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ENVIRONMENTAL DISCLOSURE LEVEL: A FIRMS' PROACTIVE OR DEFENSIVE POSTURE?

Nível de disclosure ambiental: Postura proativa ou defensiva das empresas?

Nivel de divulgación ambiental: ¿Una postura proactiva o defensiva de las empresas?

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ABSTRACT

This paper investigated which theory best explains companies' motivation for environmental disclosure: the image theory (proxy: adherence to the Corporate Sustainability Index - ISE), or the legitimacy theory (proxy: materiality of provisions for environmental damage in the Balance Sheet - MatPA). Listed non-financial Brazilian companies with Environmental Disclosure Score (EDS) available on Bloomberg for the period 2010-2018 were analyzed. The panel data analysis indicated that among non-potentially polluting companies, ISE is significant to explain environmental disclosure and MatPA is not; among potentially polluting firms, MatPA is significant, but ISE is not. This suggests the coexistence of two antagonistic motivations for disclosure: the proactive strategy of creating value and differentiation through environmental disclosure prevails (image theory) in non-potentially polluting companies, whereas potentially polluters primarily adopt a reactive attitude toward disclosure, seeking self-legitimation with stakeholders after causing damage to the environment (legitimacy theory).

Keywords: environmental disclosure, environmental provision, ESG, image theory, legitimacy theory.

RESUMO

Este trabalho investiga qual teoria melhor explica a motivação das empresas para o disclosure ambiental: a teoria da imagem (proxy: adesão ao Índice de Sustentabilidade Empresarial - ISE) ou a teoria da legitimação (proxy: materialidade de provisões para danos ambientais no balanço - MatPA). São analisadas as empresas brasileiras não financeiras com Environmental Disclosure Score (EDS) disponível na Bloomberg no período 2010-2018. A análise de dados em painel indica que, entre empresas não potencialmente poluidoras, ISE é significativo para explicar o disclosure ambiental e MatPA não; já nas potencialmente poluidoras, MatPA é significativa, mas ISE não. Isso sugere a coexistência de duas motivações antagônicas para divulgar: entre empresas não potencialmente poluidoras prevalece a estratégia proativa de criar valor e diferenciação mediante disclosure ambiental (teoria da imagem); já nas potencialmente poluidoras, prevalece uma postura reativa de divulgar visando autolegitimação diante dos stakeholders, após danos provocados ao ambiente (teoria da legitimação).

Palavras-chave: divulgação ambiental, provisão ambiental, ESG, teoria da imagem, teoria da legitimação.

RESUMEN

Este artículo investiga qué teoría explica mejor la motivación de las empresas para la divulgación ambiental: la teoría de la imagen (proxy: adhesión al Índice de Sostenibilidad Empresarial - ISE), o la teoría de la legitimidad (proxy: materialidad de las provisiones por daños ambientales en el balance - MatPA). Se analizan las empresas brasileñas no financieras con Environmental Disclosure Score (EDS) disponible en Bloomberg del período 2010-2018. El análisis de datos de panel indica que entre empresas no potencialmente contaminantes, el ISE es significativo para explicar la divulgación ambiental y la MatPA no; y en las potencialmente contaminantes, la MatPA es significativa, pero el ISE no. Esto sugiere la coexistencia de dos motivaciones antagónicas para la divulgación: entre empresas no potencialmente contaminantes prevalece la estrategia proactiva de creación de valor y diferenciación mediante la divulgación ambiental (teoría de la imagen); por otro lado, entre las potencialmente contaminantes, prevalece una postura reactiva de divulgación, con miras a la autolegitimación ante los stakeholders después del daño al medio ambiente (teoría de la legitimación).

Palabras clave: divulgación ambiental, provisión ambiental, ESG, teoría de la imagen, teoría de la legitimación.

