The Interplay of E" and "G" in ESG [*]

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Abstract: Previous studies debate on whether corporate environmental engagement is a cost to shareholders. It is unclear whether corporate governance mechanism provides a resolution to the potential conflicts of interest between stakeholders and shareholders. We investigate this issue in the context of China, where control rights overwhelming cash flow rights is common and corporate environmental investment data is available. We find that a firm's environmental investment increases with its control-ownership wedge. This impact is more pronounced if a firm suffers from greater environmental pressures. Our further analyses demonstrate that dividend cuts increase while the likelihood of initiating dividends and receiving environmental penalties decreases with the magnitude of the control-ownership wedge following environmental investment. These findings have implications for controlling minority owners pursuing environmental performance at the expense of other shareholders. This study sheds light on the discordance of corporate governance and environmental responsibility.

Keywords: Environmental Investment, Corporate Governance, Ownership Structure

JEL Classifications: G32, G34, Q56

1. Introduction

With the rise of awareness towards environmental, social, and governance (ESG) matters, in recent years, firms have faced growing external pressure to allocate firm resources to ESG activities. Previous studies have documented dichotomous incentives for corporate ESG investments. [1] The agency motivation view argues that corporate environmental and social efforts reflect agency problems inside the firms, and primarily benefit managers who earn a good reputation among key stakeholders (e.g., local politicians, non-governmental organizations, or labor unions) at the expense of shareholders. Another potential incentive comes from the value-motivation view, which suggests that companies engage with stakeholders for value-enhancing purposes, as corporate efforts toward environmental and societal goals are consistent with achieving maximizing shareholder wealth.

The two views regarding corporate incentives for ESG investments are largely unresolved. In an earlier debate on corporate CSR activities, Friedman (1970), Krueger (2015), and Cheng, Hong, and Shue (2020) argued CSR engagements are driven by agency problems. Meanwhile, Ferrell, Liang, and Renneboog (2016) and Deng, Kang, and Low (2013) showed that well-governed firms are more socially responsible. A more recent discussion on the motivation of corporate ESG leans towards the value-enhancing view. Freund et al. (2023), Welch and Yoon (2022), and Albuquerque, Koskinen, and Zhang (2019) provide evidence that firm ESG efforts help to maximize shareholder benefits. The agency problems side of corporate ESG investments are still largely unexplored. Building on this stream of literature, this study seeks to provide an alternative perspective to the debate and understand the relationship between corporate governance and environmental investment decisions using new measurements. Specifically, in this study, we empirically explore the following questions: 1) do agency problems have an impact on environmental investment decisions? and 2) what are the costs and benefits of environmental investment motivated by agency problems?

This study adopts a new set of measurements that potentially overcome a major limitation in the existing literature: measurement biases arising from indirect proxy variables. Previous studies, including Ferrell, Liang, and Renneboog (2016), use third-party ratings to measure

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[1] Relevant works on the agency motivation view include Benabou and Tirole (2010), Krueger (2015), Cheng, Hong, and Shue (2020). The strand of literature discussing the value-enhancing view includes Freund et al. (2023), Welch and Yoon (2022), Albuquerque, Koskinen, and Zhang (2019).

corporate environmental and social efforts. In this paper, I take the amount of money that a firm spends on environmental matters to quantify firm environmental investments. The amount of investment suffers less from measuring errors and biases from the third-party ratings.

Additionally, I use a more direct measure to capture the agency costs between the controlling owners and other shareholders: the divergence between the voting right and the cash flow right of the controlling owner. In an earlier study, Ferrell, Liang, and Renneboog (2016) propose five proxy variables for agency problems, which include capital expenditure, cash holdings, and dividend payout ratio. These proxies are indirect and could be biased due to other business activities (e.g., corporate expansion could drive down dividend payout ratio, but is not necessarily a manifestation of agency problems). In this paper, I focus on firms for which pyramid ownership structure is prevalent. In such firms, the primary agency conflict arises from shareholders' ability to expropriate smaller investors, and the agency problems can be directly captured by the control ownership wedge.

Under the agency-motivated view, controlling minority shareholders can trade off the costs to abate environmental pollution against the expected environmental legal liabilities in their environmental investment decisions. On the one hand, although environmental investment is a cost and might reduce the operating performance in the short run (Liu et al., 2021; Chen et al., 2018), the costs for controlling owners with an ownership wedge might be relatively smaller due to their smaller cash flow rights. On the other hand, firms with greater agency costs are more likely to suffer CSR litigations (Kassinis and Vafeas, 2002), and CSR investment can reduce the risk of litigation (Freund et al., 2023). From the agency theory perspective, ES investments create agency conflict between controlling owners and non-controlling shareholders. Through investments in ES practices, controlling owners can build up their image as good citizens and generate a "warm glow" impact (Barnea and Rubin, 2010). Hence, it is likely that the controlling owners would make investment in environmental matters to earn a reputation at the expense of non-controlling shareholders. We thus hypothesize that a firm's environmental investment would increase with its agency costs.

Additionally, previous works have explored the possible conflicts between financial and environmental/social performance. In a China study, Liu et al. (2021) investigate the trade-off between financial and environmental performance. They find that firms with earnings pressure have a higher intensity of sulfur dioxide emissions, indicating that managers pursue financial

performance at the cost of environmental performance. Similarly, in a U.S. study, Thomas et al. (2022) find that U.S. firms pollute more when they meet or just beat consensus earnings per share (EPS) forecasts, suggesting that meeting expectations is a more important goal than reducing pollution. Caskey and Ozel (2017) document significantly higher injury/illness rates in firms that meet or just beat analyst forecasts compared to firms that miss or comfortably beat analyst forecasts. These studies indicate a conflict of interest between shareholders and stakeholders. In addition, Chen, Hung, and Wang (2018) find that mandatory corporate social responsibility (CSR) reporting firms experience a decrease in profitability subsequent to the mandate, indicating that CSR activity comes at a cost to performance. Di Giuli and Kostovetsky (2014) find no evidence that firms recover ESG expenditures through increased sales. Instead, they find that increases in firm CSR ratings are associated with negative future stock returns and declines in firm ROA, suggesting that any benefits to stakeholders from social responsibility come at the direct expense of firm value. Managers often face a dilemma in ESG investment decisions: ESG investment is a benefit to stakeholders but a cost to shareholders.

To answer the research questions, we focus on listed firms in China. In countries other than the U.S. and the U.K., firms are typically controlled by a few major shareholders who possess control rights exceeding their cash-flow rights (Claessens et al., 2000; Faccio and Lang, 2002; La Porta et al., 1999). The fundamental agency problem produces a conflict of interests between the controlling owners and the minority shareholders (Shleifer and Vishny, 1997). The agency costs generated by the control-ownership wedge resemble the combined problems associated with two ownership structures: a controlling shareholder structure and a dispersed ownership structure (Bebchuk et al., 2000). Although the possession of voting rights insulates controllers from the markets for control, a smaller fraction of the firm's cash flow rights relative to voting rights fails to align controller incentives with those of minority shareholders. Controlling owners thus possess incentives and abilities to extract private control benefits (e.g., perquisite consumption, excessive managerial pay, appropriation of the firm's opportunities and assets, and outright theft) that are not shared by non-controlling shareholders in proportion to the shares owned (Faccio et al., 2001). The size of private control benefits can be substantial, especially in countries where minority rights are not well respected (Dyck and Zingales, 2004; Haw et al., 2004). Following the previous literature, the severity of the agency problem is measured by the divergence between voting rights and cash flow rights of the largest ultimate shareholder. Our results are robust to using the ratio of

control to cash-flow rights to compute the divergence instead of the difference between the rights. Consistent with our conjecture, the empirical analyses show that a firm's environmental investment increases with its control-ownership wedge. This result is robust to alternative measures of ownership divergence and environmental investment.

We further explore the role of environmental protection pressure that a firm suffers in the above relationship. To alleviate the pressure from environment protection and avoid the potential penalties, entrenched controlling owners that suffer environmental pressures have more incentives to make environmental investments, due to the lower cost to them. Our analyses suggest that the impact of the control-ownership wedge on environmental investment is mainly driven by environmental pressures from regulations. Specifically, the impact of control-ownership wedge on environmental investment is more pronounced for firms in high-pollution industries, for firms that are under the monitoring of environmental protection agencies, and for the period following the China Environment Protection Law's approval in 2014.

With regard to the second research question, we first investigate whether firms with greater control-ownership divergence cut or initiate dividends following environmental investment. Chen et al. (2018) document that mandatory CSR reporting results in a decrease in profitability, indicating that mandatory CSR disclosure alters firm behavior and generates positive externalities at the expense of shareholders. Thus, the environmental investment may decrease profitability and free cash flow. Faccio et al. (2001) find that firms with ownership divergence are reluctant to pay dividends, and this phenomenon is more pronounced in East Asia. When there is a drop in profitability or free cash flow, the entrenched controlling owners are more likely to cut dividends or less likely to initiate dividends. Our empirical results reveal that dividend cut and dividend initiation are positively and negatively associated with control-ownership wedge following environmental investments, respectively. Given that Asquith and Mullins (1983) demonstrate that initiating dividends increases shareholders' wealth, this result indicates that controlling owners pursue environmental performance at the expense of non-controlling owners.

Previous literature has identified some positive outcomes of CSR investment. Flammer (2015) finds that the adoption of CSR proposals leads to positive announcement returns and superior accounting performance, implying that these proposals are value-enhancing. In a recent study, Freund et al. (2023) suggest that firms engage in CSR activities partly to reduce shareholder litigation risk ex-ante and mitigate its consequences ex-post. Hence, one potential outcome of an

environmental investment is the avoidance of environmental punishment by government entities. Kassinis and Vafeas (2002) investigate the role that corporate governance plays in shaping the outcome of CSR activities and find that the likelihood of environmental litigation decreases with corporate governance. To explore the benefits of environmental investment, we then turn to the probability of receiving environmental penalties following environmental investment. Consistent with the above prediction, we find that the likelihood of environmental punishment of a firm with divergence decreases with its environmental investment.

This study contributes to the literature in several ways. First, it responds to Edmans' (2023) and Strine et al.'s (2022) call for more research relating "G" to "E" and "S" practices. Liang and Renneboog (2017) document that firms from civil law countries, where investors are not well protected, have higher CSR ratings, and are more responsive to CSR shocks than common law firms. Cronqvist et al. (2009) find that entrenched CEOs pay higher wages to workers. Consistently, we find that controlling owners make more environmental investments at the expense of small shareholders. Our study helps to better understand how firms make environmental investment decisions and will inform more discussions of corporate environment engagement.

