years in power. But after a longer period (e.g., five to 10 years), the government might not be in power anymore, and, if it still is, all firms would have already adjusted their environmental practices to comply with governmental policies. Therefore, *in equilibrium*, we shouldn't observe a large difference in corporate environmental engagement, unless significant frictions exist countrywide. Moreover, if a firm has reached a very high level of environmental engagement, it can no longer increase its rating much, if at all. In unreported results, we find that a firm's *ENVSCORE* negatively predicts the change in its future *ENVSCORE*, especially when the current level is high. This supports our argument that, once a firm has achieved high *ENVSCORE*, it is unlikely to improve further.

Electronic copy available at: https://ssrn.com/abstract=2960832

dummy indicating that the company was previously state-owned (*Old state-owned*). In Column (4) of Table 6, we find that the coefficient of *Substantial increase in state shares* is again positive and significant, whereas the coefficient of *Old state-owned* is insignificant. This suggests that newly state-owned firms have more room to improve their environmental engagement, which further corroborates our earlier argument that governments may also nationalize some firms that have arrived at environmental solutions to adapt to desired outcomes.[29]

We also examine the effect of political re-election by focusing on countries adopting presidential systems. We design an indicator variable, *Re-election*, that equals one in year *t* or *t*-1 when an incumbent president is up to an election for a second term and then interact it with state ownership. In unreported results, we find the coefficient on *Re-election* and its interaction term with state ownership is insignificant, suggesting that our results are not driven by changes in SOEs' behaviors upon re-election years.

4.4. Cross-sectional Heterogeneity

4.4.1. The role of firm- and country-level governance

We first investigate whether our results can be explained by firm-level and country-level governance quality. With regard to the firm-level governance, we use the aggregate governance score of the ASSET4 ESG rating (*CGVSCORE*), which comprehensively captures a firm's governance quality, such as board structure (independence, diversity, and committees), executive compensation policy, efficiency of board functions, reporting transparency, shareholder rights, and other governance matters. A firm with a higher *CGVSCORE* is considered better governed. We then regress *ENVSCORE* on the interaction between *State_own* and *CGVSCORE* and find a negative and significant coefficient on the interaction term in Column (1) of Table 7.[30] This suggests that better governed SOEs have less environmental engagement, consonant with the notion that at least a part of the environmental engagement might be driven by agency problems within SOEs.

With regard to country-level governance, i.e., the governance of the state, we use World Bank's World Governance Indicators (WGIs), which cover six broad dimensions of governance for countries over time: (1) voice and accountability, (2) political stability and absence of violence, (3) government effectiveness, (4) regulatory quality, (5) rule of law, and (6) control of corruption. Countries with higher scores on WGIs are generally believed to be more transparent, accountable, and responsible to their citizens and less corrupt.

[29] In untabulated tests where we interact *Substantial increase in state shares* with *Government leaning left*, we also find positive and significant coefficient on the interaction term. The result is available upon request.

[30] The coefficient of *State_own* is 8.306, which is larger than its counterpart in Table 4. This inflation in the magnitude of coefficient may be attributed to the correlation between *State_own* and *CGVSCORE*. When we do not include the interaction term in the regression, the coefficient on *State_own* becomes 3.149 with statistical significance.

Electronic copy available at: https://ssrn.com/abstract=2960832

If corporate environmental engagement by SOEs is entirely driven by politicians trying to use SOEs to seek rents and please voters without enhancing social welfare (the "political view"), we would expect the state ownership effect to be weaker for countries with better governance (i.e., higher WGI scores). In Columns (2)–(7), we show the results of regressing *ENVSCORE* on the interaction term *State_own* × ***Governance***, with ***Governance*** representing each of the six WGIs. We find none of the interaction terms is significant, which is inconsistent with the political view and points more to the social view.

4.4.2. The effects of firm locality and CEO characteristics

We next investigate the contextual effect of a firm's place of operation and revenue. As citizens' perceived social welfare is mainly determined by their life experience, a government that aims to improve social welfare will naturally care about environmental externalities in its own territory and use more domestically operated SOEs to address these externalities. If a firm has more foreign operations, sales and income, the role of the domestic government in influencing its environmental practices may be attenuated if such influence is driven by social welfare. Therefore, we test whether the effect of state ownership on environmental engagement is weaker for firms that have a higher fraction of foreign operations by interacting the *State_own* dummy with a continuous variable *Foreign assets*, which captures the percentage of a firm's foreign assets over its total assets. In Column (1) of Table 8 Panel A, we find a negative coefficient of the interaction term *State_own* × *Foreign assets*, suggesting that the state-ownership effect is indeed weaker in firms with more overseas operations. When we replace *Foreign assets* with *Foreign sales* (Column (2)) and *Foreign income growth* (Column (3)), which measure the percentage of a firm's total sales revenue that come from abroad and the growth rate of a firm's foreign income, respectively, we find similarly negative and significant coefficients of *State_own* × *Foreign sales* and *State_own* × *Foreign income growth*. These results again suggest that the state-ownership effect is indeed weaker in firms with more overseas revenues. These findings are consistent with the interpretation that the government's influence is more limited if the environmental externalities do not occur within the country's borders.

We also test the agency view. While the social view concerns actions unrelated to idiosyncratic preferences, the agency view suggests that environmental engagement depends on SOE executives' preferences. We therefore use several proxies for these idiosyncratic preferences, including whether the CEO is close to retirement age, the CEO's tenure and the CEOs' political connections.[31]

[31] Following Faccio (2006), we define "political connection of CEO" as whether the CEO has worked in the government, a political party committee, or the military, or was a member of the parliament or congress. Faccio et al. (2006), Chaney et al. (2011), and Megginson (2017) find that politically connected firms underperform. A survey paper by Megginson (2017) concludes that political connections tend to enhance valuations of connected companies, but these private benefits are usually associated with significant costs for the overall economy and financial system.

Electronic copy available at: https://ssrn.com/abstract=2960832

First, if the CEO pursues private benefits, such as a political career, satisfying a personal preference, and establishing social visibility after retiring from the company, that person may be incentivized to invest more in environmental activities. Data on CEO characteristics are obtained from NRG Metris CEO dataset, which are complemented and cross-validated by manually collecting information from BoardEx and other online news sources, such as Bloomberg Businessweek. In Column (1) of Table 8 Panel B, we interact *State_own* with a dummy variable *CEO retirement age*, which takes the value of 1 if the CEO is 60 years old or above and 0 otherwise, and conduct the similar tests as in Panel A. We find the coefficient of *State_own* × *CEO retirement age* is positive and significant, indicating that the effect of *State_own* is stronger when the CEO is close to retirement age, which supports the agency view.

Second, CEOs with longer tenure in the company are more likely to be entrenched and thus display greater agency problems. In Column (2) of Panel B, we find the coefficient of *State_own* × *CEO tenure* is positive and significant, suggesting that the effect of *State_own* is stronger in companies with longer-tenure CEOs. This suggests that SOEs' investment in environmental activities may be partially explained by CEO's agency problems. In untabulated results, we further find that the results are more pronounced in the subsample of firms in high HHI (i.e., more monopolistic) industries, in which CEOs are more protected from market discipline. The insignificant main effects of *State_own* in Columns (1) and (2) potentially indicates that greater environmental engagement in SOEs with retiring and long-tenure ECOs is almost entirely driven by agency problems.

Third, in Column (3) of Panel B, we find that the coefficient on politically connected CEOs is significantly positive and the coefficient on the interaction between CEO's political connection and *State_own* is significantly negative. This result indicates that CEO's political connections and *State_own* are substitutes in influencing environmental engagement. This suggests potential agency issues, because state ownership and a CEO's political connections should be unrelated under the social view.

4.4.3. Cross-country variations

Finally, we explore the heterogeneity across countries in the correlation between state ownership and environmental engagement. We argue that the role of Leviathan Inc. in addressing externalities is particularly important in economies that are more sensitive to energy issues, and that have weaker environmental regulations.

We spilt our sample firms based on whether their country has high energy dependence and strong environmental regulation and report these country-split results in Table 9. First, if a country is highly dependent on overseas energy supplies as a result of its own lack of energy (e.g., Singapore and Israel), the state may have a stronger incentive to develop energy-efficient and environment-friendly technologies

Electronic copy available at: https://ssrn.com/abstract=2960832

through SOEs to secure energy security and facilitate national development. In contrast, such incentives for the government to develop green technology is weaker in countries with an abundance of energy resources (e.g., the Gulf countries). We test whether the state-ownership effect is stronger in these countries using energy-security risk indexes obtained from the U.S. Chamber of Commerce's Institute for 21st Century Energy. As shown in Columns (1) and (2), the coefficient of *State_own* is positive and statistically significant only in the subsample of countries of *High energy dependence* (i.e., the energy security risk index value is above the sample median). This suggests that concerns regarding a country's natural resources may indeed motivate the state to pressure companies to be more energy efficient.

Second, if the role of SOEs is to address weaknesses in environmental regulation and internalizing non-priced externalities, in countries with strong environmental regulation, one would expect SOEs to have limited impact and, in countries with weak regulation, the impact would be stronger. Therefore we use the Carrot & Sticks dataset to construct an index of positive environmental regulatory changes as used by Schiller (2018).[32] In Columns (3) and (4), we find that indeed the effect of state ownership mainly presents in countries with *low* environmental regulation (i.e., the value of the environmental regulatory change index is zero).[33]

Overall, the results in Tables 8 and 9 reveal some interesting cross-sectional variation in the role of state ownership in a firm's environmental engagement. Such a role is stronger in countries with greater energy dependence and weaker environmental regulation, as well as in locally operated firms. On the other hand, the agency view is also supported, as we find the effect of state ownership is stronger when CEOs are close to retirement, have longer tenures, and are not politically connected.

4.5. 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.

We first replace the binary variable *State_own* with the continuous variable *Government_held* from Datastream, which identifies the percentage of free-floating shares held by the government, if those

[32] See "environmental regulations" in https://www.carrotsandsticks.net/regulations/.

[33] When regulations are inefficient and more costly (due to various historically determined institutional constraints), governments may resort to SOEs in some circumstances. This echoes the arguments by Shleifer (2005) and Lade and Rudik (2020), and explains why we find that the effect of SOEs on environmental engagement is significant in countries with weak regulation. In untabulated results, we also partition our sample into high and low long-term capital countries based on the median of the ratio of country-level stock market capitalization to GDP, and find that the positive effect only emerges in the subsample of countries with lower ratios. This result suggests that private firms in markets with less-developed capital markets find it harder to secure long-term financing for environmental projects (even though they may be value-enhancing in the long term). As a result, states step in, through SOE ownership, to provide more long-term capital for such engagement.

Electronic copy available at: https://ssrn.com/abstract=2960832

blockholdings exceed 5%. In Column (1) in Panel A of Table 10, we rerun the baseline regression as specified in Equation (1) using this alternative measure of state ownership. Results continue to suggest that firms with greater government blockholdings score more highly in environmental engagement. Since *Government_held* is a continuous variable with time-series variation, we also consider including firm fixed effects in Equation (1) and find consistent results in Table IA.7 of the internet appendix.

Second, we ask whether the effects we previously document are unique to government ownership or instead may just related to the presence of any blockholder. To address this concern, we use data from Datastream on the percentage of total shares held by different types of strategic blockholders. These include blockholdings of 5% or more by foreign investors (*Foreign holdings*), other industrial companies (*Cross holdings*), pension funds (*Pension fund held*), investment companies (*Investment co. held*), employees (*Employee held*), and total holdings by all of these blockholders (*Strategic holdings*). In our baseline tests, we already control for ownership by institutional investors (*Inst_own*) that are frequent blockholders in firms (both domestic and foreign). Data from Factset/Lionshares also allow us to identify the percentage of all outstanding shares owned by domestic institutional investors (*Domestic inst. held*) and by foreign institutional investors (*Foreign inst. held*) (Aggarwal et al. 2011, Dyck et al. 2019). We use these data to supplement our results from Datastream free-float blockholding data. Although the Factset/Lionshares and Datastream universes differ, we can only include firms that have ASSET4 ratings that are mostly covered by both databases. Hence the samples are comparable across different columns.

Columns (2)–(9) of Panel A of Table 10 present the regression results for using each of the above blockholder variables as the main explanatory variable. We find that almost all other types of blockholdings are either uncorrelated (cross holdings, pension fund holdings, domestic institutional holdings, and foreign institutional ownership) or negatively correlated with environmental engagement (foreign holdings, investment company holdings, employee holdings, and strategic holdings). The findings reported in Panel A of Table 10 suggest that the link between state ownership and environmental engagement is unique, compared to other types of blockholdings.

Third, we explore the role of different types of government stakes. Does the effect of government stakes occur because a 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 such as a sovereign wealth fund (for example, the Norges Bank of Norway or Temasek of Singapore)? Answering these questions can illuminate why and how government ownership promotes corporate environmental engagement. If one of the objectives of SOE is to internalize environmental externalities, the effect should mainly happen 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 SWFs in foreign businesses that may

Electronic copy available at: https://ssrn.com/abstract=2960832

focus more on financial returns. We test this by distinguishing between domestic and foreign state ownership and between direct government stakes and investment by SWFs.

The results are reported in Panel B of Table 10. In Column (1), we run the baseline regression on a subsample of firms that have ultimate owners in foreign countries. We do not find any statistical significance of the coefficient on *State_own*. In Column (2), we run the same regression for a subsample of firms that have domestic ultimate owners and find a positive and significant coefficient on *State_own* with economic magnitude similar to that in the baseline result in Table 4. In Column (3), we interact the *State_own* dummy with a dummy variable *Foreign_state*, which takes a value of 1 if the company has ownership stakes held by any foreign government or foreign SWF and 0 otherwise. The coefficient of the interaction term *State_own* × *Foreign_state* is negative and significant, which reinforces our earlier argument that domestic governments care more about environmental issues or are under greater pressure from the local populace. Finally, we test the difference between direct state ownership and ownership through investment by SWFs. In Column (4), we include *State_own* and a dummy variable indicating whether the company has investment from a sovereign wealth fund (*SWF*) in the same regression[34] 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 governments trying to address environmental externalities and market failures.

4.6. Alternative measures of environmental engagement and other robustness tests

The literature has expressed some concern of the reliability of a single ESG dataset, and papers recommend cross-validation of the results with alternative ESG data providers (Chatterji et al. 2016). For this purpose, we replace the dependent variable (the ASSET4 Environmental Pillar Score) with two alternative measures of firm-level environmental engagement from two most widely used alternative data sources: the 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 manage the environmental issues most material to their business and assess companies' ability to mitigate risks and capitalize on opportunities.[35] Similar to ASSET4, these two alternative ratings are also industry-adjusted, that is, companies are rated on

[34] 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.

[35] For the MSCI database, we refer to the description of Liang and Renneboog (2017). For the Sustainalytics database, the assessment of a company's environmental engagement is structured into four dimensions: (1) preparedness, (2) disclosure, (3) quantitative performance, and (4) qualitative performance.

Electronic copy available at: https://ssrn.com/abstract=2960832

their environmental engagement (both voluntary initiatives and mandatory compliance), relative to industry peers, on a global scale. Firm coverage is comprised mostly of constituents of major global equity indices.

We had access to the MSCI database for only one year (2016), so 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 measured in 2015. We control for industry- and country-fixed effects. There is a total of 849 unique firms in the cross-sectional regression. As shown in Column (1) of Table 11, the coefficient on *State_own* is positive and statistically significant. The economic magnitude is also comparable to our baseline results using the ASSET4 scores (*ENVSCORE*): on average, state-owned firms score 6% higher than nonstate-owned firms, as the coefficient of *State_own* is 0.640 for *MSCI Environmental Pillar Score* (on a scale of 0 to 10).

Column (2) of Table 11 presents the results when we estimate Equation (1) using the *Environmental Score* from Sustainalytics as the dependent variable on a sample of 11,796 firm-year observations (2,590 unique firms after merging with other datasets). We again find a significantly positive coefficient on *State_own* (1.790), which suggests that state-owned firms score 1.8% higher than non-state-owned ones (as *Environmental Score* is on a scale of 0 to 100). Given that these two alternative measures compiled by different data providers deliver consistent results, the correlation between corporate environmental engagement and state ownership is not likely driven by the peculiarity of the ASSET4 data.

We also conduct several additional robustness tests using an alternative definition for our key *State_own* variable and using alternative samples. First, by default, the Orbis ownership database only has two cutoff points of voting rights to define a controller: 25% or 50%. If we use the 50% cutoff to define *State_own*, it returns to a very small proportion of our sample firms as SOEs. But, in most countries, a 25% blockholding is sufficient for the government to have effective control. Nevertheless, for robustness, we have rerun the tests in Table 4 Panel A using the 50% voting rights cutoff and obtain very similar results (unreported to preserve space).

Another potential critique is that the number of firms from some countries included in our sample could be small, due to the availability of ownership data and ASSET4 data, which potentially biases our results toward large firms in large countries. To address this issue, we rerun the tests in Table 4 Panel A in the subsample of countries in which there are at least 20 companies with ESG ratings available. This led to dropping the following countries: Peru, Morocco, Czech Republic, Hungary, Egypt, Colombia, Portugal, Israel, New Zealand, and Ireland. Our results remain robust (unreported to preserve space). Similarly, when we exclude firms in regulated industries such as financial, oil & gas, utilities, and telecommunications, our results still hold in unreported tests. Moreover, when we split our sample into two subsamples by firm size,

Electronic copy available at: https://ssrn.com/abstract=2960832

we still find consistent results in unreported tests. Thus, the state ownership-environmental engagement relation we document is unlikely driven by firm size, public scrutiny, and regulation pressure.