INTRODUCTION

In recent decades, Corporate Social Responsibility (CSR) reporting has been developed as a differentiation strategy through good environmental, social, and governance practices (Bebbington, Larinagga, & Moneva, 2008; Cormier & Magnan, 2015; Hooghiemstra, 2000; McBrayer, 2018, Minutolo, Kristjanpoller, & Stakeley, 2019; among others). This strategy is encouraged by benchmark sustainability indexes such as the Dow Jones Sustainability World Index (DJSI World) in the United States, FTSE4Good Index Series in the UK, Socially Responsible Investment (SRI) in South Africa, and Corporate Sustainability Index (ISE) in Brazil. It is also stimulated by disclosure guidelines, such as the Global Reporting Initiative (GRI), the United Nations (UN) Global Compact, the AA 1000, the ISO 14000, the Integrated Report of the International Integrated Reporting Council (IIRC), and the combination of the IIRC with the American Sustainability Accounting Standards Board (SASB) in 2020, and the sustainability council of the International Accounting Standard Board (IASB).

A foundation of this CSR reporting strategy is the image theory (Bebbington et al., 2008; Hooghiemstra, 2000), through which companies proactively seek to create value through the disclosure of good sustainable practices. This theory contrasts with the earlier legitimacy theory (Gray, Kouhy, & Lavers, 1995), whereby companies do not proactively disclose environmental information to create value but as a reaction to the negative impacts of bad practices or environmental disasters they were involved in, such as the case of Exxon Valdez (Deegan, Rankin, & Voght, 2000; Walden & Schwartz, 1998).

The debate about the theories that best explain the organizations' behavior toward environmental disclosure gains strength in a context of simultaneous growing demand for such disclosure of good practices and the occurrence of noisy socio-environmental disasters (such as those of the Samarco and Vale companies in Brazil). The theories under analysis are the proactive strategy to create socio-environmental value and differentiation (such as joining the ISE) and the theory seeking self-legitimacy in response to adverse environmental events (such as the existence of provisions for environmental damage on the balance sheet). More specifically, the research explores the explanatory power of these theories on the motivation of potentially polluting and non-polluting companies to engage in environmental disclosure.

In this study, companies' levels of environmental disclosure are measured by the Environmental Disclosure Score (EDS), the "E" component of the Environmental, Social, and Governance (ESG) disclosure score of the Bloomberg database. The proxy for the proactive attitude of companies that adopt environmental disclosure as a strategy to create value (image theory) is to be included in the ISE – a benchmark sustainability index of the Brazilian stock exchange B3 forming a theoretical portfolio of companies with sustainable practices. The existence of a provision for environmental damage recognized in the balance sheet is used as a proxy for an adverse environmental event that would lead to greater environmental disclosure (legitimacy theory).

The sample is formed of all listed non-financial Brazilian companies with EDS available on the Bloomberg database in at least two years within the period from 2010 to 2018, which were classified as belonging or not belonging to environmentally sensitive (or potentially polluting) sectors: oil and gas, chemical, mining, metallurgy, forest products, and utilities, following Clarkson, Li, Richardson, and Vasvari (2008), and Deegan and Gordon (1996), among other authors.

This work adds to Brazilian research that examined the ISE as an explanatory factor for the level of environmental disclosure (such as Coelho, Ott, Pires, & Alves, 2013; Rosa, Guesser, Hein, Pfitischer, & Lunke, 2015; Rover, Tomazzia, Murcia, & Borba, 2012). It could be argued that since these studies found a positive association between ISE and environmental disclosure, the image theory is valid to explain disclosure levels. However, none of these studies confronted belonging to the ISE portfolio with the existence of environmental provisions in the balance sheet to test the prevalence of one of the two theories in explaining the level of environmental disclosure, nor did they test differences in behavior between companies in polluting versus non-polluting sectors.

The relevance of examining the environmental provision as a proxy for adverse environmental events – which, according to the legitimacy theory, lead to an increase in the disclosure level – lies in the fact that an environmental provision in the balance sheet represents obvious bad news, since it reports the damage's measured value, with an increase in liabilities and a decrease in profit, impacting various financial indicators. In addition, the environmental provision constitutes the only mandatory, directly identifiable accounting evidence of damage caused – which led Barth, McNichols, and Wilson (1997) to analyze it as an explanatory factor for the disclosure of environmental obligations determined by the North American environmental protection agency in 1980. Environmental provisions range from estimated expenses with voluntary or mandatory remediation of environmental damage generated by the company's normal activities to lawsuits for environmental infractions, from the smallest and most frequent to major environmental disasters.