While rich literature has examined the determinants of corporate ESG practice (for e.g., Xu and Kim, 2022; Chen, Dong and Lin, 2020; Dyck, Lins, Roth and Wagner, 2019; Duanmu, Bu and Pittman, 2018; Cronqvist and Yu, 2017), few studies relate governance to ES practices (Edmans, 2023). There are two exceptions. Cronqvist et al. (2009), relate "G" to "S" and find that CEOs with more control pay their workers more, but financial incentives through cash flow rights ownership mitigate such behavior, suggesting that entrenched CEOs paying more to enjoy private benefits such as lower effort wage bargaining and improved social relations with employees. Another one is Liang and Renneboog (2017), who document that firms from civil law countries, where investors' interests are not well protected in general, have higher CSR ratings, and are more responsive to CSR shocks than common law firms. In addition, Wurgler (2000) shows that in locations with poorer investor protection, investment is less responsive to changes in value-added, suggesting that corporate governance shapes the results of investment. Krüger (2015) finds that investors respond negatively to positive CSR activities that are more likely to result from agency problems, indicating that the motivation for CSR activities has an impact on market reactions to CSR. This study also explores the potential consequences of environmental investment motivated by agency costs.

Second, previous studies document that agency-motivated CSRs are detrimental to firm value (Krüger, 2015; Masulis and Reza, 2015). Our study extends this stream of literature and explores the costs and benefits of agency-motivated environmental investment. We find that firms with a control-ownership wedge reduce dividends and their likelihood of initiating dividends, while the likelihood of receiving an environmental penalty decreases following an environmental investment.

Third, our study has important implications for academia and practice. Together with Cronqvist et al. (2009), we empirically identify the discordance between governance and environmental responsibilities. Governance, a measure that has historically been defined in research in terms of the responsiveness of managers at publicly traded companies to their shareholders, is bundled with environmental responsiveness and social consciousness, two concepts that often require managers to put the interests of other stakeholder groups ahead of shareholders. It may be that the governance that is incorporated in the ESG concept is different from the conventional governance measures, but if it is, any references to the payoff of good corporate governance should not be a part of ESG sales pitches, because it represents a mindset opposite to the stakeholder value mindset that underlies the concept of ESG.

The remainder of the paper is organized as follows. Section 2 outlines our data and sample construction. Section 3 presents the results of our analysis of the impact of control-ownership divergence on environmental investment. Section 4 presents the results of our analysis of the consequence of environmental investment for agency-motivated environmental investment. Our conclusions are presented in Section 5.

2. Data and research design
2.1 Variable measurement and data source

In our tests on whether poor corporate governance leads to environmental investment, we focus on Chinese listed firms for two reasons. First, ownership concentration and the existence of a positive ownership control wedge are not unusual in China (Gul et al., 2010). Second, China, as a developing economy, is facing greater environmental deterioration, and firms are subject to greater environmental protection pressure. Firm environmental investment information is publicly disclosed in the annual reports of Chinese firms.

Environmental investment

Listed companies in China disclose their expenditures and investments related to environmental protection in the notes to their annual reports. The environmental investments are covered in the details of "construction in progress" and "management expenses." Among them, construction in progress includes various areas, such as wastewater and waste gas treatment, energy efficiency projects, desulfurization projects, garbage treatment, waste heat recovery and utilization, and other capitalized expenses. Under the management expense account details, there are sewage charges, greening fees, and other expenses. We hand-collect information on these expenditures and sum them up to get the environmental investment amount (*EnvInv*) in this paper.

Environmental monitoring intensity

We measure a firm's environmental pressure from the following three dimensions. First, firms in high-pollution industries are subject to stricter environmental scrutiny. We partition all the industries into high- and low-pollution industries based on the Industrial Directory of Sort Management on Environmental Protection Inspection for Listed Companies, issued by the Ministry of Environment Protection (MEP) of China on June 24, 2008. The list of industry classifications is presented in Panel B of Appendix 2.

Second, the Environment Protection Law of China was revised and approved on April 14, 2014, and implemented on January 1, 2015. The revised Environmental Protection Law strengthens the responsibility of enterprises to prevent and control pollution and increases legal sanctions for environmental violations. Freund et al. (2023) suggest that firms engage in CSR activities to reduce litigation risk ex-ante. Fiechter et al. (2022) find that firms respond to the European Union (EU) Directive 2014/95 (CSR Directive) by increasing their CSR activities and that they start doing so before the entry-into-force of the directive. Thus, it is likely that firms make green investment to reduce the potential penalties in the year prior to the implementation, but post to the approvement of the new Environment Protection Law. We set an indicator, *Env_Law*, which equals one for observations during the period of 2014-2015 and zero for 2012-2013.

Third, following Zhang et al. (2018), we partition firms into National Specially Monitored (NSM) firms that are key industrial polluters subject to special monitoring at the national level, and non-NSM firms. NSM firms suffer strict monitoring from government agencies.

We also include control variables that have been used in prior studies (Chen et al., 2020). Firm size (*Size*) is measured by the natural logarithm of the total assets at the end of the fiscal year.

Leverage is defined as long-term debt plus current liabilities deflated by total assets. *ROA* is operating income before depreciation divided by total assets. *M/B* is the ratio of the market value of equity measured as the price times shares outstanding over the book value of the equity. *Cash_holding* is the ratio of cash and short-term investments to the book value of total assets. Sales growth is the change in sales scaled by lagged total assets. *R&D* intensity is the annual dollars spent on R&D scaled by total assets. *Dividends* is cash dividends paid, scaled by total assets. *SOE* is an indicator that equals one if a firm is state-owned, and zero otherwise. Detailed definitions of the variables are provided in Appendix 1.

2.2 Sample construction and descriptive statistics

The sample consists of A-share listed firms in the Chinese stock market. We obtain the data mainly from the China Stock Market and Accounting Research (CSMAR) database. We exclude financial institutions and civil service firms from our sample. There are two sources of data on the voting and cash flow rights of the ultimate owner: CSMAR and the Taiwan Economic Journal (TEJ). We choose our sample period to be 2008 - 2020. We start the sample in 2008 because this is the year that the control-ownership divergence data begins to be covered by both CSMAR and TEJ. In addition, all the continuous regression variables are winsorized at the top and bottom 1% to exclude the impact of potential outliers. Panel A of Table 1 outlines the key sample selection procedures and the number of observations after each key procedure. Our final sample has 26,672 observations covering 3,555 unique firms.

Panel B of Table 1 reports the summary statistics of the key variables used in our tests. The mean of *EnvInv* is 93.18, indicating that, on average, firms invest RMB93.18 million in environmental protection. The mean of *EnvInv_Dummy* is 0.344, suggesting that 34.4% of the sample firms make environmental investment. The mean of *Dividend Cut* is 0.234, suggesting that, on average, dividend-paying firms cut dividends by 23.4%. The mean of *Dividend Initiation* is 0.317, indicating that 31.7% of the non-dividend paying firms initiate dividends in the sample period. The mean of Penalty is 0.031, indicating that 3.1% of firm-years receive environmental penalties. The median of *Diverge* is 0, while the mean is 0.049, indicating that most firms do not have ownership divergence, and the mean of the divergence is 4.9%.

We present the sample breakdown by year in Panel A of Appendix 2. It shows that the number of observations increases from earlier years to later years. Environmental investments has

increased since 2014 and the increase was dramatic in 2018 and 2019. Panel B of Appendix 2 presents the sample breakdown by industry. Our sample firms exhibit considerable variation across high- vs. low-pollution industries. Firms in high-pollution industries are expected to have more monitoring pressure. Panel B shows that 36.06% sample firms belong to high-pollution industry and make 80.09% of the total environmental investment.

Table 2 presents the correlation matrix of the main variables. Both *EnvInv_Dummy* and *EnvInv_Ln* have a positive relationship with *Diverge*, consistent with our prediction. Both environmental investment measures are positively related to *Penalty*, indicating that environmental penalties are important determinants of environmental investment.

3. The impact of ownership divergence on environmental investment

3.1 Research design

To test our main hypothesis, we estimate the following equation:

$$EnvInv_{i,t} = \beta_0 + \beta_1 Diverge_{i,t} + \beta_2 Voting\_Rights_{i,t} + Control\ Variables + Industry\ FE \\ + Year\ FE + \epsilon_{i.t} \tag{1}$$

where $EnvInv_{i,t}$ stands for two alternative dependent variables. The first dependent variable is *EnvInv_Dummy*, a binary variable indicating whether firm i has made an environmental investment in year t. The second dependent variable is *EnvInv_Ln*, the natural logarithm of one plus the dollar amount of environmental investment. To control for time trends and other unobservable time-invariant industry characteristics that might affect the information environment, we include industry and year fixed effects in the model.

3.2 Main results

We first verify that ownership divergence has a real impact on environmental investment. We present the results of estimating our baseline specification (Equation (1)) in Table 3. We regress *EnvInv* on *Diverge* with fundamental firm characteristics, industry-fixed effects, and year-fixed effects. The dependent variable in column (1) is *EnvInv_Dummy,* and the coefficient on *Diverge* is 0.79, positive and statistically significant at the 1% level, suggesting that firms with greater divergence are more likely to invest in environmental improvement. The dependent variable in column (2) is *EnvInv_Ln* and the coefficient on *Diverge* is positive and statistically significant at the 1% level, suggesting that firms with greater divergence make more investments

in environmental protection. Both columns support our hypothesis. In addition, the coefficients on *Size* and *SOE* are positive, indicating that large firms and SOE firms tend to make more environmental investments. The coefficients on *Penalty* are positive, suggesting that environmental investment is also driven by penalties from government agencies. The *M/B Ratio* is negatively related to environmental investments, indicating growing firms make less investment in the environment.

To avoid the potential measurement error of ownership divergence, we alternatively employ the ownership data from TEJ.[2] The results are reported in columns (1) and (2) of Table 4 Panel A. The coefficients on *Diverge_TEJ* are positive and significant, consistent with the baseline results in Tale 3. We also use alternative measures of environmental investment, *EnvInv_A*, the dollar amount of environmental investment scaled by total assets; and *EnvInv_S*, the dollar amount of environmental investment scaled by total sales. The results are reported in columns (1) and (2) of Table 4 Panel B and the relationship remains unchanged.

Cohn, Liu, and Wardlaw (2022) demonstrate that the common practice of estimating linear regressions of the log of 1 plus the outcome produces estimates with no natural interpretation that can have the wrong sign in expectation. In contrast, a simple fixed-effects Poisson model produces consistent and reasonably efficient estimates under more general conditions than commonly assumed. Following this suggestion, we employ the Poisson model to estimate Equation (1) and the dependent variable *EnvInv*. We report the results in Column 5 of Table 4 Panel A. The coefficient on *Diverge* is 0.943, significant at the 1% level, consistent with the model using *EnvInv_Ln* as the dependent variable. In addition, in the Poisson model, the pseudo R^2 is 0.469, suggesting a better-fitted model.