Finally, we realize that the ASSET4 database increases its coverage of firms over time, which may inflate the *ENVSCORE* of some firms as their scores are given relative to their industry peers. To ensure that the expansion of the ASSET4 universe does not affect our results, we use the Fama-MacBeth regression approach which estimates the effect of state ownership on *ENVSCORE* once every year; thus, its estimates will not be biased by the expanding size of cross-section across time. We find that the coefficient on state ownership remains significantly positive in a Fama-MacBeth regression (unreported to preserve space).

4.7. State ownership, social engagement, and corporate governance

An important question is whether the state-ownership effects we document are unique to environmental issues. Some authors find that state-owned firms perform better on 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 might 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 et al. 1994, Dewenter and Malatesta 2001, Megginson and Netter 2001, Bortolotti and Faccio 2009). Musacchio et al. (2015) argue that the new form of state ownership (which *The Economist* calls "Leviathan Inc.") has mixed implications for governance and firm performance. We examine these issues below.

Specifically, we replace our dependent variable *ENVSCORE* with the aggregate social and corporate governance pillar scores of the ESG ratings from the ASSET4 database. The first score measures a company's overall engagement in social issues (*SOCSCORE*) or how much firms care about customers, suppliers, employees, community, and human rights. The second score measures corporate governance quality (*CGVSCORE*) with regard to board functions and structure, executive compensation, 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 U.S. firms) rank highest in terms of corporate governance, consistent with the literature.

The evidence in Table 12 indicates that state-owned firms also engage more in social issues, as evidenced by the significantly positive coefficients on *State_own* in Columns (1)–(2), but they do not have differential corporate governance performance, as the coefficients on *State_own* are insignificant in Columns (3)–(4).

Electronic copy available at: https://ssrn.com/abstract=2960832

5. Conclusion

The role of the state in organizing economic life has been long debated. A major trend characterizing the beginning of the 21st century is the resurgence of publicly listed yet state-owned enterprises ("Leviathan Inc."). This period has also witnessed increased attention to global warming and other sustainability issues. The role played by state-owned firms in these issues thus deserves further investigation, since governments can address environmental sustainability via SOEs, but rent-seeking politicians and managers can also capture SOEs.

We find that SOEs tend to be more engaged in environmental issues and that this pattern is not present for other private sector blockholders. The effect comes mainly from domestic ownership stakes held by a local government, 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 firms with more local operations, revenues, and income growth and firms located in countries lacking energy resources, and with weaker environmental regulation. These results corroborate the social view in that SOEs can help a domestic government address market failures within its own country (which are often what citizens care the most), especially when environmental regulations are not strong enough to deal with externalities. On the other hand, we also find evidence that stronger environmental engagement by SOEs tends to happen when CEOs are close to retirement age and have longer tenures. This latter set of results are consonant with the agency view, in which CEOs make environmental investment to pursue their personal tastes or agenda. Interestingly, SOEs are also more engaged with social issues but not have better or worse corporate governance performance. A causal interpretation for our baseline results is supported by the findings that SOEs reacted more strongly than non-state-owned firms to the 2011 Fukushima nuclear disaster and to temperature shocks (abnormal temperature and drought).

This paper's findings illuminate the social view that SOEs have stronger incentives to address environmental externalities, besides the well-documented agency view that focuses on SOE managers' lack of proper incentives. Economic theory suggests that the private sector (the market) pursues profit maximization, while the public sector (the state) may correct market failures, such as environmental pollution (Benabou and Tirole 2010). While companies in developed countries tend to exhibit better corporate governance (Aggarwal et al. 2009), these companies may not internalize environmental (and social) costs.[36] Our results highlight state owners being more willing to address environmental issues than

[36] For example, a company might improve shareholder value by outsourcing production to developing countries with laxer environmental regulations. In contrast, non-SOEs in developing countries may not have incentives to pursue sustainable practices and instead may maximize profits by using more polluting technologies.

Electronic copy available at: https://ssrn.com/abstract=2960832

private owners in industries and economies that are more sensitive to and lack the long-term capital to deal with environmental issues.

We believe that our findings have important policy implications. As economies worldwide have 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 play an important role in dealing with environmental externalities.

Electronic copy available at: https://ssrn.com/abstract=2960832

References:

Acemoglu D, Akcigit U, Hanley D, Kerr W (2016) Transition to clean technology. *Journal of Political Economy*, 124(1):52-104.

Aggarwal R, Erel I, Ferreira M, Matos P (2011) Does governance travel around the world? Evidence from institutional investors. *Journal of Financial Economics* 100(1):154-181.

Aggarwal R, Erel I, Stulz R, Williamson R (2009) Differences in governance practices between U.S. and foreign firms: Measurement, causes, and consequences. *Review of Financial Studies* 22, 3131-3169.

Bénabou R, Tirole J (2010) Individual and corporate social responsibility. *Economica* 77(305):1-19.

Besley T, Ghatak M (2001) Government versus private ownership of public goods. *Quarterly Journal of Economics* 116:1343-1372.

Borisova G, Fotak V, Holland K, Megginson W (2015) Government ownership and the cost of debt: Evidence from government investments in publicly traded firms. *Journal of Financial Economics* 118(1):168-191.

Bortolotti B, Faccio M (2009) Government control of privatized firms. *Review of Financial Studies* 22(8):2907-2939.

Bortolotti B, Fotak V, Megginson W (2015) Quiet leviathans: Sovereign wealth investment, passivity, and value of the firm *Review of Financial Studies* 28:2993-3035.

Boubakri N, Ghoul S, Guedhami O, Megginson, W (2017) The market value of government ownership. Working paper available at SSRN: https://ssrn.com/abstract=2967915.

Carney R, Child T (2013) Changes to the ownership and control of East Asian corporations between 1996 and 2008: The primacy of politics. *Journal of Financial Economics* 107:494-513.

Chaney PK, Faccio M, Parsley DC (2011) The quality of accounting information in politically connected firms. *Journal of Accounting and Economics* 51(1-2):58-76.

Chatterji AK, Durand R, Levine DI, Touboul S (2016) Do ratings of firms converge? Implications for managers, investors and strategy researchers. *Strategic Management Journal* 37:1597-1614.

Chen D, Jiang D, Ljungqvist A, Lu H, Zhou M (2017) State capitalism vs. private enterprise. Working paper available at SSRN: https://ssrn.com/abstract=2544246.

Cheng I, Hong H, Shue K (2016) Do managers do good with other peoples' money? University of Chicago working paper.

Choi D, Gao Z, Jiang W (2020) Attention to global warming. *Review of Financial Studies*. Forthcoming.

Cuervo-Cazurra A, Inkpen A, Musacchio A, Ramaswamy K (2014) Government as owners: State-owned multinational companies. *Journal of International Business Studies* 45(8):919-942.

Currie J, Davis L, Greenstone M, Walker R (2015) Environmental health risks and housing values: evidence from 1,600 toxic plant openings and closings. *American Economic Review* 105(2):678-709.

Del Guercio D, Tran H (2012) Institutional investor activism. In *Socially Responsible Finance and Investing*. John Wiley & Sons Inc.

Dewenter KL, Malatesta PH (2001) State-owned and privately owned firms: an empirical analysis of profitability, leverage, and labor intensity. *American Economic Review* 91(1):320-334.

Dewenter K, Han X, Malatesta P (2010) Firm values and sovereign wealth fund investments. *Journal of Financial Economics* 98: 256-278.

Di Giuli A, Kostovetsky L (2014) Are red or blue companies more likely to go green? Politics and corporate social responsibility. *Journal of Financial Economics* 111(1):158-180.

Dimson E, Karakaş O, Li X (2015) Active ownership. *Review of Financial Studies* 28(12):3225-3268.

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

Dyck A, Lins K, Roth L, Wagner H (2018) Do institutional investors drive corporate social responsibility: International evidence. *Journal of Financial Economics*. Forthcoming

Faccio M (2006) Politically connected firms. *American Economic Review* 91(1):54-78.

Faccio M, Masulis RW, McConnell JJ (2006) Political connections and corporate bailouts. *Journal of Finance* 61(6):2597-2635.

Electronic copy available at: https://ssrn.com/abstract=2960832

Ferrell A, Liang H, Renneboog L (2016) Socially responsible firms. *Journal of Financial Economics* 122(3):585-606.
Fisman R, Wang Y (2015) The mortality cost of political connections. *Review of Economic Studies* 82(4):1346-1382.
Flammer C (2015) Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science* 61(11):2549-2568.
Gibson-Brandon R, Kruger P (2016) The sustainability footprint of institutional investors. Working paper available at SSRN: https://papers.ssrn.com/ abstract=2918926.
Gormley TA, Masta DA (2014) Common errors: How to (and not to) control for unobserved heterogeneity. *Review of Financial Studies* 27(2):617-661.
Hart O, Zingales L (2017) Companies should maximize shareholder welfare not market value. Working paper available at SSRN: https://ssrn.com/abstract=3004794.
Hong H, Li FW, Xu J (2019) Climate risks and market efficiency. *Journal of Econometrics* 208(1):265-281.
Hopner A, Oikonomou I, Sautner Z, Starks L, Zhou X (2016) ESG shareholder engagement and downside risk. Working paper available at SSRN: https://ssrn.com/abstract=2874252.
Inoue C, Lazzarini SG, Musacchio A (2013) Leviathan as a minority shareholder: Firm-level implications of state equity purchases. *Academy of Management Journal* 56(6):1775-1801.
Jia N, Huang KG, Zhang CM (2018) Agency incentives and firm innovation: Public governance, corporate governance, and firm innovation: an examination of state-owned enterprises. *Academy of Management Journal.* Forthcoming.
Karolyi A, Liao R (2017) State capitalism's global reach: Evidence from foreign acquisitions by state-owned companies. *Journal of Corporate Finance* 42:367-391.
Kotter J, Lel U (2011) Friends or foes? Target selection decisions of sovereign wealth funds and their consequences. *Journal of Financial Economics* 101:360-381.
La Porta R, Lopez-de-Silanes F (1999) The benefits of privatization: Evidence from Mexico. *Quarterly Journal of Economics* 114(4):1193-1242.
Lade GE, Rudik I (2020) Costs of inefficient regulation: Evidence from the Bakken. *Journal of Environmental Economics and Management* 102:102336.
Laffont JJ, Tirole J (1993) *A Theory of Incentives in Regulation and Procurement*. Cambridge, MA: MIT Press.
Lawson C (1994) The theory of state-owned enterprises in market economies. *Journal of Economic Surveys* 8(3):284–309.
Le Grand J (1991) The theory of government failure. *British Journal of Political Science* 21(4):423–442.
Levy B (1987) A theory of public enterprise behavior. *Journal of Economic Behavior and Organization* 8(1):75–96.
Li D, Zhang L (2010) Does q-theory with investment frictions explain anomalies in the cross section of returns? *Journal of Financial Economics* 98(2):297-314.
Liang H, Renneboog L (2017) On the foundations of corporate social responsibility. *Journal of Finance* 72(2):853-910.
Lindsay CM (1976) A theory of government enterprise. *Journal of Political Economy* 84(5):1061–1077.
Lins K, Servaes H, Tamayo A (2017) Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis, *Journal of Finance* 72(4):1785-1824.
Masulis R, Reza S (2015) Agency problems of corporate philanthropy. *Review of Financial Studies* 28(2):592-636.
Megginson W, Nash R, Randenborgh M (1994) The financial and operating performance of newly privatized firms: An international empirical analysis. *Journal of Finance* 49(2):403-452.
Megginson W, Netter J (2001) From state to market: A survey of empirical studies on privatization. *Journal of Economic Literature* 39(2):321-389.
Megginson W (2017) Privatization, state capitalism, and state ownership of business in the 21st century. *Foundations and Trends in Finance* 11(1–2):1-153.

Electronic copy available at: https://ssrn.com/abstract=2960832

Mullainathan S, Shleifer A (2005) The market for news. *American Economic Review* 95(1):1031-1053.
Musacchio A, Lazzarini S (2014) *Reinventing State Capitalism: Leviathan in Business, Brazil and Beyond*. Cambridge, M.A: Harvard University Press.
Musacchio A, Lazzarini S, Aguilera R (2015) New varieties of state capitalism: Strategic and governance implications. *Academy of Management Perspectives* 19(1):115-131.
Organisation for Economic Co-operation and Development (2013) State-owned enterprises: Trade effects and policy implications. Trade Policy Papers, No. 147.
Rodrik D (2014) Green industrial policy. *Oxford Review of Economic Policy* 30(3):469-491.
Schiller C (2018) Global supply-chain networks and corporate social responsibility. Working paper available at SSRN: https://ssrn.com/abstract=3089311.
Servaes H, Tamayo A (2013) The impact of corporate social responsibility on firm value: The role of customer awareness. *Management Science* 59(5):1045-1061.
Shleifer A (1998) State versus private ownership. *Journal of Economic Perspectives* 12(4):133-150.
Shleifer A (2005) Understanding regulation. *European Financial Management* 11(4):439-451.
Shleifer A, Vishny R (1998) *The Grabbing Hand: Government Pathologies and Their Cures*. Cambridge, MA: Harvard University Press.
The Economist (2010) Leviathan Inc. - Governments seem to have forgotten that picking industrial winners nearly always fails, August 5.
The Economist (2014) Leviathan as capitalist - State capitalism continues to defy expectations of its demise, June 21 edition.

Electronic copy available at: https://ssrn.com/abstract=2960832

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

Region	Ownership	Company	Original data in ORBIS	Correction
Asia Pacific	Domestic state-owned	Zijin Mining, China	2002-2014 nonstate-owned	Majority owned (>25%) by Minxi Xinghang State-Owned Assets Investment Co. Ltd., which is a private company controlled by the Chinese government. http://www.hkexnews.hk/listedco/listconews/SEHK/2013/0425/LTN201304251235.pdf
	Domestic state-owned	Weichai Power, China	No information for 2002-2014; 2014-2017 state-owned	State-owned until 2007. Since 2008 the total state ownership fell below 25%. https://www1.hkexnews.hk/listedco/listconews/sehk/2018/0427/ltn201804272468.pdf
	Domestic state-owned	Tsingtao Brewery, China	No information; 2014-2017 state-owned	Always state-owned. The controlling shareholder is Tsingtao Brewery Group Company Limited, which is wholly owned subsidiary of SASACQ (青岛国资委). http://www.hkexnews.hk/listedco/listconews/SEHK/2009/0429/LTN200904291779.pdf http://www.hkexnews.hk/listedco/listconews/SEHK/2014/0423/LTN20140423394.pdf, and also from Wind
	Domestic state-owned	Woori Bank, South Korea	No information	State-owned until 2016. Since 2017, The Korean Deposit Insurance Company shareholding fell below 25%. https://spot.wooribank.com/pot/Dream?withyou=ENENG0662; http://blogs.wsj.com/moneybeat/2014/07/09/south-koreas-woori-privatization-still-faces-biggest-hurdle-suitors-for-woori-bank/ https://www.spglobal.com/marketintelligence/en/news-insights/trending/jz7ioklop9tb_ozx4hbg1w2
	Foreign state-owned	S-Oil Corporation, South Korea	2002-2010 nonstate-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. http://www.bloomberg.com/news/articles/2014-01-10/saudi-aramco-to-buy-2-billion-stake-in-s-oil-official-says
	Owned by sovereign wealth fund	Singapore Post, Singapore	2002-2007 & 2014-2017 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. https://www.singpost.com/about-us/investor-relations/annual-reports?option=4
	Owned by sovereign wealth fund	Singapore Telecom, Singapore	2002-2007 & 2010 non-state-owned; 2008-2009 & 2011-2017 state-owned	Always state-owned. Temasek owns over 50% nearly all the time. http://info.singtel.com/about-us/investor-relations/annual-reports?dispatcher=302
	Owned by sovereign wealth fund	Singapore Airlines, Singapore	2002-2007 nonstate-owned; 2008-2017 state-owned	Always state-owned. Temasek owns over 50% all the time. https://www.singaporeair.com/en_UK/us/about-us/information-for-investors/annual-report/
	Owned by sovereign wealth fund	SIAM Cement, Thailand	2002-2012 state-owned; 2013-2014 nonstate-owned	Always state-owned. The controlling shareholder has always been Crown Property Bureau, which can be seen as Thailand sovereign fund. http://scc.listedcompany.com/misc/ar/20150223-scc-ar-2014-en.pdf; http://www.scg.co.th/en/04investor_governance/07_annual_report_sustainability_report.html
	Domestic state-owned	Jiangxi Copper Industry, China	No information	Always state-owned. The controlling shareholder is Jiangxi State-Owned Assets Sup. & Admin Commission. https://www.marketscreener.com/quote/stock/JIANGXI-COPPER-INDUSTRY-C-6497372/company/
	Domestic state-owned	MMC Corporation, Malaysia	2014-2017 non-state-owned	Always state-owned. The Malaysian government controls more than 25% of the company by indirectly owning two major shareholders, Permodalan Nasional Berhad (PNB) and Employees Provident Fund (EPF). https://www.mmc.com.my/page11.html

Electronic copy available at: https://ssrn.com/abstract=2960832

Appendix 1. (continued)

