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# Does ownership type affect environmental disclosure?

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## Abstract

**Purpose** – In recent years, firms tend to direct their attention in communicating their environmental actions with their stakeholders. However, the level of environmental disclosures varies significantly among firms. This paper aims to explain the variation in environmental disclosure of firms based on their ownership type, namely – state ownership and institutional ownership. The study further aims to understand whether and how the relationship between ownership structure and environmental disclosure changes regarding countries' development levels.

**Design/methodology/approach** – This paper uses a sample of 27,847 firm-year observations from 72 countries/economic districts between the years 2002 and 2017 and regression analysis to test how the relationship between different ownership structures and environmental disclosure and whether this relation is conditional on countries' development levels.

**Findings** – This study finds that firms with higher state ownership have higher environmental disclosures and higher institutional ownership has a negative effect on environmental disclosures. Furthermore, this paper also documents that firms with higher state ownership and operating in developed countries have incrementally higher environmental disclosure, relative to firms operating in developing countries.

**Research limitations/implications** – The study has limitations that would provide possible starting points for further research. The first limitation is related to the environmental disclosure measure, which reflects the level of environmental disclosure of firms based on their disclosure information given in the Thomson Reuters, Asset4 database. A more refined measure can be constructed using hand-collected data based on linguistic analysis, which may reflect not only the level of the disclosure but also the quality of the environmental disclosure. The second limitation is the limited focus of the study toward state and institutional shareholding. Therefore, future research may consider examining the different types of ownership such as family ownership.

**Practical implications** – The findings of the study may help policymakers and regulators to consider the potential impact of various ownership types on environmental disclosures. Also, given the impact of countries' development levels, regulators should consider that a one-size-fits-all is not applicable in environmental disclosures. Therefore, each country should consider the institutional dynamics of their operating environment to set appropriate regulations to enhance environmental disclosures.



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**Social implications** – From a social perspective, the findings indicate that firms' stakeholder engagement via environmental disclosures depends on the type of the controlling shareholders.

**Originality/value** – This study contributes to the literature by developing a new construct for environmental disclosure based on Biodiversity, Climate Change, Environmental Investments and Spill Impact Reduction performance measures. Further, grounding on legitimacy and stakeholder theories, this study shows the influence of ownership type on environmental disclosures and how this effect changes in accordance with the countries' development.

**Keywords** Biodiversity disclosure, Climate change disclosure, Ownership type, Countries' development level

**Paper type** Research paper

## Introduction

In the past two decades, corporations have been exposed to extensive pressure from society and regulators (e.g. Carbon Disclosure Project (CDP), the Kyoto Protocol of the United Nations Framework Convention on Climate Change) for higher accountability on climate change and environmental issues. As a consequence of these worldwide calls, firms' sensitivity and awareness of environmental issues have increased significantly. Given that firms' reputation and existence in the market at stake (Dintimala and Amril, 2018), in addition to increasing sensitivity and awareness, to provide a positive signal on the market, firms also direct their attention in communicating their environmental actions with their stakeholders. Consequently, more and more firms start with enhanced disclosures on environmental issues. However, firms' environmental disclosures show significant variations. While, previous studies document that environmental disclosure is associated with numerous factors, including the concerns of stakeholders (Ali *et al.*, 2017), firm's strategy and vision, gender diversity (Baalouch *et al.*, 2019), environmental performance (Baalouch *et al.*, 2019; Giannarakis, 2018), size, age, listing status, profitability (Kılıç and Kuzey, 2019a), board independence and existence of a sustainability committee (Kılıç and Kuzey, 2019b) and macro-level dynamics such as political, labor and cultural systems (Baldini *et al.*, 2018), the literature is yet to explain the influence of "ownership" on environmental disclosures. The ownership structure is one of the essential elements of governance mechanisms distinguishing firms' behaviors from one another (Fama and Jensen, 1983) and structured by different determinants. So far, none of the previous studies exclusively examine how ownership types affect environmental disclosure. Thus, this study aims to fill the gap in the literature by analyzing the relationship between different ownership structures and firms' climate change, biodiversity, environmental investments, and spill impact reduction disclosures. This is important because it shows whether institutional and state ownerships could act as a stimulating driver for firms' disclosure policy.

Firms are influenced by a broader social context such as public and private regulations. It is argued that countries that have traditionally been intensely engaged in environmental protection would have more corporate environmental attention, which leads to more disclosure practices (Halme and Huse, 1997). Firms' disclosure practices are affected by country-specific institutional factors such as reporting requirements, political costs of disclosure, cultural and social norms (Meek *et al.*, 1995). Consequently, in such countries, the influence of ownership on environmental disclosure will be affected. Although countries' development level affects voluntary disclosure practices, except few cross-country studies in the area of environmental disclosure (e.g. Calza *et al.*, 2016; Giannarakis *et al.*, 2018) focusing on European firms, the majority of previous studies examining the determinants of environmental disclosures has been studied in a single-country context. For instance, Al

Amosh and Mansor (2020) examine the ownership structure on the environmental disclosure level in Jordan, Halkos, and Skouloudis (2016) study the disclosure practices for Greek firms, Iatridis (2013) investigate the relationship between environmental disclosure and corporate governance in Malaysia an emerging market. Given that there is still a lack of cross-country studies examining the changes in the environmental disclosure based on countries' development, we further aim to understand whether and how the relationship between ownership structure and environmental disclosures changes regarding countries' development levels.

Using a sample of 27,847 firm-year observations from 72 countries/economic districts between the years 2002–2017 and regression analysis, we find that:

- firms with higher state ownership have higher environmental disclosures;
- higher institutional ownership has a negative effect on environmental disclosures;
- firms with higher state ownership and operating in developed countries have incrementally higher environmental disclosure, relative to firms operating in developing countries; and
- firms with higher institutional ownership have a similar level of low environmental disclosure both in developed and developing countries.

Our study has several contributions. First, grounding on legitimacy and stakeholder theories, our findings contribute to the academic literature on environmental disclosure by documenting that ownership type is a significant determinant of firms' environmental disclosure. Furthermore, we show a more comprehensive picture of how the influence of ownership type on environmental disclosures changes in accordance with the countries' development. While prior literature has paid more attention to environmental disclosure in developed and developing countries separately (Ali and Rizwan, 2013; Giannarakis *et al.*, 2018), our study documents the impact of ownership structure on environmental disclosure by focusing on both developed and developing countries together. From a social perspective, our findings indicate that firms' stakeholder engagement via environmental disclosures depends on the type of controlling shareholders. Second, using factor loadings of four environmental disclosure measures climate change, biodiversity, environmental investments, and spill impact reduction, this study contributes to the literature by developing a new construct for environmental disclosure. Third, the findings of our study may help policymakers and regulators to consider the potential impact of various ownership types on environmental disclosures. Also, given the impact of countries' development levels, regulators should consider that a *one-size-fits-all* is not applicable in environmental disclosures. Therefore, each country should consider the institutional dynamics of their operating environment to set appropriate regulations to enhance environmental disclosures.