To further capture the time-varying industry characteristics that may potentially drive both corporate ownership structure and environmental investments, we test the robustness of the baseline specification in columns (4) and (5) of Table 4 Panel A by adding the industry-year fixed effects to the regression. In both columns, the corporate control-ownership wedge is positively associated with environmental investment (significant at the 1% level), which aligns with previous findings.

Additionally, to alleviate the concern that the hand-collected corporate environmental investment data is subject to measurement errors, I use the environmental investment data from

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[2] The correlation between the ownership divergence from CSMAR and TEJ is 0.76.

CSMAR's Environmental Research database as an alternative data source.[3] Columns (3) and (4) of Table 4 Panel B summarizes the regression results. The two variables indicating firm environmental investments derived from CSMAR's database are the dependent variables. In both columns, the coefficient of corporate control-ownership divergence is significantly positive, implying that the positive relationship between firm environmental investment and control-ownership wedge still holds after switching to an alternative data source for environmental investment. In summary, our main results are robust to alternative measures of ownership divergence, alternative measures of environmental investment and alternative model specification.

3.3 Endogeneity issues

In this subsection, we address endogeneity concerns that arise from the analyses of how corporate governance shapes firm environmental investment. Because the ownership structure is relatively stable, it is unlikely a reverse causality issue exists wherein firms establish their ownership structure as a direct function of the amount of environmental investment. To alleviate the concern that the baseline results suffer from omitted variable bias, we conduct two additional tests.

3.3.2 Regional institutions

Shleifer and Vishny (1997) suggest that ownership structure is affected by legal environments. Liang and Renneboog (2017) document that a firm's corporate social responsibility (CSR) practice and its country's legal origin are strongly correlated. These studies indicate that legal institutions have impacts on both ownership structure and CSR activities. Although both of them are studies at country level, given that China is large and the institutions and culture vary across regions, the business environments in which a firm operates might be omitted variables in this regard. To capture the variation of regional institutions, we follow previous China studies (e.g., Wang et al. 2008), and use the five indices developed by National Economic Research Institute (NERI) to capture the business environment. The five major areas of the NERI Index are: (1)

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[3] The reason why we do not use CSMAR as the data source in the first place is that the environmental investment data in CSMAR has limited data coverage. The number of firm-year observations with positive non-zero environmental investment from CSMAR is 1,098, while the hand-collected data from corporate annual reports has 8,983 such observations. Due to the large amount of missing data in the CSMAR database, we filled firms with the missing data with zero as their environmental investment amount.

"relationship between government and market," the size of the government in the regional economy; (2) "development of non-state economy (ownership structure)," concerning the growth of the non-state sector and provincial-level reform of state enterprises; (3) "goods market development," trade barriers and the regional-level price control; (4) " factors market development," the development of mechanisms of allocation of resources including capital and labor; and (5) "legal frameworks," includes data on the setting-up of a legal framework for property-rights protection and contract enforcement. Appendix 3 presents a detailed description of these indexes and their distribution across China's 30 provincial level regions.

We incorporate the two indexes alternatively into Equation (1) and report the results in Table 5. The coefficients on Diverge are significantly positive across all the specifications, and the inclusion of the business environment proxies does change the main finding.

3.3.3 Instrumental variable estimation

To further address the endogeneity concerns, we analyze firm environmental investment behavior using an instrumental variable (IV) approach. Following Laeven and Levine (2009) and Lin et al. (2012), we instrument for a firm's control-ownership wedge and control rights using the initial industry average control-ownership wedge and initial industry average voting rights in a firm's industry. The initial industry averages are calculated using data from the year prior to the sample period and are province specific.[4] Given that a firm's ownership structure is correlated with its industry's average ownership structure (Laeven and Levine, 2009), the instrument variables satisfy the relevance condition for IV identification. Meanwhile, the average industry control-ownership wedge is unlikely to be associated with the amount of the environmental investment of an individual firm except through the control-ownership wedge of the firm, which plausibly satisfies the exclusion restriction.

In the first-stage regression[5], the coefficients on the instruments are significant, and the F-statistics (significant at the 1% level) of the first-stage regression confirm the validity of the instruments. We present the second-stage IV estimation results in Table 6. The coefficients on the control-ownership wedge in the second-stage regressions are positive and significant at the 1%

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[4] Note that the industry fixed effects in the regressions of this paper are based on the initial letter of the three-digit industry classification code. To retain the industry fixed effects in the regression and the convergence of the logit/tobit models, we group the firms with their full-length industry codes when calculating the industry averages.
[5] Untabulated for now. Will include it in the table in an updated version.

level and larger in magnitude than the baseline estimates. The results are consistent with the baseline findings and support the view that firm environmental investments are positively related to the divergence between the control rights and cash flow rights of the largest owner of a firm.

3.4 Firm Heterogeneity

3.4.1 Large vs. small firms

We partition the full sample into large and small firms based on the average total assets[6] and estimate Equation (1) separately for each sub-sample. The results presented in Panel A of Table 7 show that the coefficients on *Diverge* are significantly positive across all the specifications, suggesting that the relationship between *EnvInv* and *Diverge* exists in both small and large firms. Moreover, the magnitude of the coefficients for small firms is larger.

3.4.2 SOE vs. non-SOE

We partition the full sample into SOE and non-SOE and estimate Equation (1) separately for each sub-sample. The results presented in Panel B of Table 7 show that the coefficients on *Diverge* are significantly positive for non-SOE firms, suggesting that the relationship between *EnvInv* and *Diverge* is mainly driven by non-SOEs. The insignificant coefficients on *Diverge* for SOEs could be driven by the fact that the pressure from environmental protection for SOEs is smaller. We further discuss the impact of environmental pressure in Section 3.5.

3.5 The moderating effect of monitoring intensity

3.5.1 High- vs. low-pollution industries

We partition the sample into two subsamples based on high- vs. low-pollution industries and estimate the equation separately. The results from the logit model in Panel A of Table 9, columns (1) and (2), illustrate that the coefficient of *Diverge* in the high-pollution industry is positive, while that in the low-pollution industry is negative, both significant. The difference between the two coefficients is significantly different. This finding suggests that the environmental investment motivated by agency cost is mainly driven by pressures from environmental protection. The results from the tobit model (columns (3) and (4)) demonstrate the same pattern.

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[6] We obtain similar results if we partition the sample based on total sales.

3.5.2 The impact of the Environment Protection Law

The implementation of the Environment Protection Law in China strengthens the responsibility of enterprises to prevent and control pollution and increases the legal sanctions for environmental violations. The increased pressure from law revisions motivates the controlling owners to make more investments in order to avoid legal sanctions. We incorporate an indicator variable, *Env_Law*, equals one in the two years (2014 and 2015) post to, and zero in the two years (2012 and 2013) prior to the revision of the Environment Protection Law, and an interaction between *Env_Law* and *EnvInv*. The results are reported in Panel B of Table 8. Both the coefficients on *Env_Law* in columns (1) and (2) are significantly positive, indicating that environmental investment increases following the implication of the Environment Protection Law. Moreover, the coefficients on *Env_Law*EnvInv_Dummy* and *Env_Law*EnvInv_Ln* are both significant and positive. They suggest that the impact of divergence on investment increases following the implementation of the law.

3.5.3 NSM vs. non-NSM firms

We partition the sample into two subsamples based on NSMF vs. non-NSMF and estimate the equation separately. The results from the logit model in Panel C of Table 8, columns (1) and (2), illustrate that the coefficient on *Diverge* in NSM firms is significantly positive, while that in non-NSM firms is not significant, both significant. The difference between the two coefficients is significantly different. This finding suggests that the environmental investment motivated by agency cost is mainly driven by pressures from environmental protection. The results from the tobit model (columns (3) and (4)) demonstrate the same pattern.

4. The consequences of environmental investment

In this section, we examine the consequences of environmental investment. Specifically, we test the possibilities of dividends cut/initiation or environmental penalty following an environmental investment.

4.1 Dividend cut and initiation

To explore the cost associated with an environmental investment, we first examine whether entrenched owners cut or initiate dividends following environmental investment. We estimate the following equation.

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\begin{aligned}
Dividend\_Cut \ or \ Initiation_{i,t+1} \\
= \beta_0 + \beta_1 Diverge_{i,t} + \beta_2 EnvInv_{i,t} \\
+ \beta_3 Diverge_{i,t} * EnvInv_{i,t} + \beta_4 Voting\_Rights_{i,t} + Control \ Variables \\
+ Firm \ FE + Year \ FE + \epsilon_{i,t}
\end{aligned}
\tag{2}
$$

where the dependent variable is either *Dividend_Cut* or *Dividend_Initiation*. *Dividend_Cut* is the annual increase ratio of cash dividends paid multiplied by -1. *Dividend_Initiation* is an indicator that equals one if a firm initiates dividend payment, and zero otherwise. We incorporate an interaction, *Diverge*EnvInv* in the equation to capture the impact of ownership divergence on the consequence of environmental investment.

In columns (1) and (2) of Table 9, the dependent variable is *Dividend_Cut*$_{t+1}$. The coefficients on *EnvInv_Dummy* and *EnvInv_Ln* are significantly negative, indicating that environmental investing firms do not cut dividends if the agency cost is lower. However, the coefficients on *Diverge*EnvInv_Dummy* and *Diverge*EnvInv_Ln* are both significantly positive at the 10% level, suggesting that the impact of environmental investment on dividend cut increases with agency costs. In columns (3) and (4) of Table 9, the dependent variable is *Dividend_Initiation*$_{t+1}$. The coefficients on *EnvInv_Dummy* and *EnvInv_Ln* are significantly positive, indicating that firms are more likely to initiate dividends following an environmental investment if the agency cost is lower. However, the coefficients on *Diverge*EnvInv_Dummy* and *Diverge*EnvInv_Ln* are both significantly negative, suggesting that the impact of environmental investment on dividend initiation decreases with agency costs. The results in Table 9 support the view that controlling minority owners make environmental investment at the expense of non-controlling shareholders.

4.2 Environmental penalties

We then explore the potential benefits of environmental investment. In this regard, we focus on environmental penalties following environmental investment, and estimate the following equation:

$$
\begin{aligned}
Penalty_{i,t+1} = \beta_0 + \beta_1 Diverge_{i,t} + \beta_2 EnvInv_{i,t} + \beta_3 Diverge_{i,t} * EnvInv_{i,t} + \beta_4 Voting\_Rights_{i,t} \\
+ Control \ Variables + Firm \ FE + Year \ FE + \epsilon_{i,t}
\end{aligned}
\tag{3}
$$

where $Penalty_{i,t+1}$ is an indicator that equals one if a firm receives environmental punishment in year t+1 from the environment protection agencies, and zero otherwise. Table 10 shows that the coefficients on *EnvInv_Dummy* and *EnvInv_Ln* are insignificant, indicating that environmental investment made by firms without divergence may not have an impact on future penalties. However, the coefficients on *Diverge*EnvInv_Dummy* and *Diverge*EnvInv_Ln* are both significantly negative at the 1% level, suggesting that firms with control-ownership wedge reduce penalties through environmental investment.