Region	Ownership	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. http://quicktake.morningstar.com/stocknet/secdocuments.aspx?symbol=cesdy
	Domestic state-owned	VALE, Brazil	2002-2017 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. http://extapps.mz-ir.com/cielo/rao2009/eng/ra/07.htm
	Foreign state-owned	Aguas Andinas, Chile	2008-2010, 2012, 2014-2017: 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.
		Salfa Corporation, Chile	2014-2017 state-owned	Not state-owned. The largest shareholder BTG Pactual Chile S.A. Administradora General de Fondos is not state-owned. https://www.salfacorp.com/wp-content/uploads/SalfaCorp-Memoria-Anual-2018.pdf
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. https://www.cez.cz/en/investors/financial-reports/annual-reports.html
	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. https://www.zonebourse.com/VERBUND-AG-6491294/pdf/32124/VERBUND%20AG_Rapport-annuel.pdf
	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. http://www.edp.pt/en/Investidores/publicacoes/relatorioecontas/Pages/RelatorioeContas.aspx
	Domestic state-owned	France Telecom (ORANGE), France	2002-2008, 2014, 2016-2017 state-owned; 2008-2013, 2015 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 2014-2017	Always state-owned. The Russian government maintain over 50% of its shareholding mainly through Svyazinvest, also a state-owned enterprise. http://www.rostelecom.ru/en/ir/results_and_presentations/ar/
	Domestic state-owned	OC Rosneft, Russia	2002-2008 non-state-owned; 2009-2017 state-owned	Always state-owned. The controlling shareholder has always been ROSNEFTEGAZ, which is state-owned. https://www.rosneft.com/Investors/Reports_and_presentations/Annual_reports/
	Domestic state-owned	Bank of Piraeus, Greece	No Information	Always state-owned. The Greek government owns Hellenic Financial Stability Fund, which controls over 25% of Bank of Piraeus. https://www.marketscreener.com/quote/stock/PIRAEUS-BANK-SA-1408756/company/
	Domestic state-owned	Turkiye Is Bankasi, Turkey	2014-2015 non-state-owned	Always state-owned. The Turkish government controls more than 25% of the company. https://www.isbank.com.tr/en/about-us/ownership-structure

Electronic copy available at: https://ssrn.com/abstract=2960832

Appendix 2. List of Variables and Data Sources

Variable	Description
ENVSCORE	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.
ENER	Emission Reduction, measures a company's management commitment to and effectiveness in reducing environmental emissions 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 impact on biodiversity, as well as partnering with environmental organizations to reduce the company's environmental impact in the local or broader community. Source: Thomson Reuters ASSET4 database.
ENPI	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.
ENRR	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.
SOCSCORE	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.
CGVSCORE	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.
CO_2/Assets	CO_2 and CO_2 equivalents emission in tonnes scaled by total assets and then taken logarithm, and winsorized at 1% and 99%. Source: Thomson Reuters ASSET4 (ENERDP023).
MSCI Environmental Pillar Score	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, and so forth. 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

Sustainalytics Environmental Score	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.
State_own	A dummy variable that equals one if the ultimate owner is the state, the government, or a public authority, and zero otherwise or at least 25% of a firm's free-floating shares are held by governments. 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 and Datastream.
Foreign_state	A dummy variable that equals one if the company has ownership stakes held foreign government or foreign SWF, and zero otherwise. Source: Orbis.
SWF	A dummy variable that equals one if the company has shares owned by a sovereign wealth fund (SWF), and zero otherwise. Source: Factset.
Inst_own	Holdings (end-of-year) by all institutions as a fraction of market capitalization. Source: FactSet/LionShares.
Market-to-book (MTB)	Calculated as the ratio of the market value of total equity to the book value of total equity, winsorized at the 5% level. Source: Datastream.
Return on assets (ROA)	Calculated as the ratio of net income to the book value of total assets of the company. Source: Datastream and Compustat.
Ln(Market cap)	The logarithm of the company's stock market capitalization. Source: Datastream.
Leverage	The ratio of total liabilities to total assets of the company, winsorized at 5% level. Source: Datastream and Compustat.
GDP (per capita)	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. In the regression analysis, we take the logarithm of GDP per capita and denote it as *Ln(GDP)* for simplicity. Source: World Bank database.
Industry HHI	Herfindahl-Hirschman Index measured by the summation of squared market share (based on sales) of each firm within the same industry. We use Fama-French 48 industry classification. Source: Datastream Worldscope.
Government held	The percentage of total shares in issue of holdings of 5% or more held by a government or government institution. Source: Datastream.
Foreign holdings	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 1st, 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.
Cross holdings	The percentage of total shares in holdings of 5% or more held by one company in another. Source: Datastream.
Pension fund held	The percentage of total shares in holdings of 5% or more held by pension funds or endowment funds. Source: Datastream.
Investment co. held	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.

Electronic copy available at: https://ssrn.com/abstract=2960832

Employee held	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.
Strategic holdings	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.
Domestic inst. held	Holdings (end-of-year) by institutions located in the same country in which the stock is listed as a fraction of market capitalization. Source: FactSet/LionShares.
Foreign inst. held	Holdings (end-of-year) by institutions located in a different country from the country in which the stock is listed as a fraction of market capitalization. Source: FactSet/LionShares.
Foreign sales	The percentage of foreign sales over total net sales revenue of the company. Source: Datastream Worldscope.
Foreign assets	The percentage of foreign assets over total assets in the balance sheet of the company. Source: Datastream/Worldscope.
Foreign income growth	The annual growth rate of international operating income of the company. Source: Datastream Worldscope.
Idiosyncratic volatility	We follow Li and Zhang (2010) and estimate idiosyncratic volatility for an individual stock for every year by regressing daily stock returns on the value-weighted market return from July 1st of year t - 1 to June 30th of year t. A stock's idiosyncratic risk is the standard deviation of the regression residuals. The return data are from Datastream.Source: Datastream Worldscope.
Worldwide Governance Indicators	Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them. The Worldwide Governance Indicators (WGI) report on six broad dimensions of governance for over 215 countries and territories over the period 1996-2018: (I) Voice and Accountability; (II) Political Stability and Absence of Violence; (III) Government Effectiveness; (IV) Regulatory Quality; (V) Rule of Law; and (VI) Control of Corruption. The WGI are composite governance indicators based on over 30 underlying data sources. These data sources are rescaled and combined to create the six aggregate indicators using a statistical methodology known as an unobserved components model. A key feature of the methodology is that it generates margins of error for each governance estimate. These margins of error need to be taken into account when making comparisons across countries and over time.
Energy dependence (Energy security risk)	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 lower risk to energy security. Source: International Index of Energy Security Risk of the US Chamber of Commerce's Institute for 21st Century Energy (www.energyxxi.org).
Environmental regulation	Dummy variable indicating whether in a particular year the country changed its regulation toward enhancing environmental protection and reporting. Source: Carrot & Sticks dataset (https://www.carrotsandsticks.net/regulations/).
MktCap/GDP	Stock Market Capitalization / GDP. Source: World Bank

Electronic copy available at: https://ssrn.com/abstract=2960832

Political orientation (Government leaning)	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 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). *Not* 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
Industry emission intensity	The median weight of total hazardous substances produced by all factories in each SIC 2-digit code in the TRI database. Source: U.S. Environmental Protection Agency's (EPA) toxic release inventory (TRI) database.
CEO retirement age	CEO retirement age is a dummy variable that equals one if the CEO of the company is above 60 years old, and zero otherwise. Source: NRG Metrics and BoardEx.
CEO tenure	CEO tenure is measured as the number of years the CEO has worked in the focal company. Source: NRG Metrics and BoardEx.
Political connection of CEO	Political connection of CEO is a dummy variable that equals one if the CEO of the company worked in the government, political party committee and member, or military, or is/was a member of the Congress, and zero otherwise. Source: BoardEx and online search (e.g., Bloomberg Businessweek).

Electronic copy available at: https://ssrn.com/abstract=2960832

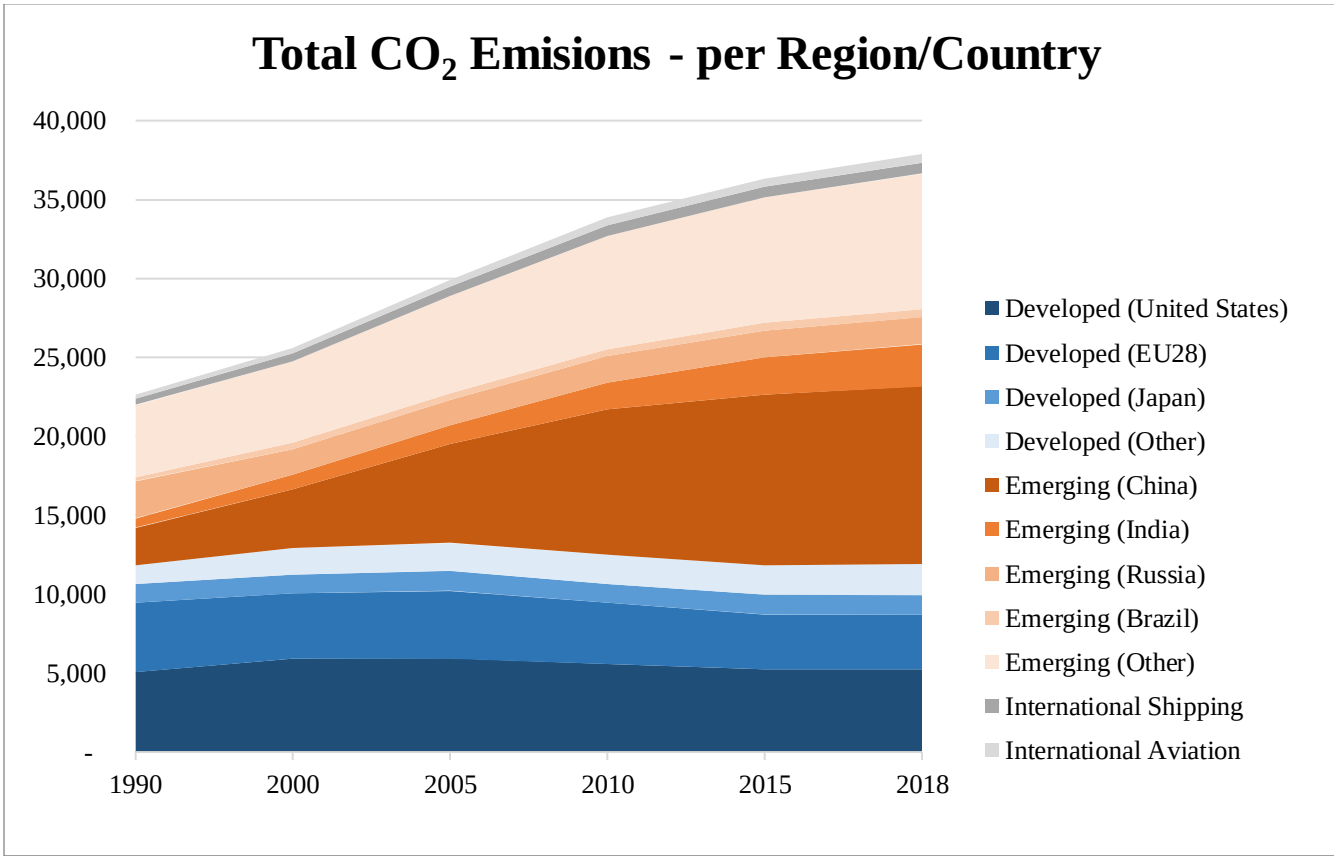

Figure 1. Total CO_2 Emissions Over Time, per Region/Country

This figure presents the 1990–2018 time series of country-specific CO_2 emission totals of fossil fuel use and industrial processes. Source: Emission Database for Global Atmospheric Research (EDGAR) 4.3.2, European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency.

Electronic copy available at: https://ssrn.com/abstract=2960832

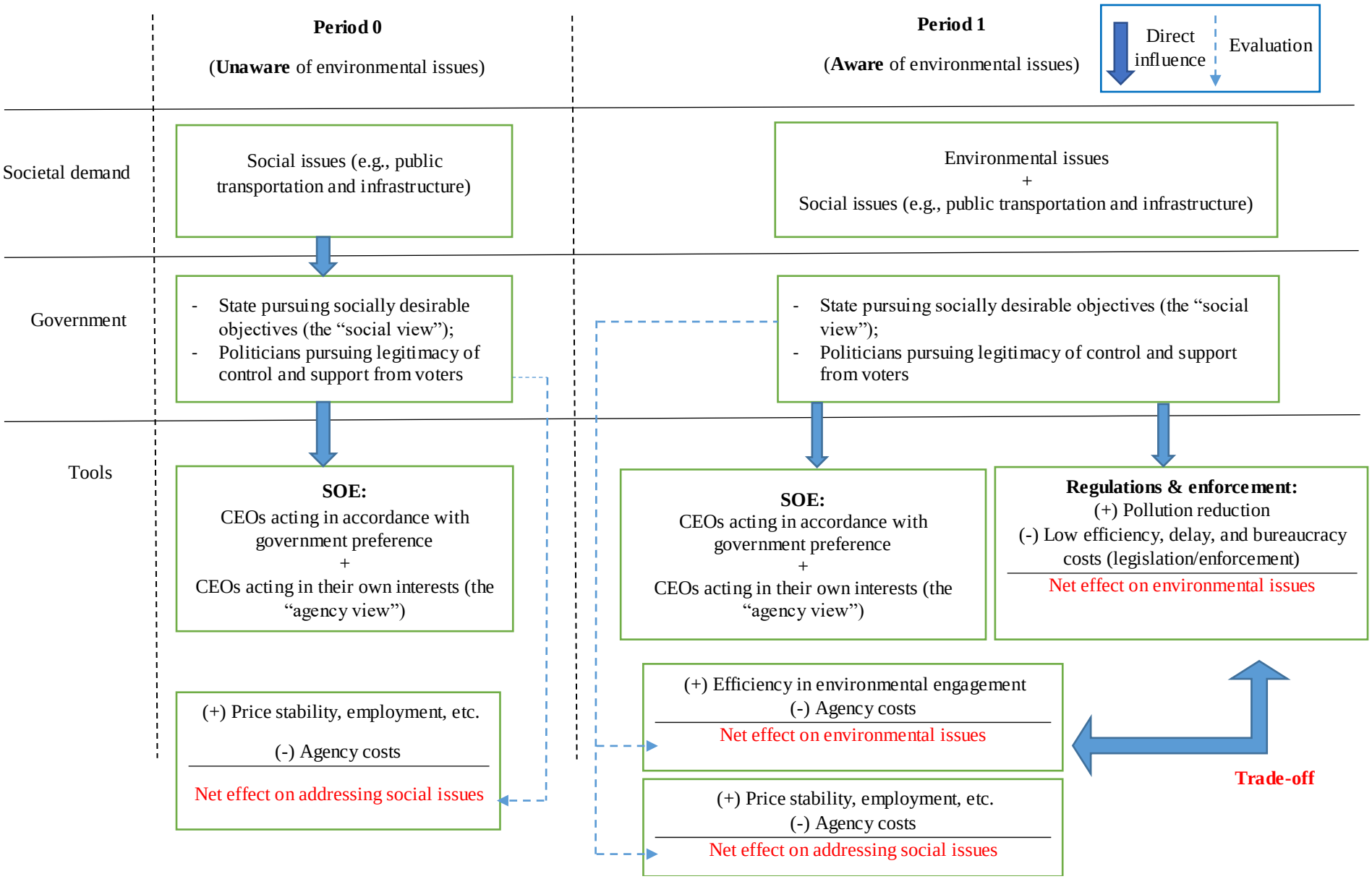

Figure 2. A Conceptual Framework for the Effect of SOEs on Environmental Engagement

Electronic copy available at: https://ssrn.com/abstract=2960832

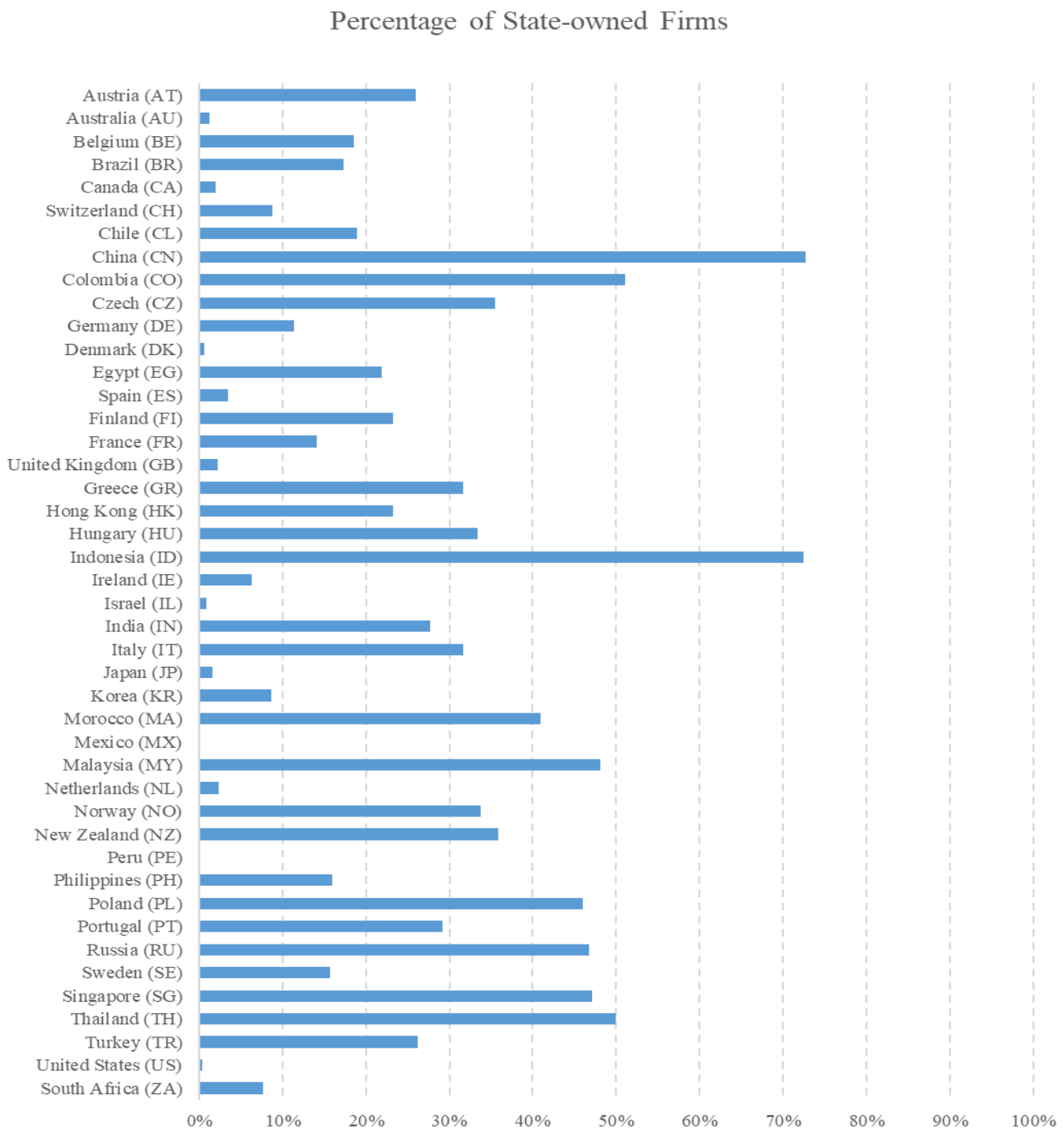

Figure 3. Average State Ownership of Publicly Listed Firms, per Country

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 2004–2017 sample period. 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, Market Cap, Leverage, Market-to-book ratio (MTB), ROA, and GDP per capita, and Industry HHI.