The remainder of the paper is organized as follows. The following section provides a literature review of environmental disclosure and ownership structure, and it develops hypotheses. The next section introduces the data and methodology used. The fourth section presents the results together with the discussion of the implications of the results. The final section concludes the study, summarizing the main findings and limitations.

## **Theoretical framework and hypotheses development**

### *Environmental disclosure*

Voluntary disclosure of environmental information aims to minimize information risks and, thereby, their related costs to satisfy stakeholders. Legitimacy theory suggests that firms seek to ensure that their activities and operations are acceptable within the norms of their

societies. It posits that the firms must appear to consider the rights of all stakeholders, and thereby, disclosures on corporate social responsibility issues are responses to the pressures from the political, social, and economic environment. Therefore, corporate management may use the annual reports as a corporate response and evidence of sensitivity to specific environmental issues as the awareness and concern in the public increases about related issues (Deegan and Rankin, 1996). The only way to achieve or maintain legitimacy is to inform society about the actions taken, of course, via disclosure (Cormier *et al.*, 2004). Also, while the motivations to disclose environmental information for poor performers are the threat to legitimacy and change the public image, the motivation to disclose environmental information for superior performers is to differentiate themselves from the others (Clarkson *et al.*, 2008).

Similarly, as it is indicated in the stakeholder theory, firms are part of a social system, and stakeholders in that social system have the power to impact their performance. Hence, firms must take action to satisfy the needs of a wide range of stakeholders. Disclosure practices are regarded as one of the critical factors in fulfilling the responsibility to stakeholders (An *et al.*, 2011). Therefore a macro view to disclosure practices is provided by legitimacy theory, whereas a micro view is provided by stakeholder theory, and they both attempt to emphasize that firms must communicate to the whole society to achieve and protect legitimacy and groups in that society from meeting their goals (Cormier *et al.*, 2004).

#### *Environmental disclosure and state ownership*

The government, which is one of the influential stakeholders, can influence corporate strategy and performance, thus disclosure practices (Lu and Abeysekera, 2014). It is argued that for the firms when the government holds the majority of the shares, the management of those firms would be willing to disclose more to reflect its social and environmental responsibilities and impact the social perception of the state (Naser *et al.*, 2006; Lan *et al.*, 2013). Other than disclosure of environmentally sensitive activities, the findings of Calza *et al.* (2016) reveal that firms with state ownership present superior environmental proactivity. Supporting such a view, the results from numerous previous studies have shown a positive relationship between the level of voluntary disclosure and state ownership (Eng and Mak, 2003; Naser *et al.*, 2006; Wang *et al.*, 2008; Haddad *et al.*, 2015; Khelif *et al.*, 2017). Amran *et al.* (2012) also found a significant positive relation between climate change disclosure practices and firm size, profitability, government ownership, and business network. Due to the voluntary nature of environmental disclosure and in line with legitimacy and stakeholder theories, we argue that state ownership increases such disclosure practices, as governmental members on the board are more likely to demonstrate their efforts about environmental sensitivity. Hence, we propose the following hypothesis:

- H1. Voluntary environmental disclosure on climate change, biodiversity, environmental investments, and spill impact reduction is higher for firms with higher state ownership.

#### *Environmental disclosure and institutional ownership*

Institutional ownership refers to the situation where the largest shareholder is an institution or not. As institutional owners are more sophisticated and experienced with access to relevant information (Balsam *et al.*, 2002), it is suggested that they would be more effective in controlling and monitoring management's activities (Siregar and Utama, 2008). Generally, large institutional investors enjoy the privilege to access internal sources of information, not

available to all shareholders (El-Diftar *et al.*, 2017). Thus, such a privilege causes them to avoid more voluntary disclosure about social and environmental issues. Empirical evidence indicates a negative relation between institutional ownership and voluntary disclosure (Tsamenyi *et al.*, 2007; Samaha *et al.*, 2012; Juhmani, 2013). For example, Siew *et al.* (2016) investigated the effect of environmental, social, and governance disclosures and institutional ownership on information asymmetry. Despite their results showed environmental, social, and governance disclosures and institutional ownership reduce information asymmetry, further analysis indicated that higher levels of institutional ownership weaken this negative relationship. In a similar vein, the findings of Bushee *et al.* (2004) reveals firms are less likely to make disclosures when institutional owners dominate them. One potential reason for such a negative impact of institutional owners on environmental disclosure can be explained via their shifted focus toward firms' financial short-term interest rather than long-term sustainable growth. Given institutional owners focus more on short-term financial benefits, they are less sensitive to the needs of the society and other stakeholders and less likely to legitimize their actions via voluntary disclosures to send a positive signal to the market. Therefore, in line with the legitimacy and stakeholder theories, we argue that there is a negative relation between institutional ownership and environmental disclosure. Hence, we propose the following hypothesis:

- H2. Voluntary environmental disclosure on climate change, biodiversity, environmental investments, and spill impact reduction is lower for firms with higher institutional ownership.

#### *The moderating role of countries' development*

Countries have different institutional settings. The differences in countries' institutional settings consequently affect firms' organizational structure and forms, including the shareholders. In terms of environmental disclosure and ownership relation, the impact of institutional setting can be explained by grounding on the stakeholder and legitimacy theory. For example, in countries where the stock markets are developed and stakeholders have a more active role, shareholders are likely to direct their attention to the needs of the society and tend to send a positive signal to the market to ensure the information need of all stakeholders. On the other hand, in countries with less developed stock markets and institutional settings, the shareholders will be less sensitive to the needs of society. In line with stakeholder and legitimacy theories, we argue that the impact of shareholders, therefore, depends on the level of institutional development in a country. With this respect, country specific-factors such as development status and disclosure practices have received attention from many researchers in recent years (Amran *et al.*, 2014). It is argued that countries that have traditionally been intensely engaged in environmental protection would have more corporate environmental attention, which leads to more disclosure practices (Halme and Huse, 1997). There are different incentives for developed and developing countries regarding their environmental disclosure. For instance, while Ali *et al.* (2017) found that developed countries' corporate social responsibility disclosure practices are shaped by specific stakeholders such as regulators, shareholders, creditors, investors, environmentalists, and the media; they found that developing countries' influenced by external forces such as international buyers, foreign investors, international media and international regulatory bodies. Baldini *et al.* (2018) studies country-level determinants together with firm-level determinants and revealed that political, labor and cultural systems affect firms' environmental, social, and governmental disclosure practices. In addition, all industrialized firms except the USA ratify the Kyoto Protocol, which sets a limit on the

amount of greenhouse gas emissions. Therefore, most of the firms in developed countries receive pressure from the government to follow carbon emission regulations and tend to disclose more about climate change. We, therefore, argue that when compared to developing ones, are more environmentally sensors and would be more engaged in environmental disclosure practices. Thus, we propose the following hypotheses:

- H3.* Firms with high state ownership have incrementally higher environmental disclosure on climate change, biodiversity, environmental investments, and spill impact reduction in developed countries relative to developing countries.
- H4.* Firms with high institutional ownership have incrementally higher environmental disclosure on climate change, biodiversity, environmental investments, and spill impact reduction in developed countries relative to developing countries.