There is international and Brazilian literature on explanatory factors, whether on ESG performance (Garcia, Mendes-da-Silva, & Orsato, 2017; Lourenço & Branco, 2013; Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018), or on the level of ESG disclosure as a whole (McBryer, 2018). There are also studies focused only on the environmental dimension of disclosure, whether mandatory (Barth et al., 1997; Chen, Cho, & Patten, 2014; Leal, Costa, Oliveira, & Rebouças, 2018) or voluntary (Cormier & Magnan, 2015; Cormier, Magnan, & Velthoven, 2005; Kim, Ryou, & Yang, 2020). However, these studies do not address the question asked in this research.

Another differential of this study is the use of the Bloomberg EDS as a proxy for environmental disclosure, which facilitates replicating the study and mitigates possible researcher bias inherent to the construction of an ad hoc index. The EDS is comprehensive as it includes mandatory and voluntary, positive and negative information obtained from publicly available sources and questionnaires applied to companies, covering more than 10 thousand firms from several countries. The Bloomberg ESG index is used in international research, both integrally (Albitar, Hussainey, Kolade, & Gerged, 2020; McBryer, 2018) and focused on its environmental dimension

(Aragón-Correa, Marcus, & Hurtado-Torres, 2016; Bellamy, Dhanorkar, & Subramanian, 2020; Qiu, Shaikat, & Tharyan, 2016). However, this index has not yet been used in the Brazilian context, nor in international studies analyzing this particular research problem.

The research results indicate that being ranked in the ISE is significant in explaining the environmental disclosure level for companies from non-potentially polluting sectors. However, the materiality of environmental provisions (MatPA) is not significant. The opposite occurs among potentially polluting companies: contrary to other studies (Coelho et al., 2013; Rosa et al., 2015; Rover et al., 2012), ISE does not have statistical significance, but MatPA does.

These results contribute to the literature by confirming the coexistence of antagonistic theories to explain environmental disclosure but in different contexts: the image theory explains the motivation of non-potentially polluting companies (proxy: being ranked in the ISE), and the legitimacy theory, the motivation of potentially polluting companies (proxy: MatPA). They also contribute to the practice by enabling consumers, investors, regulators, and society to better interpret high environmental disclosure: is it a sign of good practices, attracting recognition and investments, or is it self-legitimacy in the face of damage caused to the environment?

THEORETICAL FRAMEWORK AND HYPOTHESES

Voluntary environmental disclosure is part of the general parameters of voluntary disclosure, studied by Dye (2001), Healy and Palepu (2001), and Verrecchia (2001), whereby companies weigh the benefits, costs, and risks of disclosure and non-disclosure. The negative price reaction (Dye, 2001) for not disclosing bad news can generalize, through overshooting, the loss of reputation of all agents (Akerlof, 1970) – which is an opportunity for good agents to differentiate by being transparent.

As mentioned, new demands from society have been encouraging the companies' voluntary disclosure of non-financial information (characterizing CSR or ESG reporting), which includes disclosure of environment, ethics, governance, human rights, labor, gender, anti-corruption, and other information (Aguinis & Glavas, 2012; Gray et al., 1995). In this context, the literature on determinants of environmental disclosure presents two opposing theoretical approaches in the broader context of CSR reporting: the legitimacy theory (Gray et al., 1995) and the image theory (Bebbington et al., 2008; Hooghiemstra, 2000).

According to Gray et al. (1995, p. 54), the legitimacy theory (defined by Lindblom, 1994) underlies the attitude of a company that seeks to align its value system with the community's value system, obtaining legitimacy (particularly when there is a rupture of this congruence due to socio-environmental issues). The authors identify four strategies that companies can adopt to regain legitimacy: 1) recognize that the disruption originated from their own failures and report on real changes in the organization; 2) try to change the public's negative perceptions (considered by the company as misperceptions), but without changing its own behavior; 3) manipulate the public's perception, diverting attention, including through emotional symbols –

for example, instead of correcting a polluting industrial process, creating a social initiative; and 4) change the public's expectations of the company, considering them to be incorrect.

In close connection with the legitimacy theory, the stakeholder theory emphasizes that the continuation of a corporation requires the support of its stakeholders and that CSR reporting depends on a constant dialogue with these stakeholders (Gray et al., 1995, p. 53). Considering the overlaps between these theories, they will be considered together in this article.