Electronic copy available at: https://ssrn.com/abstract=2960832

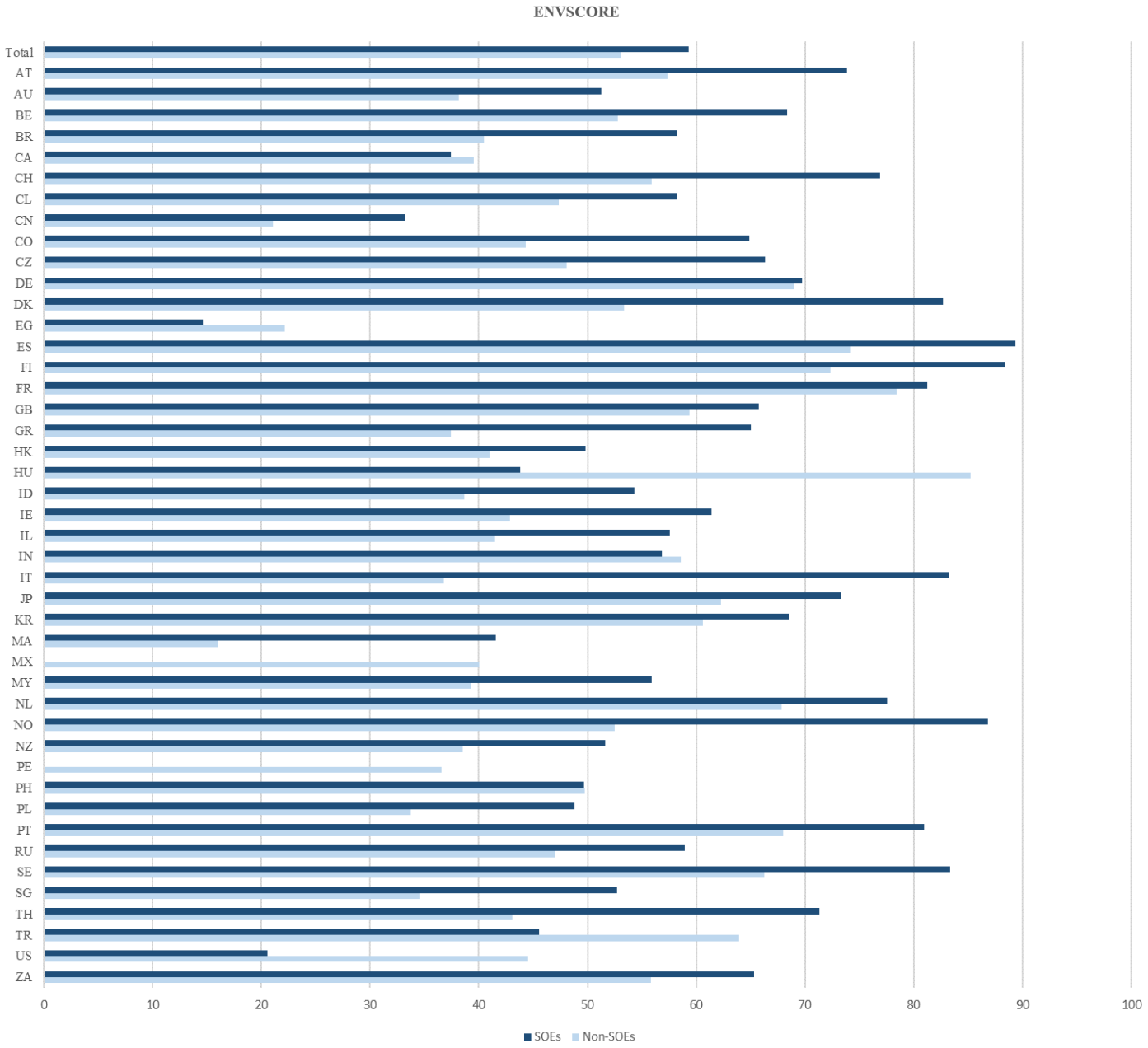

Figure 4. Average Environmental Scores (ENVSCORE) of SOEs and Non-SOEs per Country

This figure presents the average environmental scores (ENVSCORE) of SOEs and non-SOEs in each country in our sample. For all firm-year observations in the SOE group or the non-SOE group in each country in the sample period from 2004 to 2017, we calculate their pooled average in ENVSCORE. There is no bar for countries without SOE.

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 1. 2010 Forbes Top-Ranked Global Companies

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 3.

Forbes Rank 2010	Country	*State_own*	*ENVSCORE*				*SOCSCORE*	*CGVSCORE*
				ENER	*ENPI*	*ENRR*		
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
5. ICBC	**CN**	1	**87.86**	**72.09**	**95.19**	**85.65**	**78.27**	**78.98**
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
12. PetroChina	**CN**	1	**57.50**	**64.25**	**15.44**	**75.30**	**81.13**	**19.74**
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
16. Gazprom	**RU**	1	**81.95**	**91.28**	**53.11**	**79.10**	**76.46**	**6.99**
17. China Construction Bank	**CN**	1	**53.33**	**34.44**	**87.36**	**35.94**	**81.45**	**28.92**
18. Petrobras	**BR**	1	**91.67**	**90.93**	**84.42**	**88.34**	**93.80**	**34.01**
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
22. Bank of China	**CN**	1	**79.61**	**37.93**	**95.50**	**88.15**	**82.44**	**49.77**
23. Allianz	DE	0	93.50	93.66	88.13	93.40	93.40	78.88
24. GDF Suez	**FR**	1	**90.06**	**92.34**	**88.28**	**78.89**	**95.71**	**76.96**
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
27. EDF Group	**FR**	1	**92.86**	**84.90**	**97.53**	**88.77**	**96.13**	**33.16**
28. AXA Group	FR	0	93.39	85.18	95.44	93.31	94.37	82.90
29. Lloyds	**GB**	1	**90.01**	**92.48**	**69.86**	**92.90**	**93.20**	**73.90**
30. Procter & Gamble	US	0	94.69	92.76	97.41	93.50	92.54	81.51
31. ENI	**IT**	1	**89.02**	**83.41**	**81.75**	**84.79**	**96.11**	**59.61**

Electronic copy available at: https://ssrn.com/abstract=2960832

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% levels, respectively. Country abbreviations are described in Figure 3.

Panel A: Univariate Tests by Country

				ENVSCORE									
Country	Unique firm no.	Obs	*State_own*	All	*State_own* =1	*State_own* =0	*p-value* (1>0)		*ENER*	*ENPI*	*ENRR*	*SOCSCORE*	*CGVSCORE*
Total	3,902	33,122	0.078	53.53	59.31	53.04	0.00	***	53.48	50.59	53.65	54.63	53.78
AT	14	133	0.260	64.23	73.91	60.78	0.00	***	61.12	62.17	59.38	59.73	42.05
AU	345	2,348	0.013	38.74	52.46	38.68	0.00	***	41.86	35.18	41.53	43.25	63.37
BE	14	141	0.186	55.92	67.50	53.68	0.02	**	56.82	51.97	54.23	56.29	57.04
BR	53	313	0.173	43.41	58.38	40.20	0.00	***	45.26	38.00	46.93	53.43	23.32
CA	222	1,748	0.020	41.11	36.74	41.11	0.83		44.73	36.89	42.59	42.65	75.87
CH	38	360	0.087	59.80	73.80	58.60	0.00	***	59.22	54.97	60.41	57.39	52.27
CL	20	149	0.189	49.30	58.25	47.47	0.06	*	49.05	46.43	50.60	54.97	11.78
CN	40	256	0.727	29.92	33.25	21.05	0.00	***	30.02	37.47	28.14	29.31	23.81
CO	7	47	0.511	56.58	65.84	46.40	0.01	**	57.52	45.75	58.95	72.10	31.05
CZ	3	31	0.355	55.68	66.33	49.82	0.01	***	48.73	59.63	52.61	71.15	18.69
DE	73	672	0.114	71.35	69.98	71.45	0.69		69.21	68.97	68.74	71.34	36.87
DK	16	170	0.006	55.32	82.68	53.16	--		54.96	49.53	58.84	52.11	45.91
EG	11	77	0.219	23.60	14.49	26.45	0.99		23.75	28.89	25.08	28.91	9.14
ES	50	474	0.034	75.95	89.65	75.65	0.00	***	75.65	65.96	75.64	81.68	51.01
FI	20	237	0.232	77.61	88.73	74.24	0.00	***	73.19	77.60	72.41	74.35	62.65
FR	91	963	0.141	78.79	81.24	78.45	0.08	*	76.96	70.66	78.92	79.29	58.15
GB	349	3,139	0.022	61.53	67.23	61.59	0.06	*	64.45	49.06	64.21	66.16	74.01
GR	19	157	0.316	45.73	65.03	37.41	0.00	***	48.92	33.60	51.49	48.40	17.83
HK	175	1335	0.232	42.76	49.82	40.98	0.00	***	39.78	42.18	45.67	43.08	41.82
HU	3	24	0.333	71.18	43.79	84.88	1.00		73.56	65.03	65.45	77.90	35.29
ID	22	125	0.724	48.90	54.72	38.01	0.00	***	52.68	40.86	48.62	67.27	30.25
IE	9	66	0.063	49.49	61.40	48.67	0.19		47.08	47.57	51.62	47.59	67.78
IL	16	117	0.009	47.95	57.58	47.28	--		42.87	46.57	52.50	50.67	41.27
IN	97	572	0.276	59.95	57.03	61.04	0.93		58.11	54.81	61.86	61.87	34.39
IT	34	311	0.316	54.09	83.46	39.97	0.00	***	52.69	51.87	55.42	63.24	43.84
JP	428	5,078	0.016	64.16	74.09	64.05	0.00	***	63.95	64.89	59.06	50.68	10.96
KR	114	800	0.087	62.99	68.81	62.35	0.04	**	62.19	65.50	57.08	58.76	13.52
MA	3	23	0.409	28.38	41.58	16.00	0.00	***	27.88	27.48	33.99	53.88	6.30
MX	18	108	0.000	40.02		40.02			43.53	31.41	43.81	42.95	12.28
MY	54	369	0.481	47.24	55.91	39.24	0.00	***	50.30	41.31	48.45	57.63	48.45
NL	33	298	0.024	70.38	77.53	70.42	0.13		66.98	63.70	71.27	76.82	66.15
NO	16	160	0.338	64.92	86.81	54.07	0.00	***	62.57	66.58	57.37	68.50	62.73
NZ	31	143	0.358	43.14	53.31	38.69	0.00	***	43.82	44.53	39.96	41.60	59.48
PE	1	9	0.000	36.54		36.54			48.54	19.55	45.99	36.56	50.36
PH	23	103	0.160	51.28	53.50	50.93	0.38		50.77	46.38	53.50	53.51	40.01
PL	30	206	0.460	41.65	48.78	36.17	0.00	***	44.79	37.72	41.46	46.51	25.82
PT	8	76	0.292	73.10	81.40	68.91	0.01	***	77.84	55.94	73.05	79.60	57.30
RU	34	266	0.468	52.64	58.94	47.01	0.00	***	56.03	39.56	56.42	57.15	28.42
SE	19	170	0.157	71.24	83.36	68.54	0.00	***	70.96	63.48	68.54	65.62	60.53
SG	41	422	0.471	42.90	52.72	34.59	0.00	***	42.22	41.54	45.50	46.23	49.32
TH	10	55	0.500	58.82	70.07	48.52	0.00	***	59.16	47.55	63.66	69.55	47.75
TR	26	197	0.262	59.40	45.55	63.96	1.00		58.68	57.30	58.67	61.40	27.06
US	1160	10,006	0.003	47.00	22.40	47.27	1.00		45.41	47.10	47.71	51.50	75.74
ZA	112	668	0.077	58.67	65.28	58.05	0.00	***	60.59	44.38	64.26	75.04	61.55

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 2. (continued)

Panel B: Univariate Tests by Major Industry								
Industry	Obs.	*State_own*	*ENVSCORE*				*SOCSCORE*	*CGVSCORE*
			All	*State own*=1	*State own*=0	p-value (1 > 0)		
Basic Materials	3,526	0.070	56.74	64.08	56.25	0.00	54.83	55.03
Consumer Goods	3,770	0.026	63.29	56.80	63.55	0.98	59.74	47.03
Consumer Services	4,663	0.030	43.61	57.85	43.34	0.00	49.81	54.71
Financials	5,363	0.092	44.99	47.84	44.81	0.02	48.96	49.55
Health Care	1,955	0.017	43.88	29.06	44.39	1.00	52.38	58.17
Industrials	6,558	0.065	61.20	55.15	61.68	1.00	57.66	52.55
Oil & Gas	2,457	0.135	47.69	66.88	44.73	0.00	51.40	64.14
Technology	2,317	0.024	53.96	66.71	53.80	0.00	54.49	58.64
Telecommunications	862	0.381	59.87	65.20	57.03	0.00	66.19	52.89
Utilities	1,651	0.292	65.85	64.74	66.40	0.88	64.25	55.60

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 3. Summary Statistics

Panel A presents summary statistics for variables in the 2004–2017 sample period for our main specification. The main variables of interest include state ownership dummy (State_own), environmental pillar score (*ENVSCORE*, *ENER*, *ENPI* and *ENRR*), firm-level CO_2 emission, 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 pairwise correlation coefficients for variables in the main specification.

Panel A. Summary Statistics of All Variables

Variable	Obs	Mean	Std. Dev.	Min	0.25	Median	0.75	Max
ENVSCORE	33122	53.528	31.749	8.17	19.35	55.88	86.54	97.42
ENER	33122	53.481	31.801	7.29	19.34	55.085	86.71	98.04
ENPI	33122	50.594	31.545	8.35	19.86	39.745	84.91	99.68
ENRR	33122	53.651	31.618	5.79	19.63	59.285	85.22	97.49
SOCSCORE	33122	54.634	30.211	3.63	25.44	57.405	84.12	99.35
CGVSCORE	33122	53.783	31.05	1.11	22.69	62.115	81.53	98.19
Ln(CO_2/*Assets*)	16059	-3.36	2.38	-10.33	-4.55	-3.18	-1.64	1.15
State_own	33122	.078	.269	0	0	0	0	1
Inst_own	33122	.396	.314	.017	.134	.274	.688	.991
Ln(MarketCap)	33122	8.295	1.265	4.899	7.531	8.305	9.204	10.276
Leverage	33122	23.479	17.164	0	9.21	21.99	34.65	62.56
MTB	33122	2.609	2.05	.525	1.168	1.922	3.304	8.396
ROA	33122	5.694	6.677	-13.9	1.97	5.23	9.3	19.79
Ln(GDP)	33122	10.497	.695	6.899	10.525	10.699	10.832	11.543
Industry HHI	33122	.19	.211	.013	.045	.107	.254	1
Emission industries	23180	1.681	.466	1	1	2	2	2
Abnormal temperature	30305	.448	.497	0	0	0	1	1
Drought	25427	.407	.491	0	0	0	1	1
Government leaning left	28695	.042	.201	0	0	0	0	1
Government leaning right	28695	.037	.188	0	0	0	0	1
Energy dependence	29486	993.349	237.881	579	850	933	1104	2611
High energy dependence	29486	.595	.491	0	0	1	1	1
Mktcap/GDP	32873	145.271	191.623	10.009	81.016	107.279	137.607	1274.132
High Mktcap/GDP	32873	.414	.493	0	0	0	1	1
Environmental regulation	33122	.539	.499	0	0	1	1	1
Foreign assets	25700	19.866	26.34	-124.62	0	7.87	31.995	823.28
Foreign sales	29633	36.083	34.257	-114.48	0	30.08	62.41	883.66
Foreign income growth	17461	2922.596	373000	-100	0	0	.84	4.92e+07
CEO retirement age	14910	.249	.432	0	0	0	0	1
CEO tenure	17115	9.07	8.101	0	3	7	12	55
CEO political connection	22133	.111	.315	0	0	0	0	1
Government held	33074	1.927	9.708	0	0	0	0	99
Foreign holdings	32618	6.298	14.96	0	0	0	5	100
Cross holdings	32641	9.837	19.277	0	0	0	10	100
Pension fund held	32596	.329	2.473	0	0	0	0	90
Investment co. held	32599	5.961	8.536	0	0	0	10	84
Employee held	32605	4.57	12.541	0	0	0	0	93
Strategic holdings	26325	30.329	22.271	5	11	24	48	100
Domestic inst. own	33122	.27	.32	0	.023	.082	.567	.995
Foreign inst. own	33122	.133	.125	0	.058	.1	.164	1
Foreign state	27509	1	.022	0	1	1	1	1
SWF	24714	.01	.097	0	0	0	0	1
MSCI Env. Pillar Score	1,385	5.575	2.174	0	4.1	5.5	7	10
Sustainalytics Env. Score	14,447	52.916	13.008	23	42.25	51.367	62	100