## Methodology

### Data

In this study, we draw our sample from the full international universe of the Thomson Reuters Asset4 database with available environmental data about Biodiversity Impact Reduction, Climate Change Risks and Opportunities, Environmental Investments Initiatives, and Spill Impact Reduction over the period 2002–2017. The initial sample has a population of 55,442 firm-years. Furthermore, we collected data for state and institutional ownership and all other financial and non-financial (ownership and corporate governance) data from Datastream, Worldscope, and Thomson Reuters Asset4 databases. After eliminating firms with missing data for any of the independent and control variables, we have a final sample of 27,847 firm-year observations.

### Research model

To examine *H1*, voluntary environmental disclosure on climate change, biodiversity, environmental investments, and spill impact reduction is higher for firms with higher state ownership, and *H2*, voluntary environmental disclosure on climate change, biodiversity, environmental risk, and spill impact reduction is lower for firms with higher institutional ownership, we use the equation (1):

$$\begin{aligned} \ln(\text{EnvDisclosure}) = & \alpha + \beta_1 \ln(\text{Own}(\%)) + \beta_2 \ln(\text{TotalAssets}) + \beta_3 \ln(\text{DebttoCapital}) \\ & + \beta_4 \ln(\text{ROE}) + \beta_5 \ln(\text{CFO}) + \beta_6 \text{Reputation\_Monitoring} \\ & + \beta_7 \text{CEO\_Comp\_Link} + \beta_8 \text{CEO\_BoardMem} + \beta_9 \text{CG\_Comm} \\ & + \beta_{10} \text{CG\_Comm} + \beta_{11} \ln(\text{CloselyHeldShares}(\%)) \\ & + \text{Industry, Auditor, Year and Country indicators} + \varepsilon \end{aligned}$$

Where  $\ln(\text{EnvDisclosure})$  is the natural logarithm of environmental disclosure, a higher value of environmental score indicates better environmental disclosure. It is computed using factor loadings of four environmental disclosure measures *BioDiversity*, *ClimateChange*, *Env\_Investments*, and *SpillImpactReduction*. To avoid inter-correlated components within the newly created disclosure quality index variables, we rotated the factors using the orthogonal varimax method (Kaiser, 1958). Table 1 presents the details of the factor loadings. *Biodiversity* is an indicator variable that equals one if the firm reports on its impact on biodiversity or on activities to reduce its impact on the native ecosystems and species, as

**Table 1.**  
Construction of the  
EnvDisclosure score –  
factor analysis

Panel A: Factor analysis – principal factor method					
	Eigenvalue	Difference	Proportion	Cumulative	
<i>Factor1</i> – EnvDisclosure score <sup>c</sup>	1.022	1.071	1.566	1.566	
Factor2	–0.04	0.076	–0.075	1.490	
Factor3	–0.125	0.069	–0.192	1.298	
Factor4	–0.194	.	–0.298	1	
LR test: independent vs saturated: Prob > chi2 = 0.0000					
Panel B: Factor loadings (pattern matrix) and unique variances					
Variable	Factor1	Uniqueness			
Biodiversity impact reduction (Asset4 code: ENERDP019)	0.589	0.653			
Climate change risks/opportunities (Asset4 code: ENERDP089)	0.511	0.738			
Environmental investments initiatives (Asset4 code: ENERDP095)	0.483	0.766			
Spill impact reduction (Asset4 code: ENERDP087)	0.425	0.819			
Panel C: Summary statistics of the items and EnvDisclosure score					
Variable	Obs	Mean	Std. dev.	Min	Max
Biodiversity impact reduction (Asset4 code: ENERDP019)	55,442	0.169	0.375	0.000	1.000
Climate change risks/opportunities (Asset4 code: ENERDP089)	55,442	0.305	0.460	0.000	1.000
Environmental investments initiatives (Asset4 code: ENERDP095)	55,442	0.133	0.339	0.000	1.000
Spill impact reduction (Asset4 code: ENERDP087)	55,442	0.059	0.236	0.000	1.000
<i>EnvDisclosure score</i> <sup>a</sup>	55,442	0.000	0.744	–0.487	2.660
<i>Ln(EnvDisclosure)</i>	55,442	–0.210	0.607	–0.668	1.297
<b>Notes:</b> <sup>a</sup> In the construction of the environmental score, all available firm-year observations (55,471) on the Thomson Reuters Asset4 database have been used					

well as the biodiversity of protected and sensitive areas. *ClimateChange* is an indicator variable that equals one if the firm reports about its awareness of commercial risks and opportunities of climate change. *Env\_Investments* is an indicator variable that equals one if the firm reports on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities. Finally, *SpillImpactReduction* is an indicator variable that equals one if the firm reports on initiatives to reduce, avoid or minimize the effects of spills (environmental crisis management system or disaster recovery plan).

In equation (1), our main variable of interest,  $\ln(Own(\%))$ , takes two different variables to test *H1* and *H2*, respectively;

- (1)  $\ln(StateOwn(\%))$ , percentage of shares held by the government, and
- (2)  $\ln(InstitutionalOwn(\%))$ , percentage of shares held by investment firms.

We expect that  $\ln(StateOwn(\%))$  will have a positive and significant coefficient, indicating that firms with higher state ownership have higher environmental disclosure. On the other hand, we expect the coefficient of  $\ln(InstitutionalOwn(\%))$  to be a negative and significant coefficient, suggesting that environmental disclosure is lower for firms with higher institutional ownership.



Furthermore, to test the prediction of *H3* and *H4*, the moderating role of countries' development on the association between voluntary environmental disclosure and state and institutional ownership, respectively, we use equation (2).

$$\begin{aligned} Ln(EnvDisclosure) = & \alpha + \beta_1 \ln(Own(\%)) + \beta_2 Developed + \beta_3 \ln(Own(\%)) X Developed \\ & + \beta_4 \ln(TotalAssets) + \beta_5 \ln(DebttoCapital) + \beta_6 \ln(ROE) \\ & + \beta_7 \ln(CFO) + \beta_8 Reputation\_Monitoring \\ & + \beta_9 CEO\_Comp\_Link + \beta_{10} CEO\_BoardMem \\ & + \beta_{11} CG\_Comm + \beta_{12} CSR\_Comm \\ & + \beta_{13} \ln(CloselyHeldShares(\%)) \\ & + Industry, Auditor, Year and Country indicators + \varepsilon \end{aligned}$$

In equation (2), our main variable of interest is the interaction term  $\ln(Own(\%)) X Developed$ . Similar to equation (1), in equation (2),  $\ln(Own(\%))$ , takes two different variables to test *H3* and *H4*, respectively;

- (1)  $\ln(StateOwn(\%))$  and
- (2)  $\ln(InstitutionalOwn(\%))$ .

*Developed* is an indicator variable that equals one if the country where the firm is originated is a developed country, 0 otherwise. We expect the coefficients of  $\ln(StateOwn(\%)) X Developed$  to be positive and significant, indicating that the positive association between environmental disclosure and state ownership is incrementally higher in developed relative to developing countries. Similarly, we expect a positive and significant coefficient for  $\ln(InstitutionalOwn(\%)) X Developed$ , suggesting that the negative association between environmental disclosure and institutional ownership is weakening in developed relative to developing countries.