Thus, the legitimacy/stakeholders theory assumes the company's reactive and defensive attitude by considering environmental disclosure as the base of a reaction to problems faced – it is a countermeasure in the face of adverse events to its legitimacy vis-à-vis stakeholders. This is the underlying view in studies testing hypotheses that companies involved in major incidents – or operate in environmentally sensitive sectors – have a higher level of environmental disclosure (Chen et al., 2014; Clarkson et al., 2008; Deegan et al., 2000; Walden & Schwartz, 1998; among others).

The image or reputation theory – exposed by Hooghiemstra (2000) and addressed by Bebbington et al. (2008) as “reputation risk management” – focuses on CSR reporting in the broader scope of communication, such as presenting the company's identity, promoting its image and reputation. This is a more proactive view of CSR reporting, which aims to interact with society, disclosing common values of the company and members of the public as “communication partners,” whose perceptions and expectations can even change the company's identity (Bebbington et al., 2008, p. 59).

Thus, a more positive attitude is emphasized here, adopting a proactive strategy of seeking to create value through disclosure, as assumed by studies that relate disclosure to financial performance, image gains, and inclusion in benchmark stock portfolios (Bellamy et al., 2020; Cormier & Magnan, 2015; Minutolo et al., 2019; Qiu et al., 2016; Rosa et al., 2015; among others).

It is worth noting that both theories were developed in the context of major environmental disasters. For example, Hooghiemstra (2000) analyzes the transformation of Shell's CSR language, starting with the legitimacy approach in the face of accidents and moving on to a proactive and creative communication focused on public values.

Based on recent literature, this study tests the predominance of image theory to explain companies' environmental disclosure, testing hypothesis 1:

H1: The proactive image theory (proxy: ranked in the ISE) explains the level of environmental disclosure in both environmentally sensitive and non-sensitive companies.

On the other hand, as potentially polluting companies are more likely to generate environmental damage, Hypothesis 2 is:

H2: The defensive legitimacy theory (proxy: MatPA) explains the level of environmental disclosure in potentially polluting companies better than the proactive image theory.

DATA AND METHOD

The sample comprises listed non-financial Brazilian companies with Environmental Disclosure Score (EDS) available on the Bloomberg Database in at least two of the years analyzed, from 2010 to 2018, totaling 107 companies, and featuring an unbalanced panel with 839 observations. The period begins in 2010, the first year of full adoption of the International Financial Reporting Standards (IFRSs) to ensure regulatory homogeneity in the treatment of provisions, and ends in 2018, the last year with EDS available at the time of collection (December 2020).

The EDS is a proxy for the dependent variable, environmental disclosure. It is one of the components of the Bloomberg ESG index and measures the degree of disclosure of information on environmental management on a scale from 0.1 to 100. It covers more than 120 industry-standardized environmental disclosure indicators, includes data from more than 10,000 companies, and is used by more than 320,000 subscribers globally. Data is collected using specific questionnaires from multiple sources, such as CSR reports, financial statements, carbon and waste generation information, water consumption, energy consumption, and others (Bellamy et al., 2020). Bloomberg's ESG index measures the level of disclosure, i.e., the amount of information provided by companies in these categories, and not the ESG performance of companies, as with other indices.

The main variables of interest are: (i) inclusion in the Brazilian stock exchange B3 benchmark sustainability index (ISE), and (ii) materiality of the amount of environmental provisions (MatPA).

ISE is a dummy that assumes value "1" for a company i that was listed in the ISE theoretical portfolio in year t and "0" otherwise. This index reflects the average performance of companies' share prices, selected mainly from a questionnaire that measures their commitment to corporate sustainability. The questionnaire comprises hundreds of questions organized in the dimensions of company operation, sustainability, and corporate governance.

MatPA is a quantitative variable that expresses the materiality of environmental provisions (MatPA) in relation to the total assets of a company i in year t . PA represents the environmental obligation recognized in the balance sheet of a company i in year t . According to the international accounting standard IAS 37 (IASB, 2001) (and its Brazilian counterpart, CPC 25), a company has to recognize a provision (immediately record a loss in income and a corresponding liability in the balance sheet) at the time of a damaging event that will lead to probable and measurable – with reasonable precision – disbursement. This record is clearly distinguished from the mere mandatory disclosure of damaging events in Notes where the disbursement of resources is only possible or difficult to measure (contingent liability). This study focuses on the effect of an environmental provision recognized in accounting because increasing liabilities and decreasing the company's results affect several financial indicators. It does not include contingent liabilities, as they do not impact the indicators and are only disclosed in the Notes.