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 3. (continued) Summary Statistics

Panel B: Pairwise Correlation Coefficients of Key Variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	State_own	1														
(2)	Government_held	0.610	1													
(3)	ENVSCORE	0.053	0.076	1												
(4)	ENER	0.060	0.087	0.925	1											
(5)	ENPI	0.023	0.041	0.824	0.636	1										
(6)	ENRR	0.050	0.068	0.920	0.837	0.617	1									
(7)	SOCSCORE	0.084	0.112	0.780	0.755	0.563	0.772	1								
(8)	CGVSCORE	-0.097	-0.049	0.158	0.160	0.047	0.203	0.306	1							
(9)	Inst_own	-0.222	-0.158	-0.081	-0.108	-0.053	-0.060	0.002	0.571	1						
(10)	Ln(MarketCap)	0.081	0.086	0.384	0.360	0.312	0.368	0.399	0.138	0.219	1					
(11)	Leverage	0.043	0.031	0.099	0.111	0.061	0.083	0.082	0.020	-0.012	0.026	1				
(12)	MTB	-0.071	-0.055	-0.086	-0.095	-0.089	-0.048	-0.006	0.157	0.200	0.199	-0.034	1			
(13)	ROA	0.005	0.007	-0.020	-0.026	-0.037	0.006	0.041	0.071	0.107	0.216	-0.123	0.429	1		
(14)	Ln(GDP)	-0.276	-0.218	-0.014	-0.023	0.021	-0.026	-0.060	0.297	0.347	-0.010	-0.027	-0.008	-0.088	1	
(15)	Industry HHI	0.193	0.167	0.132	0.152	0.056	0.142	0.179	-0.018	-0.329	-0.057	0.017	-0.008	0.029	-0.131	1

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 4. Main Regressions

Panel A reports the results from regressing measures of firm-level environmental engagement on a state ownership dummy (*State_own*) and other control variables as well as industry-year fixed effects and country fixed effects. The firm-level environmental engagement is measured by the environmental pillar score (*ENVSCORE*, and its sub-scores, *ENER*, *ENPI*, and *ENRR*) from ASSET4 and the logarithm of CO_2 emission in tonnes at the company level (scaled by total assets and winsorized at the 1th and 99th percentiles). For CO_2 emission tests, we require each firm to have CO_2 emission data for at least three years. Control variables include the ratio of institutional ownership (*Inst_own*), market capitalization in logarithm (*Ln(MarketCap)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), GDP per capita in logarithm (*Ln(GDP)*), and the Herfindahl-Hirschman Index of a firm's industry (Industry HHI). All control variables are winsorized at the 5th and 95th percentiles, and are in year *t*-1 (except for *Ln(GDP)* and *Industry HHI* that are in year *t* and unwinsorized). The sample period is 2004-2017. In Panel B, we utilized the long-lag information of our sample by regressing *ENVSCORE* on long-lagged *State_own*. We took four different approaches: (1) using the predetermined *State_own* levels as of 2004 (*State_own_2004*); (2) taking a 5-year lag (*L5.State_own*) for the sub-sample period after 2009 (if there are fewer than 5 years, the observation is omitted); (3) taking a 5-year lag (*L5.State_own*) for the full sample period (if there are fewer than 5 years, the observation is omitted); and (4) averaging each firm's *ENVSCORE* scores over the period 2009-2017 and the value of *State_own* over the period of 2004-2009 (*State_own_pre-2009*), and running a single cross-sectional regression of the averaged *ENVSCORE* score on the averaged *State_own*. Detailed definitions of all variables are in Appendix 2. 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.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	*ENVSCORE*		*ENER*		*ENPI*		*ENRR*		*Ln(CO_2/Assets)*	
State_own	7.584***	3.316**	6.351***	2.100	5.810***	2.528*	7.972***	3.910***	-0.232**	-0.233**
	(1.526)	(1.312)	(1.530)	(1.315)	(1.508)	(1.378)	(1.539)	(1.360)	(0.117)	(0.119)
Institution_own		2.728		2.965		-2.214		5.205**		-0.131
		(2.377)		(2.426)		(2.370)		(2.462)		(0.191)
Ln(MarketCap)		13.33***		13.14***		9.878***		13.02***		-0.0106
		(0.323)		(0.331)		(0.336)		(0.329)		(0.0282)
Leverage		0.0902***		0.110***		0.0261		0.0969***		0.0067***
		(0.0219)		(0.0219)		(0.0211)		(0.0229)		(0.00195)
Market-to-Book		-1.346***		-1.456***		-0.742***		-1.366***		-0.0269*
		(0.163)		(0.169)		(0.160)		(0.173)		(0.0144)
ROA		-0.354***		-0.308***		-0.364***		-0.304***		0.00737*
		(0.0431)		(0.0443)		(0.0418)		(0.0460)		(0.00394)
Ln(GDP)		-0.983		-3.838**		-0.911		0.646		-0.701***
		(1.642)		(1.681)		(1.653)		(1.805)		(0.132)
Industry HHI		-1.765		-0.191		-1.949		-2.259		0.146
		(2.430)		(2.440)		(2.504)		(2.462)		(0.172)
Observations	33,122	33,122	33,122	33,122	33,122	33,122	33,122	33,122	15,921	15,921
R-squared	0.340	0.506	0.321	0.484	0.377	0.467	0.266	0.428	0.765	0.767
TRBC-YR FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 4. (continued)

Panel B. Other specifications with state ownership				
Dependent variable = ENVSCORE	(1)	(2)	(3)	(4)
State_own_2004	3.681**			
	(1.627)			
L5.State_own		4.269***	4.240***	
		(1.518)	(1.479)	
State_own_pre-2009				4.471***
				(1.671)
Observations	24,259	24,197	27,947	3,364
R-squared	0.512	0.514	0.512	0.544
Sample	Post-2009	Post-2009	Full	Collapsed
Control variables	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	No
Industry FE	No	No	No	Yes
Country FE	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 5. Salient Environmental Shocks

This table examines SOEs' environmental engagement around unexpected shocks that raise social awareness of environmental issues, namely, the Fukushima nuclear accident of 2011 and temperature shocks. The dependent variable is *ENVSCORE* for all models, and the specifications include the same control variables as Table 4, but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles, and are in year *t*-1 (except for *Ln(GDP)* and *Industry HHI* that are in year *t* and unwinsorized). Panel A reports the results for the Fukushima incidence over a sample period of 2009-2014 (three years before and three years after the incident), with Column (1) testing the effect of the interaction between *State_own* and the *Post_2011* dummy, and Column (2) testing the effect of the triple-interaction term *State_own* × *Post_2011* × *Utilities*. *Utilities* are defined as industries with TRBC codes of 50103010, 59101010, 59101020, 50102010, 59104010, 59102010, 50102020, 50102030, 50103030, 50103020, 50201010, 50201020, and 59103010. In Columns (3) and (4), we conduct the same test as in Column (2) but on subsamples of "nuclear-heavy" and "nuclear-light" countries, respectively. A country is defined as "nuclear-heavy" in terms of nuclear power provision if it has more than 10 operational nuclear reactors, and "nuclear-light" if this number is below 10. Panel B reports the results for two temperature shocks: abnormally high temperatures (absolute) following Choi et al (2020) in Column (1), and long-term drought following Hong, Li, and Xu (2019) in Column (2). *Emission industry* is defined as a dummy that equals 1 if a firm's industry has its emission intensity above the sample median, and 0 otherwise. Industry emission intensity is calculated based on the median weight of total hazardous substances produced by all factories in each SIC 2-digit code in the U.S. Environmental Protection Agency's (EPA) toxic release inventory (TRI) database. Detailed definitions of all variables are in Appendix 2. 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.

Panel A. Evidence from Fukushima Nuclear Disaster

Dependent variable = ENVSCORE	(1)	(2)	(3)	(4)
State_own	6.579***	4.001**	1.583	4.864**
	(1.939)	(1.857)	(2.934)	(2.408)
State_own × Post_2011	3.355***	-2.061	-1.481	-2.069
	(1.297)	(1.478)	(2.141)	(2.017)
State_own × Utilities		0.280	4.000	-4.228
		(2.960)	(4.601)	(4.186)
State_own × Post_2011 × Utilities		5.029**	10.51**	2.764
		(2.392)	(4.083)	(3.200)
Observations	16,622	16,622	11,014	5,531
R-squared	0.337	0.588	0.597	0.640
Control variables	Yes	Yes	Yes	Yes
Industry-year FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Sample	Full	Full	Nuclear-heavy	Nuclear light

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 5 (Continued). Salient Environmental Shocks

Panel B. Placebo tests for Fukushima Nuclear Disaster on unaffected industries

Dependent Variable: ENVSCORE	(1) Basic Materials	(2) Consumer Goods	(3) Consumer Services	(4) Financials	(5) Health Care	(6) Industrials	(7) Oil & Gas	(8) Technology	(9) Telecom.
State_own × Post_2011 × Industry	-3.616	-2.040	3.618	-6.454*	-4.068	-0.239	7.486**	-2.984	4.588
	(4.514)	(4.626)	(3.747)	(3.439)	(4.154)	(3.396)	(3.375)	(3.733)	(4.430)
State_own	0.985	2.462	1.570	2.331	2.204	2.745	1.449	2.072	1.497
	(1.817)	(1.763)	(1.710)	(1.876)	(1.715)	(1.851)	(1.832)	(1.731)	(1.763)
State_own × Post_2011	3.508***	3.253**	3.005**	4.615***	3.226***	3.246**	2.357*	3.212***	3.038**
	(1.292)	(1.274)	(1.274)	(1.306)	(1.243)	(1.327)	(1.330)	(1.245)	(1.273)
Industry	4.171	-2.615	-3.266	-7.121*	-11.93*	2.423	-2.168	2.096	16.15**
	(3.693)	(3.073)	(3.188)	(4.234)	(6.851)	(2.372)	(4.551)	(3.475)	(7.831)
Post_2011 × Industry	-0.526	0.458	0.631	3.863	7.359*	-0.199	-2.816	0.499	-18.19**
	(2.853)	(2.500)	(2.297)	(2.484)	(4.325)	(1.482)	(2.597)	(2.367)	(8.621)
State_own × Industry	11.08**	-7.066	9.589	-0.749	-9.438	-4.436	5.798	3.244	2.851
	(4.425)	(5.584)	(10.18)	(4.165)	(17.97)	(3.820)	(3.876)	(6.785)	(5.890)
Observations	16,622	16,622	16,622	16,622	16,622	16,622	16,622	16,622	16,622
R-squared	0.512	0.512	0.512	0.512	0.512	0.512	0.512	0.512	0.512
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 5 (Continued). Salient Environmental Shocks

Panel C. Evidence from Temperature Shocks		
Dependent variable = ENVSCORE	(1)	(2)
State_own × Emission industry × Abnormal temperature	4.555*	
	(2.566)	
State_own × Emission industry × Drought		14.17**
		(7.081)
State_own	9.657*	12.87**
	(5.377)	(6.348)
Abnormal temperature	4.190**	
	(1.745)	
Emission industries	7.881***	8.259***
	(1.874)	(2.071)
State_own × Emission industry	-2.336	-4.833
	(3.171)	(3.591)
State_own × Abnormal temperature	-8.074*	
	(4.513)	
State_own × Drought		-24.96**
		(12.16)
Emission industry × Abnormal temperature	-2.169**	
	(1.030)	
Emission industry × Drought		-4.314**
		(2.140)
Observations	21,293	17,965
R-squared	0.528	0.528
Control variables	Yes	Yes
TRBC Industry-year FEs	Yes	Yes
Country FEs	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 6. Changes in Government Political Orientation and Government Held Shares

This table reports the results from regressing the change in environmental pillar score (Δ*ENVSCORE*) on a state ownership dummy (*State_own*), a time dummy indicating the year when there was a change of government leaning right or left and their interactions, other control variables, country fixed effects, and industry-year fixed effects. *Government leaning right* is an indicator variable that equals one if the government changed from the left- or center- orientation to right-orientation in a particular year, and zero otherwise. *Government leaning left* is an indicator variable that equals one if the government changed from right- or center-orientation to the left orientation in a particular year, and zero otherwise. The specifications include the same control variables as Table 4 (and CGVSCORE additionally in Column (4)) but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles, and are in year *t-1* (except for *Ln(GDP)* and Industry HHI that are in year *t*). Detailed definitions of all variables are in Appendix 2. 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 = ΔENVSCORE	(1)	(2)	(3)	(4)
State_own × Government leaning left	4.081*		4.033*	
	(2.438)		(2.442)	
State_own × Government leaning right		-1.087	-0.953	
		(1.892)	(1.893)	
Government leaning left	-0.488		-0.456	
	(0.532)		(0.532)	
Government leaning right		0.647	0.628	
		(0.411)	(0.411)	
State_own	0.411	0.576*	0.463	
	(0.313)	(0.328)	(0.334)	
Substantial increase in state shares				1.544**
				(0.799)
Old state-owned				0.269
				(0.379)
Observations	26,574	26,574	26,574	26,219
R-squared	0.105	0.105	0.105	0.112
Control variables	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 7. The Role of Corporate and Government Governance

This table reports the results from regressing environmental pillar score (*ENVSCORE*) on lagged state ownership dummy (*State_own*) interacting with firm-and country-level governance indicators. Firm-level governance is measured by the corporate governance pillar score (*CGVSCORE*) from ASSET4. Country-level governance is measured by the six broad dimensions of the World Governance Indicators: (1) Voice and Accountability; (2) Political Stability and Absence of Violence; (3) Government Effectiveness; (4) Regulatory Quality; (5) Rule of Law; and (6) Control of Corruption. The specifications include the same control variables as Table 4, but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles. *State_own* and other control variables (except *Ln(GDP)* and *Industry HHI*) are lagged by one year. The sample period is 2004-2017. Detailed definitions of all variables are in Appendix 2. 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 = ENVSCORE	(1)	(2)	(3)	(4)	(5)	(6)	(7)
State_own	8.305***	3.924***	3.284**	3.893**	3.894**	4.442**	3.685**
	(1.920)	(1.466)	(1.310)	(1.960)	(1.811)	(1.730)	(1.578)
State_own × ***Governance***	-0.118***	-1.318	-0.303	-0.655	-0.719	-1.290	-0.580
	(0.0338)	(1.298)	(1.406)	(1.463)	(1.382)	(1.321)	(1.134)
Governance proxies:							
CGVSCORE	0.522***						
	(0.0147)						
Voice and Accountability		-9.821***					
		(2.798)					
Political Stability and Absence of Violence			4.549***				
			(1.074)				
Government Effectiveness				-0.304			
				(1.500)			
Regulatory Quality					-9.803***		
					(1.550)		
Rule of Law						-0.827	
						(2.160)	
Control of Corruption							-3.407**
							(1.402)
Observations	33,122	33,122	33,122	33,122	33,122	33,122	33,122
R-squared	0.574	0.574	0.574	0.573	0.574	0.573	0.573
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 8. Channels for the State Ownership Effect

This table reports the results from regressing environmental pillar score (*ENVSCORE*) on lagged state ownership dummy (*State_own*) interacting with firm-level variables exploring the role of firm locality (Panel A) and of CEO (Panel B). In Panel A, the locality variables include continuous variables (all winsorized at 5th and 95th percentiles) representing a firm's foreign assets as a percentage of total assets, foreign sales as a percentage of total sales, and foreign income growth. In Panel B, the CEO variables include a set of binary indicators for whether the CEO is above 60 years old thus close to retirement (*CEO retirement age*), the tenure of the CEO in the firm (*CEO tenure*), and whether the CEO is politically connected through her personal experience (*CEO political connection*). The specifications include the same control variables as Table 4, but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles. *State_own* and other control variables (except *Ln(GDP)* and *Industry HHI*) are lagged by one year. The sample period is 2004-2017. Detailed definitions of all variables are in Appendix 2. 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.