Moreover, we use firm-specific financial and non-financial (ownership and corporate governance) controls in both equations. Firms' strategic and operational decisions are highly influenced by their financial strength. Therefore, to control for firms' financial performance and situation, we use the *size of the firms* (*FirmSize*), leverage (*DebttoCapital*), Return on Equity (*ROE*), and cash flows from operations (*CFO*) as financial controls. Likewise, firms' decisions over environmental disclosures are more likely to be determined by the management, more specifically the CEO and the monitoring bodies, mainly the board of directors and corporate governance. Thus, to control the impact of CEO and firm-level corporate governance on environmental disclosures, we use *Reputation\_Monitoring*, *CEO\_BoardMem*, *CEO\_Comp\_Link*, *CG\_Comm*, *CSR\_Comm*, and *CloselyHeldShares(%)*. [Table 2](#) defines all variables used in our analyses.

Finally, we control for the potential impact of auditors, industry, year, and country on the environmental disclosures by including auditors, industry, year, and country indicators. In all our estimations, we use Huber/White/sandwich standard error estimates clustered by firms to correct potential heteroskedasticity and within-cluster correlation.

## Results

### *Descriptive statistics and univariate analysis*

[Table 3](#) presents descriptive statistics, which are also separately presented by developed and developing countries. Additionally, univariate test statistics for the mean differences between developed and developing countries are presented. In our sample,  $Ln(EnvDisclosure)$  has a mean value of  $-0.190$ , with a minimum value of  $-0.668$  and a maximum value of  $1.297$ . Developed countries are having a lower score ( $-0.196$ ), and

<i>Ln(EnvDisclosure)</i>	The log of the weighted index computed using factor loadings of four environmental disclosure measures <i>BioDiversity</i> , <i>ClimateChange</i> , <i>Env_Investments</i> and <i>SpillImpactReduction</i> (please see Table 1 for further details)
<i>BioDiversity_indicator</i>	An indicator variable that equals 1 if the firm reports on its impact on biodiversity or on activities to reduce its impact on the native ecosystems and species, as well as the biodiversity of protected and sensitive areas, 0 otherwise (Asset4 ENERDP019)
<i>ClimateChange_indicator</i>	An indicator variable that equals 1 if the firm reports about its awareness on commercial risks and opportunities of climate change, 0 otherwise (Asset4 ENERDP089)
<i>Env_Investments_indicator</i>	An indicator variable that equals 1 if the firm reports on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities, 0 otherwise (Asset4 ENERDP095)
<i>SpillImpactReduction_indicator</i>	An indicator variable that equals 1 if the firm reports on initiatives to reduce, avoid or minimize the effects of spills (environmental crisis management system or disaster recovery plan), 0 otherwise (Asset4 ENERDP087)
<i>Ln(StateOwn(%))</i>	The log of the percentage of shares held by the government (Datastream NOSHGV)
<i>Ln(InstitutionalOwn(%))</i>	The log of the percentage of shares held by investment firms (Datastream NOSHC)
<i>Developed</i>	An indicator variable that equals 1 if the country where the firm originated is a developed country, 0 otherwise (UNCTAD, United Nations Conference on Trade and Development)
<i>FirmSize (lnTotalAssets)</i>	The log of the total assets (Worldscope WC02999 in US\$)
<i>Leverage (lnDebttoEquity)</i>	The log of the total debt to total equity ratio (Worldscope WC08231)
<i>ROE (lnROE)</i>	The log of the return on equity (Worldscope WC08301)
<i>CFO (lnCFO)</i>	The log of the cash flow from operations (Worldscope WC04860)
<i>Reputation_Monitoring_indicator</i>	An indicator variable that equals 1 if the firm monitors its reputation or its relations with communities, 0 otherwise (Asset4 SOCODP021)
<i>CEO_Comp_Link_indicator</i>	An indicator variable that equals 1 if the CEO's compensation is linked to total shareholder return, 0 otherwise (Asset4 CGCPDP041)
<i>CEO_BoardMem_indicator</i>	An indicator variable that equals 1 if the CEO is a member of the board of directors, 0 otherwise (Asset4 CGBSDP061)
<i>CG_Comm_indicator</i>	An indicator variable that equals 1 if the firm has a corporate governance committee, 0 otherwise (Asset4 CGBFDP005)
<i>CSR_Comm_indicator</i>	An indicator variable that equals 1 if the firm has a corporate social responsibility committee, 0 otherwise (Asset4 CGVSDP005)
<i>Ln(CloselyHeldShares(%))</i>	The log of the percentage of shares held by insiders (Worldscope WC08021)

**Table 2.**  
Variable definition

developing countries having a higher score ( $-0.158$ ). Among the four dimensions of environmental disclosure, the highest belongs to climate change disclosure that is 32.7% for the whole sample. Also, developed countries have a greater climate change disclosure score, which is 33.2%, and developing countries have a lower one, which is 30%.

Moreover, the mean values of state ownership for developed and developing countries are 0.105 and 0.604, respectively. This result reveals that developing countries have greater state ownership. Also, the mean values of institutional ownership for developed and developing countries are 1.278 and 0.546, respectively. This result reveals that developed countries have greater institutional ownership.

Table 4 presents the Pearson correlations. The correlation coefficients assure that multicollinearity is not a severe problem for the variables, as the correlation coefficients do