5. Conclusions

Governance, a measure that has historically been defined in research in terms of the responsiveness of managers to their shareholders, is bundled in the concept of ESG with environmental responsiveness and social consciousness, two concepts that often require managers to put the interests of other stakeholder groups ahead of shareholders. This study explores the relationship between corporate governance and environmental responsibility.

We investigate this issue in the context of China, where controlling rights exceeding cash flow rights is common and the agency cost is severe. We empirically find that a firm's environmental investment increases with its control-ownership wedge, indicating that controlling owners reduce environmental risks at the expense of other shareholders. This impact is more pronounced in industries where the environmental pollution is severe and during periods following the implementation of the new Environment Protection Law. These phenomena indicate that the relationship between environmental investment and the control-ownership wedge is driven by the environmental pressure a firm suffers. Our further analyses suggest that dividend cut increases, while dividend initiation decreases with ownership divergence following environmental investment, indicating that environmental investment is made at the cost of non-controlling shareholders. The likelihood of receiving environmental penalties decreases as well following the environmental investment, suggesting a benefit of environmental investment. These findings indicate that controlling minority owners pursue environmental performance at the expense of other shareholders.

Our study highlights the discordance between corporate governance and environmental responsibility. It has implications for ESG research and practices about how to align "G" with "E" in ESG strategy and investment.

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Table 1 Sample selection and summary statistics

Panel A: Sample selection
This panel reports the sample selection procedures.

Sample-Selection Process	No. of Firm-Year Obs. Removed	No. of Firm-Year Obs. Remaining
Initial sample with financial data from 2008 to 2020 available from CSMAR	N/A	48692
Procedures:		
(1) After removing duplicates	10216	38476
(2) After removing firms in the financial, civil service, and education industries	860	37616
(3) After removing firms carrying "ST" (special treatment) tags	1497	36119
(4) After merging the data with the ultimate owners' voting and cash flow rights	5376	30743
(5) After removing missing values in the control variables	4071	26672
Final sample after requiring that the necessary data be available for all test variables		26672

Panel B: Summary statistics
This panel reports the summary statistics for the main variables. All variables definitions are in Appendix 1.

	N	Mean	SD	25th	Median	75th
EnvInv	26672	93.178	4247.962	.000	.000	2.137
EnvInv_Dummy	26672	.344	.475	.000	.000	1.000
EnvInv_Ln	26672	5.548	7.800	.000	.000	14.575
EnvInv_A	26672	.010	.578	.000	.000	.000
EnvInv_S	26672	.018	.739	.000	.000	.001
Dividend_Cut	16703	-.234	2.360	-.350	.000	.400
Dividend_Initiation	5865	.317	.465	.000	.000	1.000
Penalty	26672	.031	.173	.000	.000	.000
Cash_Flow_Rights	26672	.351	.166	.223	.337	.465
Control_Rights	26672	.400	.155	.280	.390	.510
Diverge	26672	.049	.077	.000	.000	.083
EPLaw	8009	.500	.500	.000	.000	1.000
If_HP	26671	.361	.480	.000	.000	1.000
Size	26672	22.146	1.310	21.224	21.962	22.873
ROA	26672	.033	.081	.008	.028	.061
Leverage	26672	.436	.208	.273	.429	.589
M/B	26672	2.485	2.439	1.334	1.883	2.849
SOE	26672	.404	.491	.000	.000	1.000
Inst_Ownership	26672	.389	.237	.190	.393	.573
Sales_Growth	26672	2.436	16.325	-.180	.043	.277
Cash_Holdings	26672	.271	.425	.099	.169	.300
Dividends	26672	.014	.021	.000	.007	.018
R&D	26672	.762	.426	1.000	1.000	1.000
Meet_Beat	26672	.048	.214	.000	.000	.000

Table 2 Correlation Matrix of Main Variables

Bold correlations indicate a 5% significance level or below. All variables are defined in Appendix 1.

Variables	(1) EnvInv_dummy	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(2) EnvInv_Ln	**0.982**																
(3) Dividend_Cut	-0.007	-0.008															
(4) Dividend_Initiation	**0.029**	**0.035**															
(5) Penalty	**0.086**	**0.1**	-0.034	-0.013													
(6) Voting_Rights	**0.03**	**0.043**	**-0.039**	**0.132**	0.038												
(7) Diverge	**0.04**	**0.045**	0.007	0.024	0.012	**0.101**											
(8) Size	**0.208**	**0.263**	**-0.036**	**0.133**	**0.147**	**0.166**	**0.063**										
(9) ROA	**-0.017**	**-0.016**	**-0.124**	**0.203**	-0.013	**0.148**	**0.019**	0.003									
(10) Leverage	**0.115**	**0.141**	0.009	**-0.149**	**0.065**	-0.042	**0.055**	**0.456**	**-0.321**								
(11) M/B	**-0.124**	**-0.138**	**-0.031**	**-0.085**	**-0.041**	**-0.041**	**-0.037**	**-0.365**	0.038	**-0.226**							
(12) SOE	**0.143**	**0.159**	0.006	-0.030	**0.064**	**0.085**	**-0.076**	**0.332**	-0.038	**0.280**	**-0.175**						
(13) Instutional_Owner	**0.109**	**0.129**	-0.021	**0.073**	**0.067**	**0.268**	**0.217**	**0.433**	**0.084**	**0.177**	**-0.045**	**0.355**					
(13) Sales_Growth	-0.005	-0.005	0.002	-0.012	**0.016**	0.003	**0.012**	**0.019**	0.008	**0.016**	-0.009	**0.020**	**0.014**				
(14) Cash_holding	**-0.109**	**-0.116**	**-0.027**	0.024	**-0.040**	**0.045**	-0.021	**-0.164**	**0.122**	**-0.259**	**0.203**	**-0.079**	**-0.035**	-0.001			
(15) Dividend	**-0.026**	**-0.026**	**-0.241**	**0.561**	-0.012	**0.137**	**0.022**	**-0.034**	**0.322**	**-0.266**	**0.150**	**-0.101**	**0.057**	-0.004	**0.135**		
(16) R&D	**0.056**	**0.054**	-0.006	**0.062**	**0.053**	**0.027**	**-0.030**	**-0.022**	0.014	**-0.198**	**0.039**	**-0.266**	**-0.075**	-0.006	**0.032**	**0.071**	
(18) Meet_Beat	0.011	**0.012**	**-0.038**	0.016	0.009	0.008	0.011	**0.029**	**0.030**	0.012	-0.001	**0.078**	**0.043**	0.003	**-0.014**	0.006	**-0.046**

Table 3 The Impact of Ownership Divergence on Environmental Investment

This table presents the impact of ownership divergence on corporate environmental investment. The dependent variable of (1) is a binary variable indicating whether a firm makes environmental investment. The dependent variable of (2) is the logged dollar amount of firm environmental investment. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Firm-level controls include the logged value of total assets, ROA, financial leverage, SOE, sales growth, cash holdings, institutional ownership, dividends, environmental penalty, M/B ratio, R&D expense, and whether the firm meets or beats analysts' EPS forecast. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. $*$, $**$, and $***$ denotes significance at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) Logit EnvInv_Dummy	(2) Tobit EnvInv_ln
Diverge	0.790***	7.134***
	(2.99)	(2.98)
Voting_Rights	-0.053	-0.773
	(-0.350)	(-0.594)
Size	0.265***	2.696***
	(6.91)	(7.30)
ROA	0.44	4.509
	(0.97)	(1.08)
Leverage	0.016	0.425
	(0.20)	(0.58)
SOE	0.416***	3.542***
	(10.15)	(9.38)
Sales_Growth	0	-0.004
	(-0.200)	(-0.290)
Cash_Holdings	-0.699***	-6.432***
	(-9.543)	(-7.957)
Inst_Ownership	0.057	0.426
	(0.90)	(0.70)
Dividend	-0.764	-6.323
	(-0.761)	(-0.596)
Penalty	0.403***	3.012***
	(5.62)	(4.80)
M/B Ratio	-0.132***	-1.185***
	(-9.982)	(-8.050)
R&D	-0.014	-0.168
	(-0.085)	(-0.129)
Meet_Beat	0.026	0.261
	(1.42)	(1.48)
Constant	-6.529***	-62.150***
	(-8.482)	(-9.030)
Year FE	YES	YES
Industry FE	YES	YES
Pseudo R2	0.131	0.051
N	26672	26672

Table 4 Alternative Data Sources and Model Specification

This table presents the impact of ownership divergence on corporate environmental investment using alternative measures and alternative regression model. EnvInv_Dummy is a binary variable indicating whether a firm makes environmental investment. EnvInv_ln is the logged dollar amount of firm environmental investment. EnvInv_A is the dollar amount of firm environmental investment scaled by its total assets. EnvInv_S is the dollar amount of firm environmental investment scaled by its total sales. EnvInv_Dummy_CSMAR is a binary variable indicating whether a firm makes environmental investment with data sourced from CSMAR. Envinv_ln_CSMAR is the logged dollar amount of firm environmental investment with data sourced from CSMAR. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Diverge_TEJ is the firm's controlling owner's voting rights minus its cash flow rights from TEJ. Voting_Rights_TEJ is the voting rights of the controlling owner from TEJ. Firm-level controls include the logged value of total assets, ROA, financial leverage, SOE, sales growth, cash holdings, institutional ownership, dividends, environmental penalty, M/B ratio, R&D expense, and whether the firm meets or beats analysts' EPS forecast. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel A: Alternative independent variables and model specification					
	(1) Logit	(2) Tobit	(3) Poisson	(4) Logit	(5) Tobit
VARIABLES	EnvInv_Dummy	EnvInv_ln	Envinv	EnvInv_Dummy	EnvInv_ln
Diverge_TEJ	0.631*	5.490*			
	(1.92)	(1.71)			
Voting_Rights_TEJ	0.016	-0.16			
	(0.09)	(-0.112)			
Diverge			0.943***	0.78***	3.34***
			(2.94)	(2.80)	(3.39)
Voting_Rights			0.292	-0.04	-0.02
			(1.19)	(-0.27)	(-0.04)
Size	0.269***	2.724***	0.643***	0.27***	1.23***
	(7.61)	(7.16)	(5.06)	(6.96)	(5.44)
ROA	0.428	4.404	2.272***	0.49	1.50
	(0.99)	(1.06)	(3.61)	(1.14)	(1.03)
Leverage	0.013	0.416	0.933***	0.02	0.53*
	(0.07)	(0.56)	(2.83)	(0.24)	(1.94)
SOE	0.415***	3.508***	-0.061	0.42***	1.31***
	(5.73)	(8.97)	(-0.407)	(10.32)	(7.14)
Sales_Growth	0	-0.005	-0.001	-0.00	-0.00
	(-0.335)	(-0.335)	(-0.410)	(-0.21)	(-0.46)
Cash_Holding	-0.699***	-6.428***	-1.036***	-0.71***	-1.64***
	(-6.109)	(-7.984)	(-3.718)	(-10.41)	(-3.10)
Inst_Ownership	0.061	0.506	-0.048	0.04	-0.13
	(0.49)	(0.74)	(-0.263)	(0.78)	(-0.64)
Dividend	-0.951	-7.804	-1.56	-0.64	-3.96
	(-0.608)	(-0.730)	(-0.790)	(-0.71)	(-1.27)
Penalty	0.529***	4.288***	0.066	0.41***	1.73***
	(4.60)	(8.51)	(0.72)	(6.52)	(8.67)
M/B	-0.132***	-1.186***	-0.239***	-0.13***	-0.31***
	(-6.120)	(-8.450)	(-4.440)	(-9.57)	(-3.55)
R&D	-0.015	-0.18	0.02	-0.01	-0.03
	(-0.199)	(-0.138)	(0.21)	(-0.08)	(-0.07)
Meet_Beat	0.026	0.261	0	0.02	0.06
	(0.37)	(1.43)	(0.00)	(1.15)	(0.82)
Constant	-6.384***	-62.878***	1.9	-6.10***	-20.82***
	(-8.445)	(-8.869)	(0.71)	(-8.18)	(-4.57)
Year FE	YES	YES	YES	NO	NO
Industry FE	YES	YES	YES	NO	NO
Year * Industry FE	NO	NO	NO	YES	YES
Pseudo R2	0.131	0.0507	0.469	0.134	0.031
N	26672	26672	26672	26596	26672