Panel A. The Effects of Firm Locality

Dependent Variable = ENVSCORE	(1)	(2)	(3)
State_own	5.563***	6.347***	4.969***
	(1.755)	(1.765)	(1.737)
Foreign assets	0.0525***		
	(0.0159)		
State_own × Foreign assets	-0.0748*		
	(0.0446)		
Foreign sales		0.0722***	
		(0.0126)	
State_own × Foreign sales		-0.0939***	
		(0.0330)	
Foreign income growth			0.0133*
			(0.00740)
State_own × Foreign income growth			-0.0652*
			(0.0384)
Observations	25,096	29,091	16,462
R-squared	0.520	0.514	0.536
Controls, industry-year FE, country FE	Yes	Yes	Yes

Panel B. The Effects of CEOs

Dependent Variable = ENVSCORE	(1)	(2)	(3)
State_own	1.379	-0.887	2.876*
	(1.915)	(2.198)	(1.706)
CEO retirement age	-1.678*		
	(0.894)		
State_own × CEO retirement age	5.018*		
	(2.786)		
CEO tenure		-0.241***	
		(0.0517)	
State_own × CEO tenure		0.430**	
		(0.180)	
CEO political connection			4.042***
			(1.108)
State_own × CEO political connection			-6.124**
			(3.097)
Observations	14,819	17,043	21,522
R-squared	0.500	0.512	0.524
Controls, TRBC Industry-year FE, Country FE	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 9. Cross-Country Variation

This table reports the results from regressing environmental pillar score (*ENVSCORE*) on state ownership dummy (*State_own*), other control variables, country fixed effects, and industry-year fixed effects for the sub-sample of country-splits based on above ("High") or below ("Low") the sample median. Columns (1)–(2) show the results of country split by *Energy Security Risk (*country-level index on energy security risk as assessed by the U.S. Chamber of Commerce). Columns (3)-(4) show the results of country split by *Environmental Regulation* (dummy variable indicating whether country had a positive environmental regulatory change based on Carrot & Sticks data set). The specifications include the same control variables as Table 4 but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles. *State_own* and other control variables (except *Ln(GDP)* and Industry HHI) are lagged by one year. The sample period is 2004-2017. Detailed definitions of all variables are in Appendix 2. 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: ENVSCORE	(1)	(2)	(3)	(4)
State_own	4.244***	-1.073	0.521	2.694*
	(1.585)	(2.877)	(2.172)	(1.559)
Observations	17,444	11,732	17,671	15,144
R-squared	0.542	0.534	0.550	0.512
Control variables	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Sample	High Energy Dependence	Low Energy Dependence	High Environmental Regulation	Low Environmental Regulation
High – Low (chi-square)	4.477*** (2.61)		-4.466*** (-3.45)	

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 10. 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 industry-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 the 5% threshold. Proxies for other types of block-ownership (i.e., above 5% ownership holdings) 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 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*). In Panel B, *Foreign_state* is a dummy variable that equals one if the company has ownership stakes held by any foreign government or foreign SWF, 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 specifications include the same control variables as Table 4 but we omit the coefficients of the control variables for brevity. The sample period is 2004-2017. Detailed definitions of all variables are in Appendix 2. 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.

Panel A. Government versus Other Types of Block-owners

Dependent Variable: ENVSCORE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Government held	0.0737**								
	(0.0310)								
Foreign holdings		-0.0456**							
		(0.0213)							
Cross holdings			-0.0054						
			(0.0185)						
Pension fund held				0.0976					
				(0.0725)					
Investment co. held					-0.0676**				
					(0.0303)				
Employee held						-0.158***			
						(0.0243)			
Strategic holdings							-0.0508***		
							(0.0181)		
Domestic inst. own								-2.367	
								(2.651)	
Foreign inst. own									2.162
									(2.655)
Observations	32,907	32,373	32,411	32,325	32,338	32,351	25,903	33,122	33,139
R-squared	0.574	0.575	0.575	0.575	0.575	0.578	0.577	0.573	0.573
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 10. (continued)

Panel B. Different Forms of State Ownership				
Dependent variable: ENVSCORE	(1)	(2)	(3)	(4)
State_own	1.008	4.553***	13.63***	3.173**
	(2.899)	(1.532)	(3.657)	(1.420)
State_own × Foreign_state			-9.945***	
			(3.601)	
SWF				3.723
				(3.175)
Observations	3,687	27,382	32,653	27,608
R-squared	0.608	0.522	0.506	0.505
Control variables	Yes	Yes	Yes	Yes
TRBC Industry-year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Sample	Foreign own	Domestic own	All	All

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 11. Alternative Measures of Environmental Engagement

This table reports the results based on the environmental scores using two alternative sources—the Environmental Pillar Score from MSCI and the Environmental Score from Sustainalytics. Since we only have the 2016 data in the *MSCI Environmental Pillar Score*, we conduct cross-sectional OLS regression and regress the environmental score on a state ownership dummy (*State_own*), control variables, industry fixed effects, and country fixed effects. For *Sustainalytics Environmental Score*, we conduct a pooled OLS regression as Equation (1) and regress the environmental score on a state ownership dummy (*State_own*), control variables, industry-year fixed effects, and country fixed effects. In Column (1), we do not include *Ln(GDP)* as it perfectly correlates with country fixed effects. Detailed definitions of all variables are in Appendix 2. In Column (2), we use robust standard errors are clustered at the firm level. ***, **, and * denote $p<0.01$, $p<0.05$, and $p<0.1$, respectively. All control variables are winsorized at the 5th and 95th percentiles.

Dependent variable =	(1) *MSCI Environmental Pillar Score*	(2) *Sustainalytics Environmental Score*
State_own	0.640**	1.790**
	(0.272)	(0.754)
Institution_own	-0.544	-1.583
	(0.601)	(1.255)
Ln(MarketCap)	0.689***	4.140***
	(0.126)	(0.211)
Leverage	-0.0043	0.023*
	(0.004)	(0.013)
Market-to-Book	-0.055	-0.315***
	(0.033)	(0.105)
ROA	-0.027**	-0.148***
	(0.013)	(0.030)
Ln(GDP)	135.9	-1.321
	(199.0)	(1.246)
Industry HHI	-0.467	-3.515***
	(0.449)	(1.321)
Observations	849	11,796
Number of firms	849	2,590
R-squared	0.594	0.464
Industry-year FE	No	Yes
Industry FE	Yes	No
Country FE	Yes	Yes
Model	Cross-section OLS	Pooled OLS

Electronic copy available at: https://ssrn.com/abstract=2960832

Table 12. Other ESG Pillars: Social and Corporate Governance Performance

This table reports the 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 industry-year fixed effects. Control variables include market capitalization in logarithm (*Ln(Market Cap)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), GDP per capita in logarithm (*Ln(GDP)*), and the Herfindahl-Hirschman Index (*Industry HHI*). All control variables are winsorized at the 5th and 95th percentiles. *State_own* and other control variables (except *Ln(GDP)*) are lagged by one year. Detailed definitions of all variables are in Appendix 2. Robust standard errors are clustered at the firm level and reported in parentheses. The sample period is 2004-2017. ***, **, and * denote p<0.01, p<0.05, and p<0.1, respectively.

	(1)	(2)	(3)	(4)
Dependent variable =	*SOCSCORE*	*SOCSCORE*	*CGVSCORE*	*CGVSCORE*
State_own	8.890***	4.691***	1.716	0.329
	(1.613)	(1.362)	(1.167)	(1.087)
Institution_own		7.076***		22.557***
		(2.287)		(1.716)
Ln(MarketCap)		13.04***		5.462***
		(0.316)		(0.227)
Leverage		0.0745***		0.0530***
		(0.0218)		(0.0143)
Market-to-Book		-1.414***		-0.762***
		(0.160)		(0.118)
ROA		-0.227***		-0.163***
		(0.0425)		(0.0311)
Ln(GDP)		-5.003***		0.352
		(1.683)		(1.447)
Industry HHI		1.131		2.942*
		(2.276)		(1.605)
Observations	33,122	33,122	33,122	33,122
R-squared	0.280	0.460	0.685	0.728
TRBC Industry-year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Internet Appendix for

Leviathan Inc. and Corporate Environmental Engagement

Electronic copy available at: https://ssrn.com/abstract=2960832

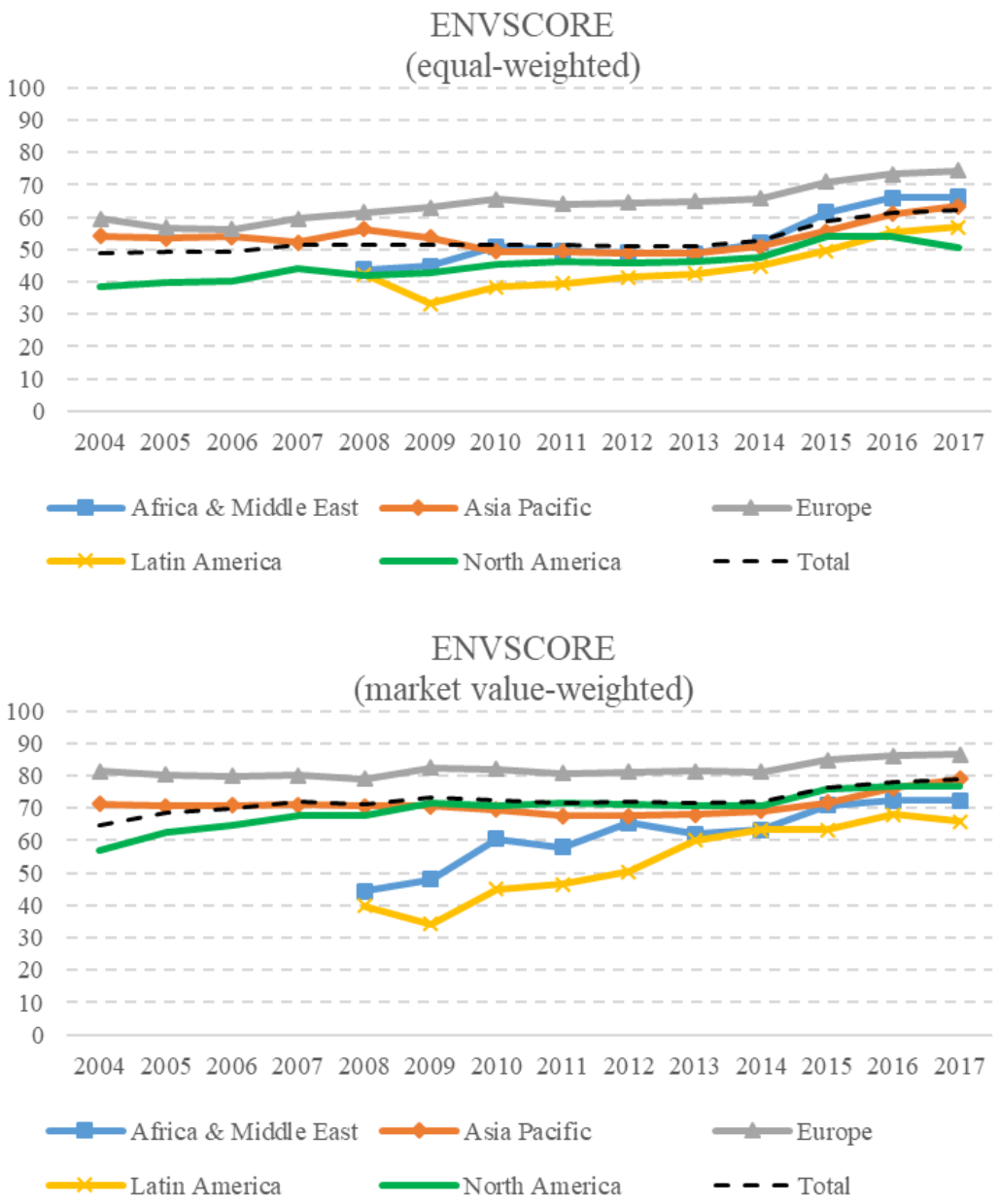

Figure IA.1 Average Environmental Engagement of Publicly Listed Firms, per Geographic Region and Year

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 2017. Panel A presents the 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

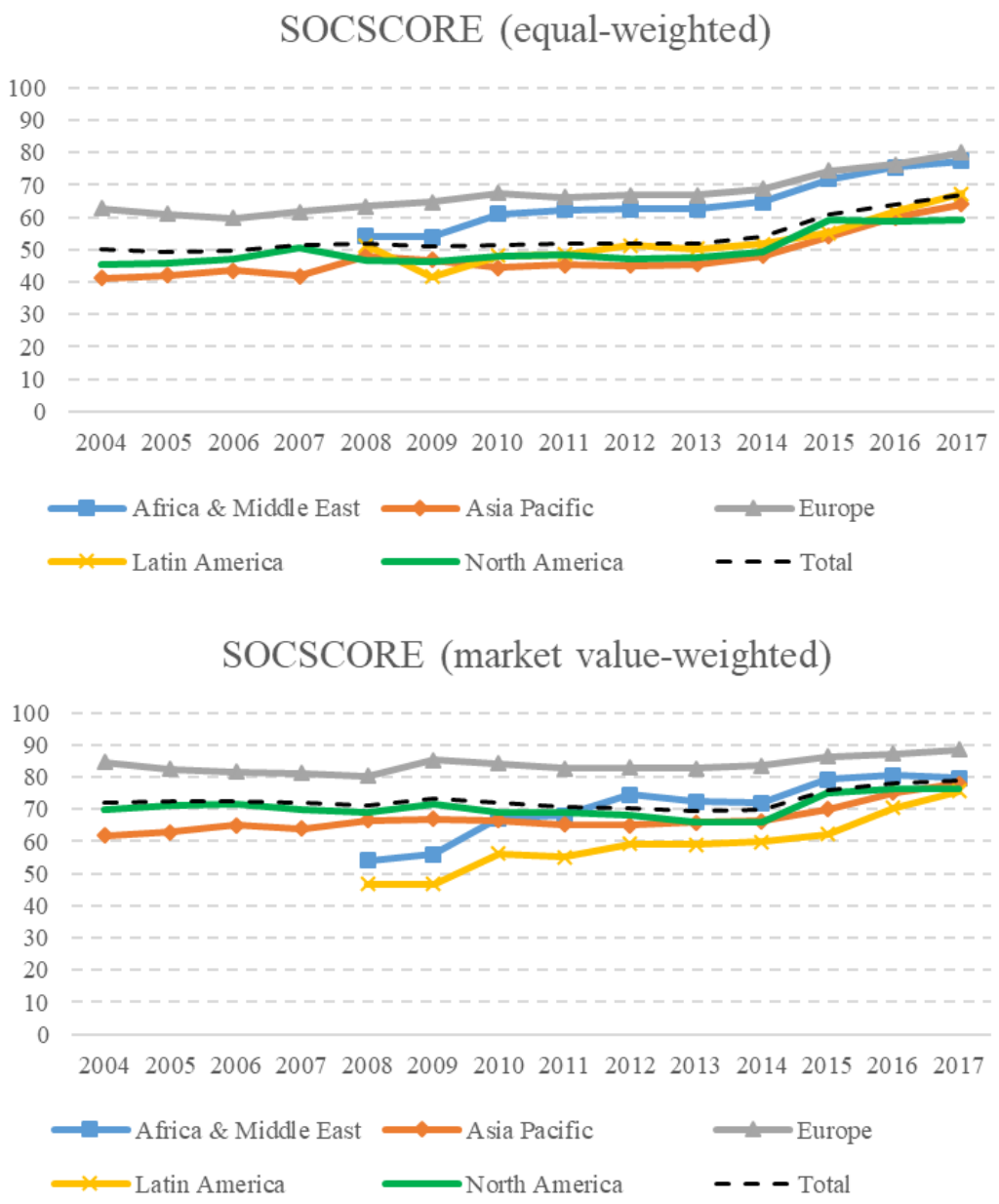

Figure IA.2 Average Social Scores of Publicly Listed Firms per Geographic Regions and Years

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 2017. Panel A presents the 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

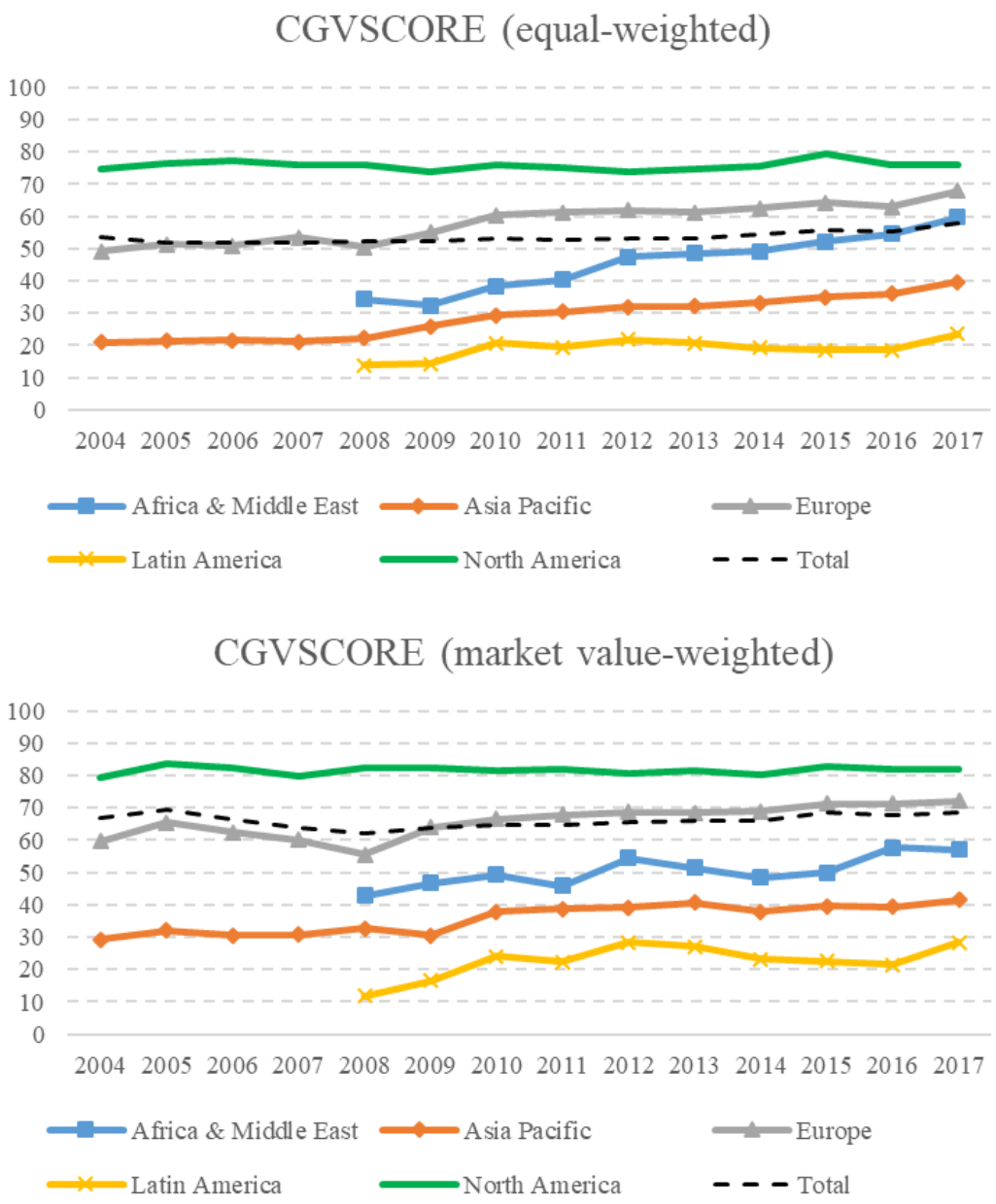

Figure IA.3 Average Corporate Governance Scores of Publicly Listed Firms per Geographic Regions and Years