Variable	Full sample ( $n = 27,847$ )			Developed countries ( $n = 23,025$ )		Developing countries ( $n = 4,822$ )		Univariate test ( $t$ -test statistics to test mean difference) $H_0: A = B$		
	Mean	Std. dev.	Min	Max	(A) Mean	Std. dev.	(B) Mean	Std. dev.	(A - B) difference	$t$ -value
<i>Panel A: Summary statistics and univariate analysis</i>										
<i>Ln(EnvDisclosure)</i>	-0.190	0.615	-0.668	1.297	-0.196	0.611	-0.158	0.632	-0.038***	-3.838
<i>BioDiversity_indicator</i>	0.172	0.378	0.000	1.000	0.166	0.372	0.204	0.403	-0.039***	-6.166
<i>ClimateChange_indicator</i>	0.327	0.469	0.000	1.000	0.332	0.471	0.300	0.458	0.032***	4.397
<i>Env_Investments_indicator</i>	0.139	0.346	0.000	1.000	0.132	0.338	0.174	0.379	-0.042***	-7.097
<i>SpillImpactReduction_indicator</i>	0.063	0.243	0.000	1.000	0.063	0.243	0.064	0.245	-0.001	-0.372
<i>Ln(StateOwn(%))</i>	0.191	0.783	0.000	4.025	0.105	0.574	0.604	1.328	-0.500***	-25.629
<i>Ln(InstitutionalOwn(%))</i>	1.152	1.287	0.000	3.714	1.278	1.299	0.546	1.029	0.732***	42.810
<i>FirmSize (ln TotalAssets)</i>	15.611	1.608	9.312	19.778	15.567	1.618	15.822	1.545	-0.255***	-10.335
<i>Leverage (lnDebttoEquity)</i>	3.765	1.574	0.000	7.204	3.765	1.593	3.762	1.483	0.003	0.142
<i>ROE (lnROE)</i>	2.596	0.845	-4.605	4.636	2.590	0.854	2.624	0.797	-0.035***	-2.705
<i>CFO (lnCFO)</i>	12.998	1.515	0.000	16.424	12.970	1.521	13.135	1.477	-0.165***	-7.0188
<i>Reputation_Monitoring_indicator</i>	0.204	0.403	0.000	1.000	0.188	0.391	0.283	0.451	-0.095***	-13.618
<i>CEO_Comp_Link_indicator</i>	0.377	0.485	0.000	1.000	0.443	0.497	0.061	0.240	0.382***	80.218
<i>CEO_BoardMem_indicator</i>	0.866	0.340	0.000	1.000	0.873	0.333	0.836	0.370	0.037***	6.354
<i>CG_Comm_indicator</i>	0.458	0.498	0.000	1.000	0.509	0.500	0.215	0.411	0.294***	43.387
<i>CSR_Comm_indicator</i>	0.428	0.495	0.000	1.000	0.423	0.494	0.453	0.498	-0.030	3.781
<i>Ln(CloselyHeldShares(%))</i>	2.476	1.423	0.020	4.529	2.250	1.389	3.553	1.036	-1.304***	-74.477
<i>Panel B: Mean values of environmental disclosures by countries</i>										
Countries	<i>Ln(EnvDisclosure)</i>	<i>BioDiversity</i>	<i>ClimateChange</i>	<i>Env_Investments</i>	<i>SpillImpactReduction</i>					
Argentina	-0.539	0.125	0.000	0.000	0.000					
Australia	-0.275	0.151	0.295	0.066	0.031					
Austria	-0.150	0.171	0.393	0.154	0.111					
Bahrain	-0.668	0.000	0.000	0.000	0.000					
Belgium	-0.200	0.106	0.229	0.234	0.138					
Bermuda	-0.448	0.064	0.165	0.052	0.004					
Brazil	0.168	0.351	0.479	0.372	0.100					
Canada	-0.142	0.197	0.340	0.100	0.146					
Cayman Islands	-0.550	0.038	0.036	0.072	0.000					

(continued)

Table 3. Summary statistics

Table 3.

Chile	-0.166	0.215	0.198	0.256	0.058
China	-0.334	0.155	0.135	0.094	0.028
Colombia	0.222	0.490	0.431	0.294	0.196
Curacao	0.139	0.000	0.692	0.538	0.000
Cyprus	-0.211	0.000	0.286	0.357	0.000
Czech Republic	-0.109	0.355	0.194	0.355	0.000
Denmark	-0.066	0.152	0.573	0.090	0.067
Egypt	-0.668	0.000	0.000	0.000	0.000
Finland	-0.056	0.175	0.539	0.175	0.019
France	0.278	0.473	0.585	0.289	0.079
Germany	-0.070	0.214	0.455	0.129	0.033
Gibraltar	-0.668	0.000	0.000	0.000	0.000
Greece	-0.358	0.141	0.141	0.156	0.063
Guernsey	-0.514	0.000	0.200	0.000	0.000
Hong Kong	-0.275	0.129	0.282	0.105	0.069
Hungary	0.747	0.680	0.680	0.600	0.360
Iceland	-0.558	0.000	0.143	0.000	0.000
India	0.120	0.367	0.381	0.311	0.145
Indonesia	-0.321	0.152	0.087	0.022	0.174
Ireland	-0.264	0.082	0.358	0.085	0.065
Isle of Man	-0.668	0.000	0.000	0.000	0.000
Israel	-0.353	0.066	0.226	0.189	0.000
Italy	0.020	0.257	0.433	0.336	0.104
Japan	-0.192	0.167	0.225	0.222	0.062
Jersey	-0.043	0.130	0.565	0.022	0.174
Jordan	-0.668	0.000	0.000	0.000	0.000
Kenya	-0.668	0.000	0.000	0.000	0.000
Kuwait	-0.568	0.056	0.056	0.000	0.000
Liberia	-0.007	0.000	0.750	0.167	0.000
Luxembourg	-0.290	0.156	0.219	0.203	0.000
Malaysia	-0.101	0.333	0.188	0.114	0.110
Malta	-0.668	0.000	0.000	0.000	0.000
Marshall Islands	-0.060	0.000	0.571	0.000	0.286
Mauritius	0.298	0.800	0.200	0.100	0.000
Mexico	0.121	0.446	0.289	0.339	0.107
Morocco	-0.668	0.000	0.000	0.000	0.000

*(continued)*

The Netherlands	-0.079	0.235	0.411	0.144	0.085
New Zealand	-0.225	0.198	0.284	0.107	0.066
Nigeria	-0.668	0.000	0.000	0.000	0.000
Norway	0.058	0.312	0.597	0.071	0.071
Oman	-0.470	0.000	0.258	0.000	0.000
Pakistan	-0.668	0.000	0.000	0.000	0.000
Panama	-0.668	0.000	0.000	0.000	0.000
Papua New Guinea	0.456	0.909	0.545	0.000	0.000
Peru	-0.321	0.304	0.043	0.000	0.000
Philippines	-0.173	0.248	0.408	0.025	0.000
Poland	-0.201	0.216	0.081	0.243	0.189
Portugal	0.312	0.500	0.635	0.292	0.177
Qatar	-0.668	0.000	0.000	0.000	0.000
Republic of Korea	-0.044	0.142	0.502	0.236	0.052
Romania	-0.668	0.000	0.000	0.000	0.000
Russian Federation	0.031	0.323	0.236	0.315	0.276
Saudi Arabia	-0.174	0.133	0.133	0.311	0.156
Singapore	-0.431	0.085	0.174	0.033	0.022
South Africa	0.007	0.254	0.534	0.102	0.076
Spain	0.369	0.497	0.591	0.353	0.259
Sri Lanka	0.402	0.500	1.000	0.000	0.000
Sweden	-0.117	0.122	0.484	0.164	0.013
Switzerland	-0.224	0.120	0.332	0.136	0.031
Taiwan	-0.245	0.076	0.356	0.161	0.015
Thailand	-0.068	0.355	0.250	0.250	0.079
Turkey	0.073	0.321	0.500	0.208	0.000
United Arab Emirates	-0.377	0.154	0.000	0.231	0.000
UK	-0.155	0.183	0.395	0.110	0.048
USA	-0.304	0.109	0.288	0.090	0.051
Virgin Islands (British)	0.233	0.875	0.000	0.000	0.000
<i>Panel C: Mean values of environmental disclosures by years – developed versus developing countries</i>					
<i>Developed countries</i>					
2002	-0.486	0.093	0.064	0.058	0.024
2003	-0.484	0.087	0.077	0.059	0.020
2004	-0.518	0.061	0.062	0.041	0.030

(continued)

Environmental disclosure

Table 3.