Table 4 Alternative Data Sources and Model Specification - *Continued*

Panel B: Alternative dependent variables

VARIABLES	(1) Tobit EnvInv_A	(2) Tobit Envinv_S	(3) Logit EnvInv_Dummy_ CSMAR	(4) Tobit Envinv_ln_ CSMAR
Diverge	0.007***	0.016***	1.90***	12.64***
	(2.77)	(2.67)	(3.85)	(4.68)
Voting_Rights	0.001	0.002	-0.04	0.33
	-0.713	(0.50)	(-0.12)	(0.19)
Size	0.002***	0.005***	0.38***	2.85***
	(5.05)	(5.98)	(9.07)	(8.89)
ROA	0.011***	0.012	1.69***	10.51*
	(2.80)	(1.37)	(3.80)	(1.69)
Leverage	0.004**	0.007*	-0.56**	-3.60***
	(2.26)	(1.70)	(-2.34)	(-2.60)
SOE	0.002***	0.005***	0.42***	2.87***
	(4.20)	(2.92)	(6.51)	(7.61)
Sales_Growth	0	0	-0.00**	-0.02
	(-1.185)	(-1.194)	(-2.22)	(-1.47)
Cash_Holding	-0.008***	-0.018***	-0.26***	-2.01**
	(-10.687)	(-9.291)	(-4.02)	(-2.10)
Inst_Ownership	0	0	0.20**	1.30
	(-0.502)	(-0.192)	(2.29)	(0.82)
Dividend	-0.014	-0.060*	3.64***	28.49***
	(-1.208)	(-1.842)	(3.81)	(2.67)
Penalty	0.003***	0.006***	0.39*	3.43***
	(4.56)	(3.72)	(1.89)	(3.22)
M/B	-0.001***	-0.003***	-0.12***	-0.85**
	(-8.310)	(-9.853)	(-2.93)	(-2.50)
R&D	0.001	0.003	0.27**	1.73**
	-0.628	(0.62)	(2.47)	(2.02)
Meet_Beat	0.001*	0	-0.01	-0.02
	(1.74)	(0.36)	(-0.10)	(-0.02)
Constant	-63.730***	-0.129***	-14.28***	-105.61***
	(-8.662)	(-6.676)	(-14.07)	(-13.11)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Pseudo R2	-0.146	-0.401	0.152	0.095
N	26672	26672	26672	26672

Table 5 Controlling for Regional Business Environment

This table controls for proxies for regional busines environment. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Firm-level controls include the logged value of total assets, ROA, financial leverage, SOE, sales growth, cash holdings, institutional ownership, dividends, environmental penalty, M/B ratio, R&D expense, and whether the firm meets or beats analysts' EPS forecast. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) Logit EnvInv Dummy	(2) Tobit EnvInv ln	(3) Logit EnvInv Dummy	(4) Tobit EnvIn ln	(5) Logit EnvInv Dummy	(6) Tobit EnvInv ln	(7) Logit EnvInv Dummy	(8) Tobit EnvInv ln	(9) Logit EnvInv Dummy	(10) Tobit EnvInv ln	(11) Logit EnvInv Dummy	(12) Tobit EnvInv ln
Diverge	0.624**	5.802**	0.698***	6.419***	0.742***	6.762***	0.754***	6.858***	0.608**	5.583**	0.593**	5.489**
	(2.41)	(2.41)	(2.66)	(2.63)	(2.80)	(2.78)	(2.79)	(2.79)	(2.35)	(2.33)	(2.26)	(2.22)
Voting_Rights	0.021	-0.171	-0.004	-0.371	-0.033	-0.608	-0.043	-0.688	0.033	-0.068	0.038	-0.054
	(0.13)	(-0.129)	(-0.026)	(-0.277)	(-0.210)	(-0.461)	(-0.279)	(-0.519)	(0.22)	(-0.054)	(0.24)	(-0.040)
Size	0.271***	2.731***	0.269***	2.719***	0.267***	2.708***	0.264***	2.681***	0.279***	2.805***	0.276***	2.779***
	(7.46)	(7.99)	(7.22)	(7.63)	(7.00)	(7.39)	(6.66)	(7.12)	(7.52)	(8.14)	(7.66)	(8.24)
ROA	0.508	4.948	0.484	4.754	0.496	4.839	0.507	4.952	0.4	4.106	0.475	4.712
	(1.08)	(1.13)	(1.03)	(1.10)	(1.05)	(1.11)	(1.11)	(1.16)	(0.87)	(0.98)	(1.02)	(1.09)
Leverage	-0.012	0.072	-0.006	0.158	0.023	0.437	0.042	0.615	-0.049	-0.253	-0.034	-0.137
	(-0.149)	(0.09)	(-0.078)	(0.21)	(0.29)	(0.57)	(0.52)	(0.80)	(-0.590)	(-0.314)	(-0.422)	(-0.174)
SOE	0.349***	2.978***	0.376***	3.210***	0.381***	3.280***	0.395***	3.374***	0.372***	3.147***	0.359***	3.040***
	(10.11)	(8.82)	(10.83)	(9.65)	(11.24)	(10.32)	(10.52)	(10.06)	(10.05)	(8.57)	(9.91)	(8.54)
Sales_Growth	0	-0.004	0	-0.005	0	-0.005	0	-0.005	0	-0.004	0	-0.004
	(-0.255)	(-0.314)	(-0.260)	(-0.325)	(-0.308)	(-0.368)	(-0.288)	(-0.364)	(-0.188)	(-0.261)	(-0.188)	(-0.257)
Cash_Holdings	-0.691***	-6.349***	-0.696***	-6.382***	-0.700***	-6.427***	-0.707***	-6.480***	-0.671***	-6.194***	-0.682***	-6.272***
	(-10.479)	(-8.596)	(-10.256)	(-8.429)	(-10.277)	(-8.347)	(-10.376)	(-8.291)	(-10.174)	(-8.527)	(-9.740)	(-8.148)
Inst_Ownership	0.076	0.616	0.075	0.609	0.066	0.522	0.06	0.436	0.078	0.661	0.083	0.699
	(1.10)	(0.93)	(1.09)	(0.92)	(0.96)	(0.79)	(0.91)	(0.69)	(1.13)	(1.01)	(1.21)	(1.06)
Dividend	-0.617	-5.218	-0.73	-6.179	-0.612	-5.207	-0.547	-4.5	-0.923	-7.615	-0.637	-5.631
	(-0.637)	(-0.511)	(-0.748)	(-0.600)	(-0.601)	(-0.487)	(-0.546)	(-0.427)	(-0.976)	(-0.764)	(-0.651)	(-0.546)
Penalty	0.514***	4.088***	0.518***	4.164***	0.522***	4.213***	0.524***	4.227***	0.510***	4.052***	0.508***	4.017***
	(7.26)	(8.08)	(7.23)	(8.03)	(7.17)	(7.94)	(7.27)	(7.97)	(6.99)	(7.97)	(7.27)	(8.08)
M/B Ratio	-0.135***	-1.200***	-0.136***	-1.208***	-0.135***	-1.204***	-0.135***	-1.203***	-0.131***	-1.163***	-0.132***	-1.172***
	(-10.375)	(-8.162)	(-10.562)	(-8.289)	(-10.067)	(-8.050)	(-10.361)	(-8.188)	(-10.322)	(-8.149)	(-10.138)	(-7.960)
R&D	0.027	0.156	0.019	0.092	0.004	-0.036	-0.01	-0.145	0.025	0.151	0.024	0.132
	(0.17)	(0.13)	(0.12)	(0.07)	(0.02)	(-0.028)	(-0.064)	(-0.112)	(0.16)	(0.12)	(0.15)	(0.11)
Meet_Beat	0.03	0.28	0.03	0.27	0.03	0.26	0.03	0.29	0.03	0.26	0.03	0.29
	(1.45)	(1.44)	(1.41)	(1.42)	(1.38)	(1.42)	(1.62)	(1.60)	(1.36)	(1.37)	(1.55)	(1.51)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Marketization	-0.099***	-0.792***										
	(-7.005)	(-6.158)										
Gov_Mkt_Relation			-0.072***	-0.577***								
			(-6.603)	(-5.812)								
Non-state_Sector					-0.043***	-0.311***						
					(-4.375)	(-3.446)						
Product_Market							-0.042***	-0.323***				
							(-3.901)	(-2.941)				
Factor_Market									-0.058***	-0.478***		
									(-4.543)	(-4.139)		
Legal_Env											-0.067***	-0.535***
											(-7.422)	(-6.731)
Constant	-5.725***	-57.342***	-5.789***	-57.931***	-5.970***	-59.740***	-5.905***	-59.073***	-6.262***	-61.794***	-6.188***	-61.169***
	(-9.196)	(-9.679)	(-8.589)	(-8.766)	(-8.895)	(-8.962)	(-7.878)	(-8.314)	(-9.989)	(-10.454)	(-9.806)	(-10.170)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R2	0.135	0.052	0.132	0.051	0.132	0.051	0.135	0.052	0.136	0.052	0.136	0.052
N	26672	26672	26672	26672	26672	26672	26672	26672	26672	26672	26672	26672