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 2017. Panel A presents the 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

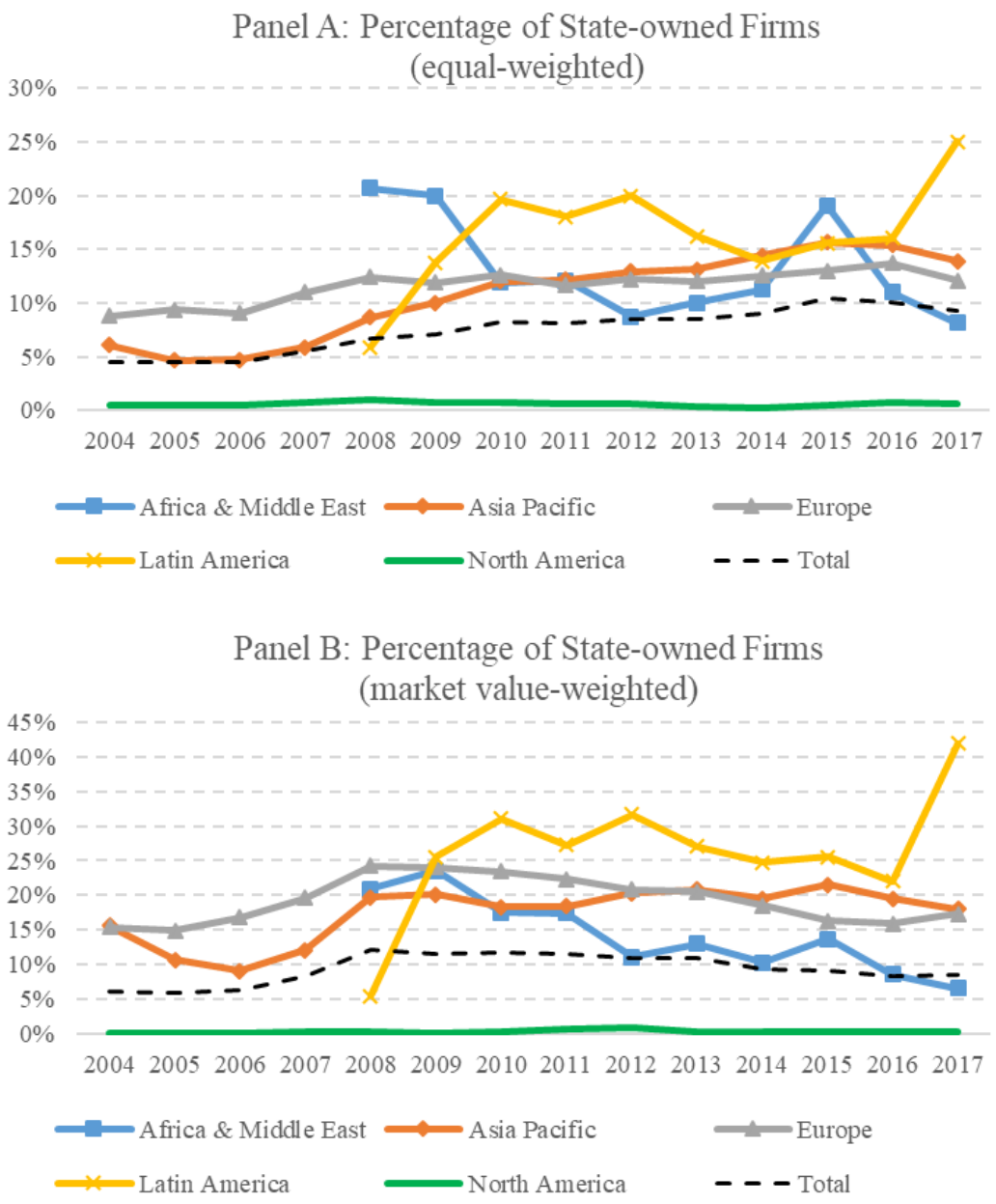

Figure IA. 4. Average State Ownership of Publicly Listed Firm, per Geographic Region and Year

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 2017. Panel A presents the 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.

Electronic copy available at: https://ssrn.com/abstract=2960832

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 (2004–2017). In the rightmost column, we list the number of observations used in regression of Equation (1).

Year	*State_own*	*ENVSCORE*	*ENER*	*ENPI*	*ENRR*	Number used in regressions
2004	4,284	1,824	1,824	1,824	1,824	1,234
2005	4,284	2,242	2,242	2,242	2,242	1,558
2006	4,264	2,255	2,255	2,255	2,255	1,594
2007	4,256	2,437	2,437	2,437	2,437	1,700
2008	4,258	2,931	2,931	2,931	2,931	2,050
2009	4,250	3,363	3,363	3,363	3,363	2,376
2010	4,240	3,983	3,983	3,983	3,983	2,739
2011	4,219	4,076	4,076	4,076	4,076	2,810
2012	4,202	4,152	4,152	4,152	4,152	2,910
2013	4,142	4,262	4,262	4,262	4,262	2,957
2014	4,323	4,386	4,386	4,386	4,386	2,830
2015	5,024	5,277	5,277	5,277	5,277	2,841
2016	5,061	6,152	6,152	6,152	6,152	3,096
2017	4,818	5,246	5,246	5,246	5,246	2,427
Total	61,625	52,586	52,586	52,586	52,586	33,122

Electronic copy available at: https://ssrn.com/abstract=2960832

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 state-owned firms' average to be larger than non-state-owned firms' and report the p-value based on unequal variance.

Country	*ENER* All	*ENER* *State_own* =1	*ENER* *State_own* =0	p-value (1 > 0)	*ENPI* All	*ENPI* *State_own* =1	*ENPI* *State_own* =0	p-value (1 > 0)	*ENRR* All	*ENRR* *State_own* =1	*ENRR* *State_own* =0	p-value (1 > 0)
Total	53.48	60.03	52.93	0.00	50.59	53.10	50.38	0.00	53.65	59.00	53.20	0.00
AT	61.12	77.54	51.01	0.00	62.17	58.61	61.31	0.68	59.38	74.57	50.87	0.00
AU	41.86	55.05	41.28	0.00	35.18	33.53	34.94	0.61	41.53	64.00	40.96	0.00
BE	56.82	68.78	55.15	0.03	51.97	58.39	49.73	0.09	54.23	70.63	49.37	0.00
BR	45.26	52.27	43.90	0.03	38.00	52.67	34.84	0.00	46.93	62.65	44.01	0.00
CA	44.73	47.74	42.91	0.18	36.89	26.52	35.97	1.00	42.59	40.09	41.22	0.59
CH	59.22	77.75	55.74	0.00	54.97	71.82	51.35	0.00	60.41	73.59	56.76	0.00
CL	49.05	58.61	47.05	0.04	46.43	59.06	43.60	0.01	50.60	53.76	49.93	0.27
CN	30.02	33.57	20.56	0.00	37.47	39.44	32.25	0.02	28.14	31.83	18.28	0.00
CO	57.52	68.78	43.84	0.00	45.75	49.82	38.77	0.09	58.95	65.02	47.74	0.03
CZ	48.73	84.98	27.69	0.00	59.63	44.33	66.58	1.00	52.61	56.14	48.96	0.13
DE	69.21	68.64	66.71	0.29	68.97	59.20	67.94	0.99	68.74	71.20	65.96	0.05
DK	54.96	78.34	53.55	--	49.53	62.61	48.99	--	58.84	83.75	55.54	--
EG	23.75	16.69	23.70	0.94	28.89	22.05	27.39	0.95	25.08	12.72	24.17	1.00
ES	75.65	91.14	73.48	0.00	65.96	86.82	63.93	0.00	75.64	77.66	74.66	0.19
FI	73.19	88.71	66.11	0.00	77.60	85.60	73.49	0.00	72.41	77.53	68.84	0.00
FR	76.96	82.31	76.07	0.00	70.66	71.78	70.45	0.32	78.92	80.00	78.71	0.25
GB	64.45	70.78	62.22	0.01	49.06	50.67	47.62	0.22	64.21	69.45	62.27	0.03
GR	48.92	73.81	38.08	0.00	33.60	39.84	30.91	0.03	51.49	71.02	43.20	0.00
HK	39.78	45.88	38.27	0.00	42.18	48.71	40.34	0.00	45.67	51.70	44.30	0.00
HU	73.56	61.88	81.77	0.99	65.03	31.02	81.43	1.00	65.45	39.34	78.66	1.00
ID	52.68	58.30	42.03	0.01	40.86	45.79	29.16	0.00	48.62	51.46	44.64	0.15
IE	47.08	50.96	40.19	0.24	47.57	59.81	42.99	0.10	51.62	64.40	45.60	0.11
IL	42.87		42.87		46.57	58.95	41.84	--	52.50	77.75	46.72	--
IN	58.11	55.09	57.05	0.74	54.81	53.23	53.64	0.56	61.86	55.96	62.00	0.98
IT	52.69	84.19	34.87	0.00	51.87	75.36	37.40	0.00	55.42	78.69	41.06	0.00
JP	63.95	75.56	61.91	0.00	64.89	67.65	63.07	0.07	59.06	69.11	57.32	0.00
KR	62.19	70.77	59.73	0.00	65.50	66.12	63.88	0.27	57.08	59.38	55.02	0.12
MA	27.88	46.71	14.44	0.00	27.48	22.50	25.73	0.68	33.99	58.76	14.44	0.00
MX	43.53		43.53		31.41		31.41		43.81		43.81	
MY	50.30	56.68	44.50	0.00	41.31	50.04	33.19	0.00	48.45	55.84	41.57	0.00
NL	66.98	63.73	64.96	0.55	63.70	72.02	60.93	0.17	71.27	80.61	69.03	0.05
NO	62.57	85.86	49.50	0.00	66.58	86.74	57.56	0.00	57.37	74.85	45.62	0.00
NZ	43.82	54.59	38.64	0.00	44.53	54.48	39.01	0.00	39.96	42.49	37.74	0.18
PE	48.54		48.54		19.55		19.55		45.99		45.99	
PH	50.77	54.63	49.27	0.31	46.38	39.12	46.44	0.83	53.50	51.32	51.64	0.52
PL	44.79	56.54	34.12	0.00	37.72	37.81	37.55	0.47	41.46	48.08	32.29	0.00
PT	77.84	86.55	72.36	0.01	55.94	62.84	52.39	0.04	73.05	79.19	68.34	0.02
RU	56.03	58.62	53.69	0.08	39.56	46.71	33.22	0.00	56.42	62.92	50.63	0.00
SE	70.96	85.31	65.97	0.00	63.48	67.99	60.65	0.10	68.54	80.49	62.99	0.00
SG	42.22	51.92	34.02	0.00	41.54	46.92	37.06	0.00	45.50	56.37	36.21	0.00
TH	59.16	76.23	40.66	0.00	47.55	56.87	37.16	0.01	63.66	69.84	52.57	0.02
TR	58.68	45.28	63.09	1.00	57.30	42.69	62.01	1.00	58.67	45.67	63.27	1.00
US	45.41	25.07	43.10	1.00	47.10	23.79	45.45	1.00	47.71	21.50	45.10	1.00
ZA	60.59	64.67	57.87	0.04	44.38	45.95	42.60	0.20	64.26	74.18	62.00	0.00

Electronic copy available at: https://ssrn.com/abstract=2960832

Table IA.2. (continued)

Country	*SOCSCORE* All	*SOCSCORE* *State_own*=1	SOCSCORE *State_own*=0	p-value (1 > 0)	*CGVSCORE* All	*CGVSCORE* *State_own*=1	*CGVSCORE* *State_own*=0	p-value (1 > 0)
Total	54.63	63.33	53.89	0.00	53.78	43.47	54.66	0.00
AT	59.73	84.83	47.36	0.00	42.05	54.76	34.86	0.00
AU	43.25	56.26	41.42	0.01	63.37	59.09	62.89	0.79
BE	56.29	70.36	51.13	0.00	57.04	60.55	53.86	0.05
BR	53.43	74.78	49.53	0.00	23.32	26.17	23.33	0.15
CA	42.65	31.26	39.95	0.97	75.87	74.53	74.98	0.55
CH	57.39	61.78	54.09	0.12	52.27	48.71	49.88	0.58
CL	54.97	62.61	53.35	0.11	11.78	12.93	11.51	0.20
CN	29.31	33.62	17.84	0.00	23.81	25.67	18.88	0.00
CO	72.10	79.97	61.21	0.02	31.05	36.23	24.99	0.05
CZ	71.15	72.78	69.92	0.19	18.69	24.65	14.98	0.00
DE	71.34	68.47	69.67	0.65	36.87	32.94	35.04	0.81
DK	52.11	47.67	48.11	--	45.91	39.26	43.12	--
EG	28.91	19.14	28.85	0.99	9.14	3.03	9.20	1.00
ES	81.68	95.58	80.31	0.00	51.01	53.55	49.47	0.10
FI	74.35	85.67	68.74	0.00	62.65	64.41	61.16	0.13
FR	79.29	85.47	78.22	0.00	58.15	63.03	57.26	0.00
GB	66.16	69.82	63.47	0.04	74.01	66.22	71.89	0.98
GR	48.40	70.23	38.96	0.00	17.83	24.42	15.09	0.00
HK	43.08	48.64	41.80	0.00	41.82	47.34	40.29	0.00
HU	77.90	51.42	90.65	1.00	35.29	32.22	37.72	0.95
ID	67.27	74.69	54.18	0.00	30.25	34.55	24.18	0.04
IE	47.59	50.95	40.07	0.20	67.78	59.20	64.08	0.65
IL	50.67	63.70	43.80	--	41.27	12.31	38.23	--
IN	61.87	62.85	59.77	0.12	34.39	21.81	36.31	1.00
IT	63.24	87.39	49.17	0.00	43.84	56.07	35.99	0.00
JP	50.68	63.27	47.26	0.00	10.96	13.48	11.00	0.04
KR	58.76	73.67	55.45	0.00	13.52	10.75	14.18	1.00
MA	53.88	80.81	32.75	0.00	6.30	11.09	2.93	0.00
MX	42.95		42.95		12.28		12.28	
MY	57.63	68.52	47.68	0.00	48.45	59.13	38.55	0.00
NL	76.82	92.45	74.79	0.00	66.15	72.81	65.37	0.00
NO	68.50	89.35	53.67	0.00	62.73	72.54	58.13	0.00
NZ	41.60	42.68	41.02	0.36	59.48	54.53	61.97	0.94
PE	36.56		36.56		50.36		50.36	
PH	53.51	64.77	49.61	0.04	40.01	25.98	40.17	0.99
PL	46.51	55.05	38.34	0.00	25.82	28.77	23.89	0.04
PT	79.60	88.29	74.52	0.00	57.30	54.18	58.43	0.73
RU	57.15	62.83	51.99	0.00	28.42	28.99	28.06	0.35
SE	65.62	84.83	58.62	0.00	60.53	63.99	59.09	0.08
SG	46.23	57.87	36.51	0.00	49.32	58.74	41.55	0.00
TH	69.55	84.00	51.22	0.00	47.75	51.80	38.99	0.05
TR	61.40	46.18	66.87	1.00	27.06	23.53	28.13	0.97
US	51.50	22.66	48.53	1.00	75.74	67.68	74.46	0.98
ZA	75.04	78.59	72.98	0.04	61.55	64.92	59.07	0.03

Electronic copy available at: https://ssrn.com/abstract=2960832

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 based on the ICBIN classification: Basic Materials, Consumer Goods, Consumer Services, Financials, Health Care, Industrials, Oil & Gas, Technology, Telecommunications, and Utilities. We also conduct t-tests for the state-owned firms' average to be larger than non-state-owned firms' and report the p-value based on unequal variance.