2005	-0.469	0.108	0.044	0.037
2006	-0.438	0.148	0.048	0.031
2007	-0.245	0.143	0.096	0.063
2008	-0.134	0.182	0.166	0.089
2009	-0.101	0.179	0.180	0.087
2010	-0.063	0.193	0.181	0.079
2011	-0.022	0.220	0.203	0.087
2012	-0.011	0.224	0.200	0.086
2013	-0.052	0.208	0.167	0.090
2014	-0.059	0.214	0.164	0.079
2015	-0.207	0.170	0.121	0.050
2016	-0.228	0.166	0.117	0.046
2017	-0.218	0.173	0.112	0.048
Mean	-0.234	0.154	0.122	0.059
<i>Developing countries</i>				
2002	-0.668	0.000	0.000	0.000
2003	-0.668	0.000	0.000	0.000
2004	-0.530	0.026	0.051	0.026
2005	-0.530	0.020	0.020	0.020
2006	-0.541	0.018	0.018	0.018
2007	-0.240	0.150	0.100	0.050
2008	-0.212	0.164	0.170	0.088
2009	-0.206	0.158	0.181	0.085
2010	-0.188	0.161	0.157	0.063
2011	-0.149	0.194	0.196	0.062
2012	-0.118	0.207	0.192	0.073
2013	-0.116	0.211	0.195	0.075
2014	-0.109	0.240	0.173	0.069
2015	-0.166	0.225	0.167	0.064
2016	-0.115	0.261	0.178	0.060
2017	-0.143	0.222	0.185	0.050
Mean	-0.294	0.141	0.124	0.050

**Notes:** This table presents the summary statistics for the full sample, developed and developing countries sample. The mean difference test is conducted between the developed and developing firms for each variable. All variables are described in Table 2. T-values are presented in parentheses. \*\*\*, \*\* and \* denote the significance level at 1%, 5% and 10%.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Ln(EnvDisclosure)</i>	1.00															
<i>BioDiversity_indicator</i>	0.73	1.00														
<i>ClimateChange_indicator</i>	0.79	0.37	1.00													
<i>Env_Investments_indicator</i>	0.65	0.33	0.29	1.00												
<i>SpillImpactReduction_indicator</i>	0.51	0.33	0.21	0.23	1.00											
<i>Ln(StateOwn(%))</i>	0.11	0.13	0.06	0.07	0.05	1.00										
<i>Ln(InstitutionalOwn(%))</i>	-0.11	-0.10	-0.05	-0.10	-0.06	-0.13	1.00									
<i>FirmSize (ln TotalAssets)</i>	0.34	0.20	0.32	0.22	0.15	0.15	-0.20	1.00								
<i>Leverage (lnDebttoEquity)</i>	0.13	0.07	0.13	0.08	0.03	0.06	-0.05	0.43	1.00							
<i>ROE (lnROE)</i>	-0.03	-0.03	-0.01	-0.03	-0.01	-0.02	0.03	-0.10	0.00	1.00						
<i>CFO (lnCFO)</i>	0.37	0.23	0.33	0.23	0.19	0.13	-0.16	0.82	0.27	0.10	1.00					
<i>Reputation_Monitoring_indicator</i>	0.44	0.31	0.41	0.26	0.18	0.11	-0.07	0.24	0.07	0.02	0.25	1.00				
<i>CEO_Comp_Link_indicator</i>	0.11	0.05	0.16	0.00	0.06	-0.08	0.22	0.03	0.07	0.06	0.05	0.10	1.00			
<i>CEO_BoardMem_indicator</i>	-0.03	-0.03	-0.03	-0.01	0.00	-0.11	0.13	-0.02	-0.05	-0.01	-0.01	-0.03	0.14	1.00		
<i>CG_Comm_indicator</i>	0.02	-0.01	0.05	-0.03	0.04	-0.11	0.24	0.11	0.06	0.01	0.14	-0.03	0.27	0.18	1.00	
<i>CSR_Comm_indicator</i>	0.52	0.33	0.51	0.28	0.16	0.07	-0.08	0.26	0.09	-0.02	0.27	0.42	0.12	0.00	-0.03	1.00
<i>Ln(CloselyHeldShares(%))</i>	-0.07	-0.01	-0.13	0.00	-0.03	0.16	-0.28	-0.09	-0.08	-0.03	-0.09	-0.05	-0.40	-0.15	-0.38	-0.08

**Table 4.**  
Correlation matrix

not exceed 0.50 for most of the variables. There is a positive association between environmental disclosure and state ownership, especially for biodiversity disclosure; this positive association is more powerful. On the contrary, there is a negative association between environmental disclosure and institutional ownership.

*Main findings*

**Table 5**, Model 1, presents the regression results for the relationship between state ownership and environmental disclosure. In line with *H1*, the coefficient of  $\ln(\text{StateOwn}(\%))$  is positive and significant ( $\beta = 0.030$ ;  $t$ -values = 2.901), suggesting that firms with higher state ownership have higher environmental disclosure. To test the robustness of our findings and the sensitivity of our results to model specification, we also used a random effect panel regression. Untabulated results indicate that our results are statistically similar to our findings presented in our main analyzes.

Furthermore, **Table 5**, Model 2, presents the impact of institutional ownership on environmental disclosure. The coefficient of  $\ln(\text{InstitutionalOwn}(\%))$  is negative and significant ( $\beta = -0.014$ ;  $t$ -values = -3.322), indicating that firms with higher institutional ownership have lower environmental disclosure, which is in line with our arguments in *H2*.

Finally, **Table 5**, Model 3, presents coefficient estimates of both state and institutional ownership in a single model. Our findings in Model 1 and Model 2 remain statistically the same. In summary, our results show that firms' environmental disclosures change according to the ownership type. While firms with higher state ownership have higher environmental disclosures, firms with higher institutional ownership have lower environmental disclosures.

**Table 4**, Model 1, presents the regression results of the incremental effect of state ownership on the environmental disclosure in developed countries. The interaction term,  $\ln(\text{StateOwn}(\%)) \times \text{Developed}$ , captures the incremental effect of developed countries on the

DV: Ln(EnvDisclosure)	(1)	(2)	(3)
<b><i>Ln(StateOwn(%))</i></b>	<b>0.030*** (2.901)</b>		<b>0.030*** (2.866)</b>
<b><i>Ln(InstitutionalOwn(%))</i></b>		<b>-0.014*** (-3.322)</b>	<b>-0.014*** (-3.259)</b>
<i>FirmSize (lnTotalAssets)</i>	-0.003 (-0.431)	-0.004 (-0.584)	-0.005 (-0.724)
<i>Leverage (lnDebttoEquity)</i>	0.005 (1.150)	0.005 (1.262)	0.005 (1.225)
<i>ROE (lnROE)</i>	-0.031*** (-5.484)	-0.033*** (-5.736)	-0.032*** (-5.614)
<i>CFO (lnCFO)</i>	0.090*** (11.757)	0.091*** (11.882)	0.090*** (11.824)
<i>Reputation_Monitoring_indicator</i>	0.294*** (14.665)	0.297*** (14.783)	0.294*** (14.647)
<i>CEO_Comp_Link_indicator</i>	0.073*** (5.677)	0.074*** (5.723)	0.073*** (5.701)
<i>CEO_BoardMem_indicator</i>	-0.027 (-1.192)	-0.026 (-1.168)	-0.026 (-1.150)
<i>CG_Comm_indicator</i>	0.027 (1.355)	0.028 (1.378)	0.029 (1.456)
<i>CSR_Comm_indicator</i>	0.387*** (27.424)	0.387*** (27.420)	0.387*** (27.386)
<i>Ln(CloselyHeldShares(%))</i>	-0.015*** (-2.989)	-0.016*** (-3.025)	-0.017*** (-3.253)
<i>Constant</i>	-1.519*** (-10.996)	-1.517*** (-11.001)	-1.490*** (-10.830)
Industry fixed-effect	Yes	Yes	Yes
Auditors fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Country fixed-effect	Yes	Yes	Yes
Observations	27,847	27,847	27,847
Pseudo R <sup>2</sup>	0.419	0.419	0.420