Table 6 Instrumental Variables (IV) Estimation

This table presents the results of instrument variables estimations of the effect of the control-ownership wedge on corporate environmental investment. EnvInv_Dummy is a binary variable indicating whether a firm makes an environmental investment. EnvInv_ln is the logged dollar amount of firm environmental investment. Voting_Rights is the voting rights of the controlling owner from CSMAR. The instruments for the control-ownership wedge and voting rights are the initial industry average wedge and the initial industry average voting rights, respectively. Firm-level controls include the logged value of total assets, ROA, financial leverage, SOE, sales growth, cash holdings, institutional ownership, dividends, environmental penalty, M/B ratio, R&D expense, and whether the firm meets or beats analysts' EPS forecast. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) Logit EnvInv_Dummy	(2) Tobit EnvInv_ln
Diverge	1.22***	16.10***
	(2.94)	(2.89)
Voting_Rights	0.25	3.49
	(1.21)	(1.08)
Size	0.16***	2.79***
	(10.64)	(11.73)
ROA	0.14	3.18
	(0.61)	(0.91)
Leverage	0.02	0.53
	(0.22)	(0.49)
SOE	0.27***	3.78***
	(11.87)	(11.43)
Sales_Growth	-0.00	-0.01
	(-1.09)	(-1.26)
Cash_Holdings	-0.44***	-7.09***
	(-7.70)	(-7.53)
Inst_Ownership	-0.09*	-1.35*
	(-1.84)	(-1.69)
Dividend	-0.61	-6.64
	(-0.92)	(-0.65)
Penalty	0.25***	3.06***
	(5.03)	(4.88)
M/B Ratio	-0.07***	-1.21***
	(-5.39)	(-5.49)
R&D	-0.05	-0.71
	(-1.26)	(-1.32)
Meet_Beat	0.00	0.14
	(0.08)	(0.19)
Constant	-3.83***	-63.63***
	(-12.17)	(-12.86)
Year FE	YES	YES
Industry FE	YES	YES
N	22876	22919

Table 7 Firm Heterogeneity

This table partitions sample into sub-groups based on firm size or SOE and estimate Eq.(1) separately. Panel A partitions the sample into large and small firms, based on the median of the average logged assets in the latest five year. Panel B partitions the sample into SOE and non-SOEs. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel A Large vs. small firms

VARIABLES	Large	Small	Large	Small
	(1) Logit	(2) Logit	(3) Tobit	(4) Tobit
	EnvInv_Dummy	EnvInv_Dummy	EnvInv_ln	EnvInv_ln
Diverge	0.383**	1.008**	4.419***	7.822*
	(2.31)	(2.03)	(2.79)	(1.89)
Voting_Rights	-0.277	0.231*	-2.851	1.749
	(-1.323)	(1.82)	(-1.430)	(1.59)
Size	0.306***	0.192***	3.456***	1.945***
	(10.24)	(2.79)	(10.96)	(3.39)
ROA	-0.091	1.152***	-0.753	10.079***
	(-0.156)	(2.98)	(-0.127)	(2.68)
Leverage	-0.051	-0.056	-0.376	-0.05
	(-0.492)	(-0.719)	(-0.334)	(-0.078)
SOE	0.340***	0.484***	3.248***	3.777***
	(3.36)	(15.29)	(3.01)	(8.72)
Sales_Growth	-0.001	0	-0.011	-0.002
	(-0.470)	(-0.115)	(-0.848)	(-0.128)
Cash_Holdings	-0.717***	-0.639***	-7.315***	-5.431***
	(-9.442)	(-3.557)	(-7.908)	(-3.666)
Inst_Ownership	0.296***	-0.164	2.619***	-1.367
	(6.09)	(-1.403)	(4.81)	(-1.320)
Dividend	1.285	-3.268***	11.956	-24.641**
	(1.03)	(-2.785)	(0.75)	(-2.572)
Penalty	0.791***	0.270***	7.763***	1.902***
	(16.40)	(4.37)	(15.68)	(5.59)
M/B Ratio	-0.100***	-0.169***	-0.976***	-1.411***
	(-5.543)	(-9.951)	(-4.562)	(-7.538)
R&D	0.015	-0.062	0.072	-0.413
	(0.10)	(-0.300)	(0.05)	(-0.262)
Meet_Beat	0.05	0.00	0.63	(0.02)
	(0.93)	(0.04)	(1.06)	(-0.041)
Constant	-6.680***	-4.239***	-75.290***	-41.401***
	(-9.839)	(-3.032)	(-11.004)	(-3.492)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Pseudo R2	0.1	0.152	0.04	0.056
N	15889	10783	15889	10783

Panel B SOE vs. non-SOE firms

VARIABLES	Non-SOE (1) Logit EnvInv_Dummy	SOE (2) Logit EnvInv_Dummy	Non-SOE (3) Tobit EnvInv_ln	SOE (4) Tobit EnvInv_ln
Diverge	0.914***	0.577	9.236***	4.297
	(4.80)	(1.09)	(4.43)	(1.02)
Voting_Rights	-0.527***	0.834***	-4.750***	5.862***
	(-3.519)	(5.84)	(-2.894)	(5.06)
Size	0.308***	0.197***	3.437***	1.938***
	(8.71)	(3.40)	(8.69)	(4.67)
ROA	1.146***	-0.493	10.692**	-2.039
	(3.10)	(-0.925)	(2.56)	(-0.516)
Leverage	-0.200**	0.323***	-1.813	2.967***
	(-1.997)	(2.70)	(-1.607)	(3.03)
Sales_Growth	-0.003***	0.001	-0.037***	0.01
	(-3.737)	(0.60)	(-4.260)	(0.62)
Cash_Holdings	-0.732***	-0.656***	-7.238***	-5.577***
	(-12.898)	(-4.537)	(-11.291)	(-4.555)
Inst_Ownership	-0.015	-0.045	-0.141	-0.717
	(-0.113)	(-0.351)	(-0.100)	(-0.713)
Dividend	-1.536	2.667	-15.163	22.336
	(-1.643)	(1.24)	(-1.321)	(1.31)
Penalty	0.620***	0.389***	6.120***	2.547***
	(12.24)	(4.00)	(12.45)	(4.47)
M/B Ratio	-0.138***	-0.128***	-1.324***	-1.045***
	(-7.218)	(-8.950)	(-6.973)	(-10.297)
R&D	-0.025	-0.048	-0.298	-0.319
	(-0.301)	(-0.191)	(-0.398)	(-0.171)
Meet_Beat	0.096**	(0.03)	0.920*	(0.17)
	(2.26)	(-0.793)	(1.96)	(-0.618)
Constant	-6.538***	-4.457***	-73.288***	-41.782***
	(-9.732)	(-3.453)	(-9.740)	(-4.507)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Pseudo R2	0.1	0.152	0.04	0.056
N	15889	10783	15889	10783

Table 8 The Role of Environmental Pressure

This table presents the role that environment pressure plays on the impact of ownership divergence on corporate environmental investment. Panel A compares the impact of ownership divergence between high- vs. low pollution industries. Panel B compares the impact of ownership divergence prior and post to the approval of the Environment Protection Law in 2014. Panel C compares the impact of ownership divergence between NSM and non-NSM firms. EnvInv_Dummy is a binary variable indicating whether a firm makes environmental investment. EnvInv_ln is the logged dollar amount of firm environmental investment. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Firm-level controls include the logged value of total assets, ROA, financial leverage, SOE, sales growth, cash holdings, institutional ownership, dividends, environmental penalty, M/B ratio, R&D expense, and whether the firm meets or beats analysts' EPS forecast. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel A: High- vs. Low-pollution industries

VARIABLES	Non-heavily polluting (1) Logit EnvInv_Dummy	Heavily polluting (2) Logit EnvInv_Dummy	Non-heavily polluting (3) Tobit EnvInv_ln	Heavily polluting (4) Tobit EnvInv_ln
Diverge	-0.658**	1.556***	-6.256*	10.220***
	(-2.006)	(4.08)	(-1.663)	(5.82)
Voting_Rights	-0.016	-0.08	-0.497	-0.586
	(-0.081)	(-0.711)	(-0.241)	(-0.734)
Size	0.206***	0.324***	2.530***	2.557***
	(7.27)	(4.43)	(8.01)	(5.31)
ROA	0.135	0.547	1.293	5.376*
	(0.22)	(1.16)	(0.20)	(1.83)
Leverage	0.095	0.267***	1.167	1.994***
	(0.61)	(3.67)	(0.65)	(3.03)
SOE	0.197***	0.605***	1.886**	4.020***
	(2.87)	(21.84)	(2.39)	(16.57)
Sales_Growth	0.001	-0.001	0.007	-0.005
	(1.11)	(-0.207)	(0.82)	(-0.230)
Cash_Holdings	-0.308***	-0.759***	-3.559***	-5.838***
	(-2.592)	(-5.723)	(-3.116)	(-5.654)
Inst_Ownership	0.312***	-0.321**	3.209***	-2.212**
	(2.71)	(-2.182)	(2.85)	(-2.117)
Dividend	-2.583	-2.303**	-29.662	-13.394**
	(-1.508)	(-2.573)	(-1.525)	(-2.258)
Penalty	0.242***	0.284*	2.678***	1.360*
	(2.73)	(1.84)	(2.97)	(1.77)
M/B Ratio	-0.139***	-0.102***	-1.370***	-0.835***
	(-5.323)	(-19.242)	(-4.678)	(-54.107)
R&D	0.22	0.011	1.949	-0.028
	(1.36)	(0.22)	(1.28)	(-0.219)
Meet_Beat	0.072**	(0.02)	0.816**	(0.18)
	(2.44)	(-0.360)	(2.46)	(-0.561)
Constant	-5.384***	-7.029***	-64.876***	-52.856***
	(-9.283)	(-4.581)	(-10.167)	(-4.995)
Test of the difference of the coefficients of *Diverge*	Chi^2 = 17.36 Prob > Chi^2 = 0.00***		Chi^2 = 13.46 Prob > Chi^2 = 0.00***	
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Pseudo R2	0.11	0.097	0.044	0.034
N	17053	9616	17053	9618