Industry	Obs	*State_own*	*ENVSCORE* All	*ENVSCORE* *State_own* =1	*ENVSCORE* *State_own* =0	p-value (1 > 0)	*ENER* All	*ENER* *State_own* =1	*ENER* *State_own* =0	p-value (1 > 0)
Basic Materials	3,526	0.070	56.74	64.08	56.25	0.00	59.87	66.23	59.40	0.00
Consumer Goods	3,770	0.026	63.29	56.80	63.55	0.98	61.94	59.55	62.14	0.79
Consumer Services	4,663	0.030	43.61	57.85	43.34	0.00	44.17	61.82	43.79	0.00
Financials	5,363	0.092	44.99	47.84	44.81	0.02	43.13	41.15	43.44	0.94
Health Care	1,955	0.017	43.88	29.06	44.39	1.00	44.91	35.97	45.34	0.95
Industrials	6,558	0.065	61.20	55.15	61.68	1.00	58.84	57.63	58.97	0.81
Oil & Gas	2,457	0.135	47.69	66.88	44.73	0.00	53.46	71.06	50.75	0.00
Technology	2,317	0.024	53.96	66.71	53.80	0.00	50.42	66.03	50.15	0.00
Telecommunications	862	0.381	59.87	65.20	57.03	0.00	59.10	64.04	56.50	0.00
Utilities	1,651	0.292	65.85	64.74	66.40	0.88	70.68	68.24	71.82	1.00

Industry	*ENPI* All	*ENPI* *State_own* =1	*ENPI* *State_own* =0	p-value (1 > 0)	*ENRR* All	*ENRR* *State_own* =1	*ENRR* *State_own* =0	p-value (1 > 0)
Basic Materials	49.43	53.70	49.26	0.02	56.84	64.66	56.27	0.00
Consumer Goods	60.22	47.41	60.69	1.00	62.72	58.53	62.86	0.91
Consumer Services	37.86	42.37	37.83	0.02	48.54	62.11	48.29	0.00
Financials	44.94	52.09	44.30	0.00	46.23	47.92	46.15	0.13
Health Care	38.79	24.73	39.20	1.00	48.22	31.67	48.75	1.00
Industrials	61.60	47.40	62.67	1.00	58.21	55.82	58.42	0.96
Oil & Gas	41.06	53.89	39.08	0.00	47.50	66.58	44.55	0.00
Technology	57.11	64.88	57.07	0.04	52.94	68.18	52.72	0.00
Telecommunications	55.78	59.63	53.77	0.00	60.17	65.85	57.04	0.00
Utilities	58.04	58.37	57.94	0.39	59.76	59.92	59.78	0.46

Industry	*SOCSCORE* All	*SOCSCORE* *State_own* =1	*SOCSCORE* *State_own* =0	p-value (1 > 0)	*CGVSCORE* All	*CGVSCORE* *State_own* =1	*CGVSCORE* *State_own* =0	p-value (1 > 0)
Basic Materials	54.83	67.16	53.88	0.00	55.03	50.84	55.36	0.98
Consumer Goods	59.74	54.82	59.87	0.94	47.03	45.60	47.22	0.68
Consumer Services	49.81	64.84	49.55	0.00	54.71	51.87	54.99	0.88
Financials	48.96	54.50	48.54	0.00	49.55	38.84	50.76	1.00
Health Care	52.38	39.21	52.98	1.00	58.17	39.05	58.71	1.00
Industrials	57.66	56.24	57.81	0.87	52.55	42.90	53.29	1.00
Oil & Gas	51.40	68.42	48.77	0.00	64.14	40.34	67.94	1.00
Technology	54.49	64.21	54.37	0.01	58.64	51.36	59.01	0.97
Telecommunications	66.19	71.65	63.27	0.00	52.89	50.02	55.05	0.99
Utilities	64.25	70.04	62.07	0.00	55.60	40.19	61.96	1.00

Electronic copy available at: https://ssrn.com/abstract=2960832

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 2017. We also conduct t-tests for the state-owned firms' average to be larger than non-state-owned firms' and report the p-value based on unequal variance.

Year	Obs	*State_own*	*ENVSCORE* All	*ENVSCORE* *State_own*=1	*ENVSCORE* *State_own*=0	p-value (1 > 0)	*ENER* All	*ENER* *State_own*=1	*ENER* *State_own*=0	p-value (1 > 0)
2004	1,234	0.045	48.96	57.26	48.57	0.02	48.56	56.16	48.20	0.03
2005	1,558	0.045	49.14	58.21	48.71	0.01	49.01	57.56	48.61	0.01
2006	1,594	0.045	49.48	57.34	49.18	0.02	49.34	56.02	49.10	0.04
2007	1,700	0.055	51.29	60.50	50.75	0.00	51.06	61.26	50.44	0.00
2008	2,050	0.067	51.63	57.88	51.19	0.01	51.41	59.26	50.84	0.00
2009	2,376	0.070	51.35	54.28	51.13	0.11	51.22	56.72	50.81	0.01
2010	2,739	0.082	51.42	53.52	51.20	0.15	51.42	55.21	51.03	0.03
2011	2,810	0.082	51.42	54.64	51.19	0.06	51.51	56.25	51.15	0.01
2012	2,910	0.085	51.19	54.00	50.92	0.08	51.42	55.89	51.01	0.01
2013	2,957	0.085	51.23	56.69	50.87	0.00	51.56	58.08	51.09	0.00
2014	2,830	0.090	52.82	56.42	52.63	0.04	52.97	57.41	52.66	0.01
2015	2,841	0.105	58.62	61.22	58.31	0.06	58.51	62.24	58.08	0.01
2016	3,096	0.101	61.28	68.16	61.03	0.00	60.94	67.63	60.69	0.00
2017	2,427	0.093	62.03	72.81	62.31	0.00	61.85	70.72	62.33	0.00

Year	*ENPI* All	*ENPI* *State_own*=1	*ENPI* *State_own*=0	p-value (1 > 0)	*ENRR* All	*ENRR* *State_own*=1	*ENRR* *State_own*=0	p-value (1 > 0)
2004	46.30	52.26	46.02	0.05	48.58	57.90	48.13	0.01
2005	46.72	46.91	46.72	0.48	48.66	61.95	48.03	0.00
2006	47.22	49.37	47.19	0.27	49.25	59.87	48.80	0.00
2007	49.34	53.53	49.10	0.09	51.23	60.69	50.68	0.00
2008	49.99	53.48	49.79	0.10	51.72	57.21	51.32	0.02
2009	49.71	48.90	49.78	0.63	51.28	54.37	51.05	0.10
2010	49.35	49.09	49.36	0.55	51.55	53.02	51.38	0.23
2011	49.33	49.86	49.31	0.40	51.63	54.51	51.41	0.08
2012	48.96	49.14	48.95	0.46	51.75	54.01	51.55	0.12
2013	48.98	51.52	48.90	0.11	51.57	56.46	51.24	0.01
2014	50.39	52.10	50.43	0.22	53.01	55.60	52.84	0.09
2015	54.19	54.18	54.19	0.50	58.76	60.28	58.58	0.18
2016	55.53	58.95	55.59	0.04	61.59	67.06	61.45	0.00
2017	56.26	64.33	56.60	0.00	62.15	71.82	62.41	0.00

Year	*SOCSCORE* All	*SOCSCORE* *State_own*=1	*SOCSCORE* *State_own*=0	p-value (1 > 0)	*CGVSCORE* All	*CGVSCORE* *State_own*=1	*CGVSCORE* *State_own*=0	p-value (1 > 0)
2004	49.96	60.43	49.46	0.00	53.59	41.88	54.15	1.00
2005	49.29	61.80	48.70	0.00	51.94	45.65	52.23	0.96
2006	49.91	62.68	49.35	0.00	51.92	44.44	52.35	0.98
2007	51.27	61.77	50.63	0.00	51.87	44.03	52.33	0.99
2008	51.83	59.90	51.24	0.00	52.36	36.88	53.49	1.00
2009	51.23	58.84	50.67	0.00	52.42	36.82	53.65	1.00
2010	51.57	58.34	50.93	0.00	53.35	38.03	54.70	1.00

Electronic copy available at: https://ssrn.com/abstract=2960832

2011	51.81	60.44	51.12	0.00	52.95	39.16	54.26	1.00
2012	51.68	60.01	50.93	0.00	53.34	44.00	54.30	1.00
2013	51.90	61.78	51.12	0.00	53.21	42.44	54.38	1.00
2014	53.88	62.25	53.18	0.00	54.32	43.85	55.48	1.00
2015	61.00	65.28	50.50	0.00	55.76	46.35	56.86	1.00
2016	63.86	69.77	63.74	0.00	55.23	48.65	56.24	1.00
2017	66.86	74.16	67.69	0.00	58.06	53.44	59.68	1.00

Electronic copy available at: https://ssrn.com/abstract=2960832

Table IA.5: Using Change in Environmental Scores as Dependent Variables in Baseline Regressions

This table reports the results from regressing measures of firm-level environmental engagement on a state ownership dummy (*State_own*) and other control variables as well as industry-year fixed effects and country fixed effects. The firm-level environmental engagement is measured by the change in environmental pillar score (Δ*ENVSCORE*, and its sub-scores, Δ*ENER*, Δ*ENPI*, and Δ*ENRR*) from ASSET4. Control variables include the ratio of institutional ownership (*Inst_own*), market capitalization in logarithm (*Ln(MarketCap)*), leverage ratio (*Leverage*), market-to-book ratio (*MTB*), return on assets (*ROA*), GDP per capita in logarithm (*Ln(GDP)*), and the Herfindahl-Hirschman Index of a firm's industry (Industry HHI). All control variables are winsorized at the 5th and 95th percentiles. *State_own* and other control variables (except *Ln(GDP)*) are lagged by one year. The sample period is 2004-2017. The changes in environmental pillar scores are measured by one-year lag in Columns (1)—(4), and by three-year lags in Columns (5)—(8). Detailed definitions of all variables are in Appendix 2. 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) Δ*ENVSCORE (t+1) - t*	(2) Δ*ENER (t+1) - t*	(3) Δ*ENPI (t+1) - t*	(4) Δ*ENRR (t+1) - t*	(5) Δ*ENVSCORE (t+1) - Ave (t, t-1, t-2)*	(6) Δ*ENER (t+1) - Ave (t, t-1, t-2)*	(7) Δ*ENPI (t+1) - Ave (t, t-1, t-2)*	(8) Δ*ENRR (t+1) - Ave (t, t-1, t-2)*
State_own	0.598**	0.451*	0.378	0.596**	1.017**	0.999**	0.455	0.903*
	(0.247)	(0.264)	(0.257)	(0.282)	(0.483)	(0.496)	(0.525)	(0.522)
Institution_own	1.082***	0.717*	0.786*	1.298***	2.051***	1.435*	1.613*	2.229**
	(0.399)	(0.422)	(0.435)	(0.480)	(0.788)	(0.826)	(0.862)	(0.912)
Ln(MarketCap)	-0.114**	-0.0835	0.120**	-0.139**	-0.336***	-0.282***	0.229**	-0.440***
	(0.0528)	(0.0540)	(0.0553)	(0.0605)	(0.104)	(0.104)	(0.109)	(0.116)
Leverage	-0.00142	0.00173	-0.00711*	0.00165	-0.00477	0.00179	-0.0139*	-0.00155
	(0.00380)	(0.00395)	(0.00391)	(0.00441)	(0.00720)	(0.00736)	(0.00768)	(0.00831)
Market-to-Book	-0.00505	0.0762**	-0.0947**	-0.0177	-0.0396	0.0970	-0.193***	-0.0408
	(0.0362)	(0.0381)	(0.0404)	(0.0430)	(0.0625)	(0.0651)	(0.0701)	(0.0725)
ROA	0.0210*	0.0135	0.0143	0.0203	0.0638***	0.0585***	0.0188	0.0751***
	(0.0109)	(0.0118)	(0.0130)	(0.0133)	(0.0189)	(0.0196)	(0.0209)	(0.0221)
Ln(GDP)	1.708**	1.794**	0.894	2.028**	0.538	1.281	-0.173	0.897
	(0.700)	(0.733)	(0.790)	(0.830)	(1.277)	(1.333)	(1.463)	(1.511)
Industry HHI	-0.656**	-0.440	-0.446	-0.669*	-1.190*	-0.970	-1.042	-1.155
	(0.332)	(0.343)	(0.355)	(0.387)	(0.686)	(0.696)	(0.735)	(0.755)
Observations	30,727	30,727	30,727	30,727	24,479	24,479	24,479	24,479
R-squared	0.103	0.092	0.092	0.090	0.148	0.124	0.132	0.129
TRBC Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table IA.6. Including CGVSCORE to Control for Agency Costs

This table reports the results from regressing measures of firm-level environmental engagement on a state ownership dummy (*State_own*) and other control variables as well as industry-year fixed effects and country fixed effects. The firm-level environmental engagement is measured by the environmental pillar score (*ENVSCORE*, and its sub-scores, *ENER*, *ENPI*, and *ENRR*) from ASSET4 and the logarithm of CO_2 emission in tonnes at the company level (scaled by total assets and winsorized at the 1th and 99th percentiles). For CO_2 emission tests, we require each firm to have CO_2 emission data for at least three years. We also include the firm-level corporate governance pillar score (*CGVSCORE* from ASSET4) to measure a firm's corporate governance quality. The control variables are the same as Table 4, but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles, and are in year *t*-1 (except for *Ln(GDP)* and *Industry HHI* that are in year *t* and unwinsorized). Detailed definitions of all variables are in Appendix 2. 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)	(10)
Dependent variable =	ENVSCORE	ENER	ENPI	ENRR	Ln(CO_2/Assets)
State_own	3.149***	1.933	2.419*	3.739***	-0.199*
	(1.219)	(1.221)	(1.338)	(1.263)	(0.108)
CGVSCORE	0.509***	0.507***	0.331***	0.519***	0.0035**
	(0.0142)	(0.0144)	(0.0156)	(0.0146)	(0.0013)
Institution_own	-8.756***	-8.480***	-9.685***	-6.512***	-0.275
	(2.126)	(2.179)	(2.271)	(2.221)	(0.180)
Ln(MarketCap)	10.55***	10.36***	8.069***	10.18***	-0.0245
	(0.308)	(0.315)	(0.335)	(0.315)	(0.0271)
Leverage	0.0632***	0.0829***	0.00856	0.0693***	0.007***
	(0.0200)	(0.0200)	(0.0204)	(0.0209)	(0.0018)
Market-to-Book	-0.958***	-1.070***	-0.490***	-0.970***	-0.0255*
	(0.146)	(0.153)	(0.155)	(0.154)	(0.0138)
ROA	-0.271***	-0.225***	-0.310***	-0.220***	0.0074**
	(0.0389)	(0.0403)	(0.0403)	(0.0415)	(0.0037)
Ln(GDP)	-1.162	-4.017**	-1.028	0.463	-0.666***
	(1.529)	(1.585)	(1.615)	(1.694)	(0.123)
Industry HHI	-3.289	-1.709	-2.940	-3.813*	0.151
	(2.227)	(2.255)	(2.391)	(2.249)	(0.166)
Observations	33,122	33,122	33,122	33,122	15,931
R-squared	0.573	0.551	0.496	0.499	0.773
TRBC Industry-year FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

Table IA.7. Using *Government held* with Firm Fixed Effects

This table reports the results from regressing measures of firm-level environmental engagement on a continuous variable *Government_held* which measures the percentage of free-float shares held by the government if they are above the 5% threshold, and other control variables as well as year fixed effects and firm fixed effects. The firm-level environmental engagement is measured by the environmental pillar score (*ENVSCORE*, and its sub-scores, *ENER*, *ENPI*, and *ENRR*) from ASSET4. The control variables are the same as Table 4, but we omit the coefficients of the control variables for brevity. All control variables are winsorized at the 5th and 95th percentiles, and are in year *t*-1 (except for *Ln(GDP)* and *Industry HHI* that are in year *t* and unwinsorized). Detailed definitions of all variables are in Appendix 2. 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)
Dependent variable:	ENVSCORE	ENER	ENPI	ENRR
Government_held	0.072**	0.055*	0.056	0.071**
	(0.030)	(0.029)	(0.037)	(0.031)
Institution_own	-2.401	-2.081	1.930	-6.065***
	(2.084)	(2.134)	(2.418)	(2.352)
Ln(MarketCap)	2.826***	2.985***	1.070***	3.353***
	(0.350)	(0.368)	(0.404)	(0.404)
Leverage	0.064***	0.081***	0.002	0.075***
	(0.018)	(0.019)	(0.020)	(0.020)
Market-to-Book	-0.541***	-0.465***	-0.147	-0.648***
	(0.111)	(0.113)	(0.123)	(0.127)
ROA	-0.050**	-0.043*	0.007	-0.059**
	(0.024)	(0.025)	(0.028)	(0.028)
Ln(GDP)	8.854***	6.381***	4.981***	10.84***
	(1.364)	(1.395)	(1.549)	(1.593)
Industry HHI	-2.940	-1.674	2.423	-6.173*
	(2.864)	(3.120)	(3.290)	(3.431)
Observations	32,737	32,737	32,737	32,737
R-squared	0.845	0.832	0.796	0.791
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Electronic copy available at: https://ssrn.com/abstract=2960832

european corporate governance institute

about ECGI

The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities.*

The ECGI will produce and disseminate high quality research while remaining close to the concerns and interests of corporate, financial and public policy makers. It will draw on the expertise of scholars from numerous countries and bring together a critical mass of expertise and interest to bear on this important subject.

The views expressed in this working paper are those of the authors, not those of the ECGI or its members.

www.ecgi.global

european corporate governance institute

ECGI Working Paper Series in Finance

Editorial Board

Editor	Mike Burkart, Professor of Finance, London School of Economics and Political Science
Consulting Editors	Franklin Allen, Nippon Life Professor of Finance, Professor of Economics, The Wharton School of the University of Pennsylvania
	Julian Franks, Professor of Finance, London Business School
	Marco Pagano, Professor of Economics, Facoltà di Economia Università di Napoli Federico II
	Xavier Vives, Professor of Economics and Financial Management, IESE Business School, University of Navarra
	Luigi Zingales, Robert C. McCormack Professor of Entrepreneurship and Finance, University of Chicago, Booth School of Business
Editorial Assistant	Úna Daly, Working Paper Series Manager

www.ecgi.global/content/working-papers

european corporate governance institute

Electronic Access to the Working Paper Series

The full set of ECGI working papers can be accessed through the Institute's Web-site (www.ecgi.global/content/working-papers) or SSRN:

Finance Paper Series	http://www.ssrn.com/link/ECGI-Fin.html
Law Paper Series	http://www.ssrn.com/link/ECGI-Law.html

www.ecgi.global/content/working-papers