**Table 5.**  
Regressions results  
for *H1* and *H2*

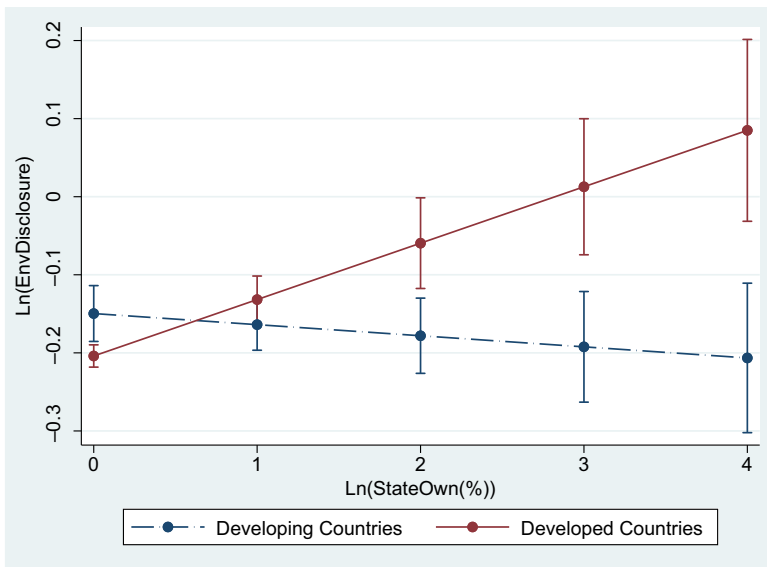
**Notes:** All variables are described in **Table 2**. T-values are presented in parentheses. \*\*\*, \*\* and \* denote the significance level at 1%, 5% and 10%



association between state ownership and environmental disclosure. In line with *H3*, the coefficient of  $\ln(\text{StateOwn}(\%)) \times \text{Developed}$  is positive and significant ( $\beta = 0.029$ ;  $t\text{-values} = 4.221$ ). This result indicates that in developed countries, the positive association between state ownership and environmental disclosure is strengthened. To visualize the moderating impact of countries' development level, in [Figure 1](#), we present the margins plot. As it is seen in [Figure 1](#), firms with higher state ownership and operating in developed countries have environmental disclosure.

Similarly, [Table 6](#), Model 2 documents the regression results of the incremental effect of institutional ownership on the environmental disclosure in developed countries. The interaction term,  $\ln(\text{InstitutionalOwn}(\%)) \times \text{Developed}$ , captures the incremental effect of developed countries on the association between institutional ownership and environmental disclosure. Unlike our expectations in *H4*, the coefficient of  $\ln(\text{InstitutionalOwn}(\%)) \times \text{Developed}$  is insignificant. Therefore, we do not have any support to conclude that the impact of institutional ownership on environmental disclosure is less harmful in developed countries relative to developing countries. We also documented the moderating results in [Figure 2](#), where there is no significant pattern between developed and developing countries in terms of the association between environmental disclosures and institutional ownership.

Further, to increase the robustness of our results, in [Table 6](#), Model 3, we re-estimate Model 1 and Model 2 by incorporating both state and institutional ownership into the same model. Our results stay statistically the same as in Models 1 and 2. Overall, our results suggest that while the impact of state ownership on environmental disclosure is moderated by the development of the countries where the firms are operating, and while country development strengthens the impact of state ownership on environmental disclosure, countries development does not mitigate the negative association between institutional ownership and environmental disclosure.



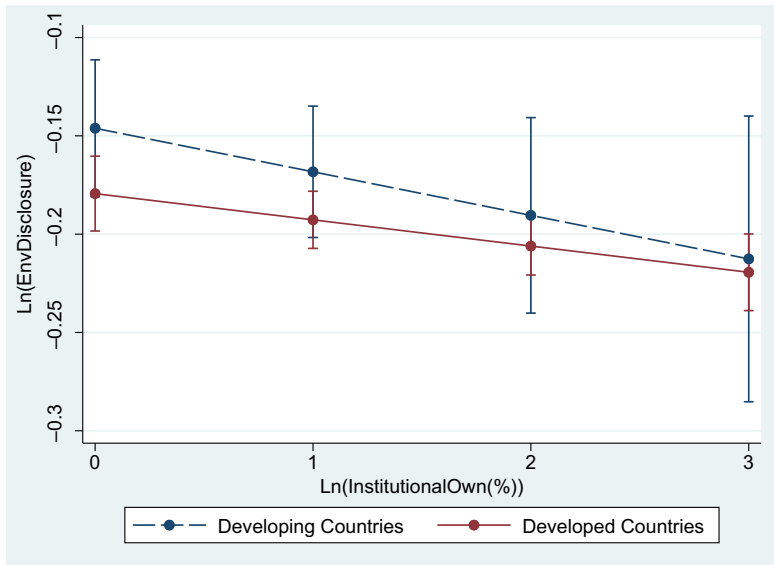
**Figure 1.** Interaction of Ln (StateOwn(%)) and developed countries