Panel B: The Implementation of Environment Protection Law

VARIABLES	(1) Logit EnvInv_Dummy	(2) Tobit EnvInv_ln
Env_law*Diverge	0.863***	7.553**
	(2.74)	(2.47)
Env_law	0.093*	0.848*
	(1.92)	(1.76)
Diverge	0.566*	4.373
	(1.92)	(1.64)
Voting_Rights	0.219	1.437
	(1.22)	(0.89)
Size	0.236***	2.379***
	(6.77)	(7.50)
ROA	-0.632	-5.159
	(-0.849)	(-0.710)
Leverage	0.046	0.535
	(0.31)	(0.32)
SOE	0.393***	3.220***
	(7.86)	(7.55)
Sales_Growth	-0.006	-0.05
	(-1.621)	(-1.494)
Cash_Holdings	-0.946***	-8.373***
	(-7.363)	(-6.311)
Inst_Ownership	-0.056	-0.339
	(-0.599)	(-0.397)
Dividend	-4.194***	-37.962**
	(-2.840)	(-2.384)
Penalty	0.377***	2.823***
	(3.46)	(3.10)
M/B Ratio	-0.137***	-1.208***
	(-4.183)	(-3.596)
R&D	-0.064	-0.444
	(-0.318)	(-0.288)
Meet_Beat	-0.186*	-1.644
	(-1.712)	(-1.523)
Constant	-4.074***	-43.501***
	(-5.709)	(-6.559)
Year FE	YES	YES
Industry FE	YES	YES
Pseudo R2	0.137	0.052
N	7996	8009

Panel C NSM vs. non-NSM Firms

VARIABLES	Non-NSM (1) Logit EnvInv_Dummy	NSM (2) Logit EnvInv_Dummy	Non-NSM (3) Tobit EnvInv_ln	NSM (4) Tobit EnvInv_ln
Diverge	0.443	2.225***	4.355*	9.316***
	(1.61)	(4.37)	(1.71)	(5.20)
Voting_Rights	-0.022	1.249***	-0.497	5.546***
	(-0.130)	(9.06)	(-0.335)	(8.41)
Size	0.283***	-0.246***	2.917***	-0.487***
	(5.88)	(-14.883)	(5.89)	(-6.623)
ROA	0.177	1.689***	2.277	9.376***
	(0.43)	(8.05)	(0.59)	(10.19)
Leverage	-0.07	0.977***	-0.263	4.311***
	(-0.752)	(9.91)	(-0.304)	(10.50)
SOE	0.380***	0.385***	3.355***	1.583***
	(8.87)	(17.79)	(8.05)	(19.16)
Sales_Growth	0	-0.013	0.002	-0.117
	(0.29)	(-0.675)	(0.15)	(-1.262)
Cash_Holdings	-0.631***	-0.488***	-5.999***	-2.755***
	(-9.562)	(-4.615)	(-7.631)	(-6.561)
Inst_Ownership	0.024	-0.193***	0.091	-0.963***
	(0.33)	(-4.170)	(0.12)	(-5.967)
Dividend	-1.387	8.506***	-13.086	38.736***
	(-1.440)	(4.35)	(-1.260)	(4.85)
Penalty	0.308***	0.197***	2.454***	0.873***
	(4.12)	(3.08)	(3.57)	(3.91)
M/B Ratio	-0.115***	-0.231***	-1.071***	-1.174***
	(-10.889)	(-48.931)	(-8.154)	(-54.474)
R&D	-0.009	-0.176**	-0.172	-0.557
	(-0.052)	(-2.568)	(-0.126)	(-1.545)
Meet_Beat	(0.02)	0.323***	(0.13)	1.371***
	(-0.726)	(18.02)	(-0.426)	(12.00)
Constant	-6.269***	4.743***	-64.297***	16.290***
	(-6.731)	(17.09)	(-6.352)	(16.62)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Pseudo R2	0.055	0.053	0.049	0.012
N	25065	1598	25065	1607

Table 9 Dividends Cut/Initiation Following Environmental Investment

This table presents the changes in dividend cut/dividend initiation following the environmental investment. Dividend_Cut$_{t+1}$ is the one-year-forward increase ratio of cash dividends paid, multiplied by -1. Dividend_Initiation$_{t+1}$ is a one-year-forward indicator that equals one if a firm initiates dividend payment, and zero otherwise. EnvInv_Dummy is a binary variable indicating whether a firm makes an environmental investment. EnvInv_ln is the logged dollar amount of firm environmental investment. Env_Law is a binary variable that equals one in the two years prior to, and zero in the two years post to the Environment Protection Law was revised. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

VARIABLES	Firms with Dividends		Firms without Dividends	
	Dividend_Cut$_{t+1}$		Dividend_Initiation$_{t+1}$	
	(1) Regression	(2) Regression	(3) Logit	(4) Logit
EnvInv_Dummy*Diverge	0.540*		-2.734**	
	(2.01)		(-1.979)	
EnvInv_Dummy	-0.060**		0.0411***	
	(-2.495)		(-2.99)	
EnvInv_ln*Diverge		0.031*		-0.202***
		(1.92)		(-2.595)
EnvInv_ln		-0.003*		0.029***
		(-1.894)		(3.188)
Diverge	-0.241	-0.216	0.409	0.568
	(-0.922)	(-0.797)	(0.374)	(0.474)
Voting_Rights	-0.13	-0.128	2.789***	2.764***
	(-0.626)	(-0.619)	(6.996)	(6.995)
Size	0.313***	0.312***	0.028	0.023
	(7.42)	(7.40)	(0.374)	(0.296)
ROA	3.900***	3.902***	10.926***	10.908***
	(13.34)	(13.36)	(6.216)	(6.161)
Leverage	-0.566***	-0.566***	-1.48**	-1.491**
	(-5.979)	(-5.977)	(-2.341)	(-2.348)
SOE	-0.029	-0.029	-0.0636**	-0.628**
	(-0.376)	(-0.385)	(-3.134)	(-3.096)
Sales_Growth	-0.002***	-0.002***	-0.001	-0.001
	(-3.202)	(-3.215)	(-0.512)	(-0.497)
Cash_Holding	-0.104**	-0.104**	0.522***	0.523**
	(-2.503)	(-2.493)	(2.338)	(2.341)
Inst_Ownership	-0.071	-0.071	0.694**	0.690**
	(-1.070)	(-1.069)	(2.22)	(2.207)
Penalty	-0.148**	-0.147**	0.203	0.199
	(-2.432)	(-2.429)	(1.42)	(1.379)
M/B	-0.054***	-0.054***	-0.012	-0.011
	(-4.238)	(-4.215)	(-0.357)	(-0.345)
R&D	0.01	0.01	-0.046	-0.045
	(0.46)	(0.46)	(-0.471)	(-0.456)
Meet_Beat	-0.007	-0.007	0.323**	0.326**
	(-0.246)	(-0.244)	(2.023)	(2.052)
Constant	-6.786***	-6.790***		
	(-7.416)	(-7.409)		
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
R2/Pseudo-R2	0.194	0.194	0.2	0.246
N	16398	16398	3967	3967

Table 10 Environmental Penalties Following Environmental Investment

This table presents the changes in environmental penalties following the environmental investment. Penalty$_{t+1}$ is the one-year-forward indicator variable that takes one if the firm has received an environmental penalty. EnvInv_Dummy is a binary variable indicating whether a firm makes an environmental investment. EnvInv_ln is the logged dollar amount of firm environmental investment. Env_Law is a binary variable that equals one in the two years prior to, and zero in the two years post to the Environment Protection Law was revised. Diverge is the firm's controlling owner's voting rights minus its cash flow rights from CSMAR. Voting_Rights is the voting rights of the controlling owner from CSMAR. Definitions of variables are in Appendix 1. The sample period is from 2008 to 2020. Standard errors are clustered at the industry level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Penalty$_{t+1}$	
VARIABLES	(1) Logit	(2) Logit
EnvInv_Dummy*Diverge	-3.398***	
	(-3.063)	
EnvInv_Dummy	0.157	
	(1.606)	
EnvInv_ln*Diverge		-0.201***
		(-2.815)
EnvInv_ln		0.008
		(1.584)
Diverge	0.828	0.737
	(0.734)	(0.603)
Voting_Rights	-0.168	-0.194
	(-0.344)	(-0.401)
Size	-0.131	-0.122
	(-1.229)	(-1.142)
ROA	0.669	0.525
	(0.350)	(0.291)
Leverage	-0.112	-0.110
	(-0.306)	(-0.306)
SOE	0.0958	0.097
	(0.482)	(0.490)
Sales_Growth	0.002	0.002
	(0.390)	(0.401)
Cash_Holding	0.023	0.0239
	(0.179)	0.181
Inst_Ownership	0.235	0.23
	(1.526)	(1.519)
Penalty	-0.429***	-0.429***
	(-2.741)	(-2.727)
Year FE	YES	YES
Firm FE	YES	YES
Pseudo-R2	0.246	0.245
N	3967	3967

Appendix 1 Variable Definitions

This appendix presents the definitions of the main variables used in this study.

Variable	Definition	Source
EnvInv	The dollar amount of environmental investment (in million dollars);	Manually collected
EnvInv_Dummy	An indicator that equals one if a firm makes an environmental investment in year t, and zero otherwise;	Manually collected
EnvInv_Ln	The natural logarithm of the dollar amount of environmental investment;	Manually collected
EnvInv_A	The dollar amount of environmental investment scaled by the firm's total assets;	Manually collected
EnvInv_S	The dollar amount of environmental investment scaled by the firm's total sales;	Manually collected
Dividend_Cut	The increase ratio of cash dividends paid, multiplied by -1;	CSMAR
Dividend_Initiation	An indicator that equals one if a firm initiates dividend payment, and zero otherwise;	CSMAR
Penalty	An indicator that equals one if the firm has received an environmental protection penalty due to violations of the environment protection regulations in a year, and zero otherwise;	MEP
Control_Rights	The voting rights;	CSMAR, TEJ
Cash_Flow_Rights	The cash flow rights of the ultimate owner;	CSMAR, TEJ
Diverge	The controlling owner's voting rights minus its cash flow rights;	CSMAR, TEJ
EPLaw	An indicator that equals one in the two years prior to, and zero in the two years post to the Environment Protection Law was revised;	
If_HP	An indicator that takes one if the firm's industry has been categorized as high-pollution by the MEP.	MEP
Size	The natural logarithm of the total assets at the end of the fiscal year;	CSMAR
ROA	Operating income before depreciation divided by total assets;	CSMAR
Leverage	Long-term debt plus current liabilities deflated by total assets;	CSMAR
M/B	The ratio of the market value of equity measured as the price times shares outstanding over the book value of the equity;	CSMAR
SOE	An indicator that equals one if the firm is state owned, and zero otherwise;	CSMAR
Institutional_Owner	The percentage of outstanding shares held by institutional investors;	CSMAR
Sales_Growth	Change in sales scaled by lagged total assets;	CSMAR
Cash_Holdings	Cash and short-term investments scaled by total assets;	CSMAR
Dividends	Cash dividends paid, scaled by total assets;	CSMAR
R&D	A dummy variable that takes one if a firm's research and development (R&D) expenditure is greater than zero.	CSMAR
Meet_Beat	An indicator variable that equals to one of a firm meet or beats the latest consensus of analysts' EPS forecasts by two cents or less, where latest consensus is calculated as the average of each analysts' latest forecast.	CSMAR

Marketization	The marketization index, calculated as the average of Gov_Mkt_Relation, Non_state_Sector, Product_Market, Factor_Market, and Legal_Env.	NERI
Gov_Mkt_Relation	The "relationship between government and market" area has three components: the role of market in resources allocation, using (1 - government expenditure as share of GDP) to indicate it; reducing the intervention to firms by government, by the survey data of firms on "the convenience of the administrative examination and approval procedures"; and reducing the size of government, using the employees in public administration, social security and social organization as share of the total population as the indicator of the size of government.	NERI
Non_state_Sector	The "development of non-state economy (ownership structure)" area has three components: the share of non-state sectors' in contributions to industrial value-added; the share of non-state sectors' in fixed assets investment; and the share of non-state sectors' in urban employment.	NERI
Product_Makket	The "product market development" area has two components: price controls, which is largely time-invariant4 in the index, measuring the share of goods with prices decided by the government; and reducing the trade barriers and local protection, which is from survey data.	NERI
Factor_Market	The "factors market development" area has six components: the marketization of the financial sector, indicated by the share of deposits in private banks to total; the marketization of credit allocation, indicating the share of credit allocated to non-state sectors; the supply of technical staff; the supply of administrative staff; the supply of skilled workers; and the marketization of technological achievements. The third to the fifth components are measured by survey data, and the last component is measured by the ratio of technology market order flow to the number of local science and technology staff.	NERI
Legal_Env	"Legal frameworks" has four components: intermediate institutions such as law firms, accounting offices, and independent auditing offices; assistance to firms from guilds; defense of the rule of law in markets; and intellectual property rights protection. The first three components are from survey data, while the last one is measured by the ratio of patterns approved to the number of science and technology staff	NERI

Appendix 2 Sample Composition

Panel A: Year breakdown

This panel lists the year breakdown of the main sample.

Year	No. of Obs.	% of Obs.	Mean Envinv
2008	1189	4.46	37.56
2009	1217	4.56	35.30
2010	1310	4.91	34.96
2011	1615	6.06	34.96
2012	1944	7.29	38.78
2013	2061	7.73	37.08
2014	1976	7.41	45.37
2015	2028	7.60	50.23
2016	2060	7.72	75.99
2017	2434	9.13	58.91
2018	2948	11.05	181.99
2019	2939	11.02	248.52
2020	2951	11.06	129.41
Total	26672	100.00	

Panel B: Industry breakdown

This panel lists the industry breakdown of the main sample.

Industry Code	Industry Name	No. of Obs.	% of Obs.	Mean EnvInv
	High-pollution industry			
B06	Coal mining and dressing	280	1.05	225.42
B07	Oil and natural gas exploitation	49	0.18	1095.47
B08	Ferrous metal ore mining and dressing	41	0.15	21.17
B09	Non-ferrous metal ore mining and dressing	181	0.68	3180.3
B10	Non-metallic ore mining and dressing	3	0.01	1.09
C13	Agricultural and sideline food processing	381	1.43	36.61
C15	Alcohol, beverage and refined tea manufacturing	391	1.47	12.47
C17	Textile	411	1.54	21.54
C18	Textile garment and apparel	285	1.07	1.08
C19	Leathers, furs, feathers and related products and footwear	72	0.27	3.25
C22	Papermaking and paper product	286	1.07	55.56
C25	Petroleum processing, coking, and nuclear fuel processing	186	0.7	79.72
C26	Manufacturing of chemical raw materials and chemical products	1852	6.94	56.38
C27	Pharmaceutical	1621	6.08	7.82
C28	Chemical fiber manufacturing	241	0.9	78.55
C29	Rubber and plastic products	537	2.01	720.58
C30	Non-metallic mineral products	770	2.89	52.25
C31	Ferrous metal smelting and rolling processing	346	1.3	228.25
C32	Non-ferrous metal smelting and rolling processing	577	2.16	86.51
C33	Metal product	456	1.71	9.73
D44	Electric power and heat production and supply	653	2.45	789.7
	Sub-total of high-pollution industry	9619	36.06	6763.45
	Low-pollution industry			
A01	Agriculture	142	0.53	7.62
A02	Forestry	37	0.14	6
A03	Animal husbandry	111	0.42	24.83
A04	Fishery	80	0.30	0.78
A05	Service for agriculture, forestry, animal husbandry and fishery	17	0.06	0.16
B11	Exploitation auxiliary activities	104	0.39	13.24
C14	Food manufacturing	317	1.19	11.42
C20	Wood processing and wood, bamboo, rattan, Palm fiber, and straw product industry	80	0.3	4.24
C21	Furniture manufacturing	100	0.37	1.8
C23	Printing and recording media reproduction	94	0.35	4.47
C24	Manufacturing of stationery, industrial arts, sports and entertainment supplies	108	0.4	0.04
C34	General equipment manufacturing	1005	3.77	26.41
C35	Special-purpose equipment manufacturing	1458	5.47	10.27
C36	Automobile manufacturing	917	3.44	24.27
C37	Manufacturing of railways, ships, aircrafts, space crafts and other transportation equipment	364	1.36	2.31
C38	Electric machinery and equipment manufacturing	1652	6.19	113.54
C39	Manufacturing of computers, communications and other electronic equipment	2361	8.85	12.27

Panel B: industry Breakdown - *Continued*				
Industry Code	Industry Name	No. of Obs.	% of Obs.	Mean EnvInv
C40	Instrument and meter manufacturing	320	1.2	34.84
C41	Other manufacturing industries	178	0.67	3.31
C42	Comprehensive utilization of waste resources	19	0.07	187.06
C43	Metal product, machinery and equipment repair	1	0	0.97
D45	Gas production and supply	106	0.4	182.34
D46	Water production and supply	133	0.5	358.31
E47	Building construction	38	0.14	5.28
E48	Civil engineering construction	477	1.79	63.18
E49	Construction installation	8	0.03	0
E50	Architectural decoration and other construction	201	0.75	10.12
F51	Wholesale	572	2.14	13.02
F52	Retail	910	3.41	5.64
G53	Railway transportation	36	0.13	6.79
G54	Road transport	276	1.03	3.73
G55	Waterway transport	228	0.85	16.89
G56	Air transport	106	0.4	43.81
G58	Loading/unloading handling and transport agency	144	0.54	2.44
G59	Storage	63	0.24	0.69
G60	Postal service	7	0.03	0
H61	Accommodation	71	0.27	17.97
H62	Catering	32	0.12	1.46
I63	Telecommunications, radio and television and satellite transmission services	119	0.45	0.02
I64	Internet and related services	292	1.09	2.11
I65	Software and information technology services	1178	4.42	14.23
K70	Real estate	1093	4.1	5.23
K71	Leasing	26	0.1	0.71
K72	Commercial service	300	1.12	1.65
M73	Research and experimental development	20	0.07	0.61
M74	Professional technical service	192	0.72	4.32
M75	Science and technology popularization and application services	3	0.01	0.45
N77	Ecological protection and environmental governance	169	0.63	397.78
N78	Public facility management	143	0.54	12.28
Q83	Health	54	0.2	0.56
R85	Press and publishing	150	0.56	1.89
R86	Radio, television, film, and film and television sound recording production	128	0.48	0.08
R87	culture and arts	41	0.15	0.31
R88	Sports	3	0.01	0
S90	Diversified industries	269	1.01	18.01
	Sub-total of low-pollution industry	17053	63.94	1681.76

Appendix 3 The Index of Marketization and the Number of Observations for Each Region

This table reports the five major areas of the NERI Index: (1) "relationship between government and market", the size of the government in the regional economy; (2) "development of non-state economy (ownership structure)", concerning the growth of the non-state sector and provincial-level reform of state enterprises; (3) "goods market development", trade barriers and the regional-level price control; (4) "factors market development", the development of mechanisms of allocation of resources including capital and labor; and (5) "legal frameworks", includes data on the setting-up of a legal framework for property-rights protection and contract enforcement. These institutional indexes are obtained from the National Economic Research Institute (NERI) Index of Marketization of China's provinces from2008-2019 to measure the quality of market-supporting institutions at the provincial level. The NERI Index project was sponsored by the National Economic Research Institute and the China Reform Foundation. The NERI indices capture the progress of the institutional transition in China's 30 provinces (excluding Tibet, due to lack of data).

Regions	Marketization Index	The Relationship between Government and Market	The Development of Non-State Sector	The Development of Product Market	The development of Factor Markets	The Development of Market Intermediaries Legal Environment
Anhui	8.30	8.16	10.46	8.28	7.57	7.73
Beijing	9.06	7.68	9.22	5.15	13.05	10.82
Chongqing	8.68	7.63	10.49	8.09	9.43	8.57
Fujian	9.46	7.93	11.72	10.03	9.44	8.99
Gansu	5.36	5.17	4.31	7.09	6.18	4.55
Guangdong	10.27	9.14	11.83	10.01	11.50	9.92
Guangxi	7.19	7.11	9.58	9.05	6.18	4.67
Guizhou	5.58	5.25	6.48	7.84	5.13	3.47
Hainan	6.36	6.14	10.56	6.18	5.73	3.59
Hebei	7.17	6.91	10.16	6.89	6.91	5.51
Heilongjiang	7.07	7.15	7.05	7.64	7.78	6.52
Henan	7.93	7.55	11.04	8.72	6.97	6.13
Hubei	8.28	7.54	10.18	8.37	9.47	6.41
Hunan	7.75	6.84	10.49	8.65	7.18	6.34
Inner Mongolia	6.04	4.85	8.85	8.09	5.41	3.16
Jiangsu	10.19	9.71	12.24	8.76	11.52	9.63
Jiangxi	7.81	7.45	10.66	8.88	7.14	5.73
Jilin	7.36	6.59	9.27	8.37	7.34	5.96
Liaoning	8.49	6.89	10.11	8.66	10.34	7.00
Ningxia	6.05	5.43	8.87	7.05	5.50	3.85
Qinghai	4.30	3.88	5.97	3.28	5.75	2.71
Shaanxi	6.89	6.02	6.48	7.48	8.25	6.95
Shandong	9.17	8.26	11.41	10.01	9.14	7.97
Shanghai	10.53	9.63	9.90	8.23	13.90	12.03
Shanxi	6.16	5.55	7.30	7.34	6.41	4.71
Sichuan	8.04	7.24	9.88	8.25	7.96	7.67
Tianjin	9.87	9.66	10.13	7.22	12.50	11.05
Tibet	1.45	-2.80	4.44	3.90	0.58	1.31
Xinjiang	4.43	3.41	5.35	6.75	3.39	3.46
Yunnan	5.79	6.42	7.30	6.43	5.39	3.63
Zhejiang	10.06	9.04	11.89	8.68	10.70	11.22