DV: Ln(EnvDisclosure)	(1)	(2)	(3)
<i>Ln(StateOwn(%))</i>	-0.014 (-1.035)		-0.014 (-1.034)
<b><i>Ln(StateOwn(%)) X developed</i></b>	<b>0.086*** (4.253)</b>		<b>0.086*** (4.211)</b>
<i>Ln(InstitutionalOwn(%))</i>		-0.022 (-1.612)	<b>-0.023* (-1.660)</b>
<b><i>Ln(InstitutionalOwn(%)) X developed</i></b>		0.009 (0.613)	0.011 (0.730)
<i>Developed</i>			
<i>FirmSize (lnTotalAssets)</i>	-0.094 (-0.904)	-0.070 (-0.666)	-0.072 (-0.695)
<i>Leverage (lnDebttoEquity)</i>	-0.003 (-0.441)	-0.004 (-0.561)	-0.005 (-0.694)
<i>ROE (lnROE)</i>	0.005 (1.177)	0.005 (1.253)	0.005 (1.239)
<i>CFO (lnCFO)</i>	-0.031*** (-5.418)	-0.033*** (-5.728)	-0.032*** (-5.532)
<i>Reputation_Monitoring_indicator</i>	0.090*** (11.696)	0.091*** (11.874)	0.090*** (11.750)
<i>CEO_Comp_Link_indicator</i>	0.294*** (14.666)	0.297*** (14.796)	0.294*** (14.666)
<i>CEO_BoardMem_indicator</i>	0.072*** (5.606)	0.074*** (5.720)	0.072*** (5.625)
<i>CG_Comm_indicator</i>	-0.023 (-0.998)	-0.026 (-1.178)	-0.022 (-0.971)
<i>CSR_Comm_indicator</i>	0.025 (1.226)	0.028 (1.382)	0.027 (1.328)
<i>Ln(CloselyHeldShares(%))</i>	0.387*** (27.494)	0.387*** (27.404)	0.387*** (27.442)
<i>Constant</i>	-0.016*** (-3.180)	-0.016*** (-3.036)	-0.018*** (-3.444)
	-1.511*** (-10.928)	-1.518*** (-11.012)	-1.484*** (-10.784)
Industry fixed-effect	Yes	Yes	Yes
Auditors fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Country fixed-effect	Yes	Yes	Yes
Observations	27,847	27,847	27,847
Pseudo R <sup>2</sup>	0.421	0.419	0.422

**Table 6.**

Regressions results for H3 and H4

**Notes:** All variables are described in Table 2. T-values are presented in parentheses. \*\*\*, \*\* and \* denote the significance level at 1%, 5% and 10%



**Figure 2.**

Interaction of Ln(InstitutionalOwn(%)) and developed

Variables	(1) DV: Ln(CO <sub>2</sub> equivalents emission total)	(2) DV: Ln(environmental provisions)	(3) DV: Ln(emission reduction/waste recycling ratio)	(4) DV: Ln(waste recycling ratio)
<i>Ln(StateOwn)</i> (%)	0.240*** (2.781)	0.332 (1.360)	-0.077** (-2.375)	-0.014** (-2.197)
<i>Ln(InstitutionalOwn)</i> (%)	-0.009 (-0.204)	0.021 (0.186)	-0.009 (-0.553)	-0.001 (-0.333)
<i>FirmSize</i> ( <i>ln</i> TotalAssets)	-0.610*** (-6.808)	0.617** (2.168)	0.016 (0.752)	-0.002 (-0.430)
<i>Leverage</i> ( <i>ln</i> DebttoEquity)	0.328*** (6.591)	0.073 (0.469)	0.010 (0.726)	0.003 (0.802)
<i>ROE</i> ( <i>ln</i> ROE)	-0.608*** (-9.556)	-0.175 (-1.021)	0.091*** (4.166)	0.018*** (3.942)
<i>CFO</i> ( <i>ln</i> CFO)	1.112*** (12.735)	0.444** (2.057)	0.000 (0.005)	0.006 (1.205)
<i>Reputation_Monitoring_indicator</i>	0.310** (2.428)	0.346 (0.712)	0.019 (0.469)	0.010 (1.044)
<i>CEO_Comp_Link_indicator</i>	0.714*** (5.040)	0.018 (0.043)	-0.063 (-1.215)	-0.015 (-1.442)
<i>CEO_BoardMem_indicator</i>	0.589** (2.520)	0.215 (0.391)	0.046 (0.739)	0.025 (1.635)
<i>CG_Comm_indicator</i>	-0.446** (-2.349)	-1.024* (-1.797)	-0.087 (-1.294)	-0.022 (-1.533)
<i>CSR_Comm_indicator</i>	0.637*** (5.141)	0.157 (0.427)	-0.008 (-0.221)	-0.001 (-0.136)
<i>Ln(CloselyHeldShares)</i> (%)	-0.086* (-1.821)	0.028 (0.231)	0.018 (1.164)	0.004 (1.034)
<i>Constant</i>	7.708*** (7.105)	4.880 (1.600)	-0.938* (-1.677)	-0.288*** (-2.819)
Industry fixed-effect	Yes	Yes	Yes	Yes
Auditors fixed-effect	Yes	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes	Yes
Country fixed-effect	Yes	Yes	Yes	Yes
Observations	9,681	2,677	5,807	6,213
R <sup>2</sup>	0.317	0.385	0.204	0.205

Notes: All variables are described in Table 2. T-values are presented in parentheses. \*\*\*, \*\* and \* denote the significance level at 1%, 5% and 10%

Table 7. Additional analysis

*Additional tests*

In [Table 7](#), we further examine the impact of ownership type on environmental performance rather than environmental disclosures like in our primary analysis. Using a smaller sample where data is available, we replaced our dependent variable disclosure with:

- CO<sub>2</sub> equivalents emission total;
- Environmental provisions;
- Emission reduction/waste recycling ratio; and
- Waste recycling ratio.

Our results show that while state ownership has a significant impact on environmental performance, institutional ownership does not have a significant influence.

**Conclusion**

In this study, we have examined the influence of firms' ownership structures on their level of environmental disclosure. Using the assumptions of legitimacy theory and stakeholder theory, we have tried to extend the previous literature on the relationship between voluntary environmental disclosure level and ownership structure considering institutional ownership and state ownership. Moreover, we contribute to previous literature on voluntary environmental disclosure and country-specific factors considering their development status.

Our main findings suggest a positive relationship between state ownership and voluntary environmental disclosure and a significant negative relationship between institutional ownership and voluntary environmental disclosure. So, the firms with higher state ownership have higher environmental disclosure scores, and the firms with higher institutional owners have lower disclosure scores for climate change, biodiversity, environmental risk, and spill impact reduction.

Furthermore, the findings suggest that the positive relationship between state ownership and environmental disclosure is higher in developed countries. However, we find no evidence about the effect of institutional ownership on environmental disclosure is less harmful in developed countries relative to developing countries.

Our study has some limitations that would provide possible starting points for further research. The first limitation is related to our environmental disclosure measure, which reflects the level of environmental disclosure of firms based on their disclosure information given in the Thomson Reuters, Asset4 database. A more refined measure can be constructed using hand-collected data based on linguistic analysis, which may reflect not only the level of the disclosure but also the quality of the environmental disclosure. Using hand-collected data and contracting it for a comprehensive and international sample is not feasible due to practical reasons (e.g. language barriers to conduct the linguistic analysis in different countries, limited access to local data, judgmental differences among researchers). The second limitation is the limited focus of our study toward state and institutional shareholding. Therefore, future research may consider examining the different types of ownership such as family ownership.

Despite the limitations, our study offers theoretical, practical, and social contributions. On the theoretical side, the study extends prior research in the field of environmental disclosure and ownership type by focusing on both developed and developing countries together, implying that the type of ownership is a significant determinant of the level of firms' environmental disclosure and this effect is conditional on countries development. From a practical perspective, the results of the study would make policymakers and regulators aiming to manage potential ownership types considering their impact on

environmental disclosures. Specifically, our results indicate that each country should consider the institutional dynamics of the countries while setting regulations to enhance environmental disclosures. Finally, from a social perspective, our findings support the idea that firms' stakeholder engagement via environmental disclosures depends on the type of controlling shareholders.

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