The amount of PA was manually collected from the Notes of the companies' Standardized Financial Statements (SFSs). This procedure was necessary because, although the Brazilian Securities and Exchange Commission (CVM) chart of accounts allows companies to open balance sheet provisions by category (via specific sub-accounts), companies often disclose the total provisions on the balance sheet leaving the categories blank. However, they break down the total amount of provisions by category (e.g., tax, labor, environmental) in a table included in the Notes. In the collection process, companies that registered environmental provisions without detailing the specific amounts (combining them with other amounts in mixed categories such as "civil and environmental provisions") were considered companies without environmental provisions.

Considering that some sectors are more vulnerable to environmental damage and, therefore, have more environmental provisions, the variable *EnvSens* was inserted, with a value of "1" for companies belonging to environmentally sensitive sectors and "0", otherwise, following Clarkson et al. (2008) and Deegan and Gordon (1996): Oil, Gas & Consumable Fuels; Chemical; Metals & Mining; Paper & Forest Products; Independent Power and Renewables; Electric Utilities; Gas Utilities; and Water Utilities, according to the Industry level of the Global Industry Classification Standard (GICS) obtained from Bloomberg.

Exhibit 1 lists the variables of this study and the related literature. In addition to the variables of interest, other variables the literature considers as relevant to explain the level of environmental disclosure were adopted as control variables: size (net revenue), profitability (net margin), and indebtedness (interest-bearing liabilities/asset ratio). The variables expressed in thousands of Brazilian Reals (BRL) were corrected for inflation due to the long period under analysis, and the variable 'size' was transformed into a natural logarithm to reduce bias effects. Control variables were winsorized at 1%.

By using the entire population of non-financial Brazilian companies with EDS available on Bloomberg, the sample is not random and may not guarantee the representativeness of economic sectors. Considering the 'sector' level (more aggregated than the 'industry' level) of the GICS classification, which groups companies into ten sectors, the sample is distributed as follows: 31 companies from the 'utilities' (of which 22 are electricity), 17 from 'consumer discretionary,' 15 'industrials,' 13 'materials,' 11 'consumer staples,' and 20 distributed across the other five sectors. Due to such diversity, we chose to create the variable *EnvSens*, following Miralles-Quirós et al. (2018), instead of specific dummies for each sector, avoiding reducing the models' degrees of freedom.

The hypotheses were tested by organizing the analysis in two phases. First, a graphic and descriptive analysis was conducted, with difference tests between groups to identify whether the variables of interest differentiate levels of environmental disclosure in the sample. Second, regression analysis with panel data was carried out, combining characteristics of time series with a cross-section, allowing to observe the evolution of data over time comparatively and simultaneously. Statistical analyses were performed using SPSS and Stata software.

Exhibit 1. Variables used in the econometric models

Variables	Type	Proxy	Literature	Expected effect	Source of data
<i>Level of environmental disclosure (EDS)</i>	D	Environmental Disclosure Score – EDS	Aragón-Correa et al. (2016); Qiu et al. (2016); Bellamy et al. (2020)		Bloomberg
<i>Corporate Sustainability Index (ISE)</i>	I	Dummy assuming "1" for a company <i>i</i> included in the ISE index in year <i>t</i> ; and "0" otherwise	Rover et al. (2012); Coelho et al. (2013); Lourenço e Branco (2013); Rosa et al. (2015); Leal et al. (2018)	(+)	B3
<i>Presence of environmental provision (DmyPA)⁽¹⁾</i>	I	Dummy assuming "1" for a company <i>i</i> that presented environmental provision in year <i>t</i> ; and "0" otherwise	-	(+)	SFSs
<i>Materiality of environmental provision (MatPA)</i>	I	Percentage of how much the total amount of the environmental provision (PA) of a company <i>i</i> in year <i>t</i> represents in relation to the total amount of the company <i>i</i> 's assets in year <i>t</i>	Barth et al. (1997)	(+)	SFSs
<i>EnvSens</i>	I	Dummy assuming "1" for a company <i>i</i> belonging to environmentally sensitive sectors; and "0" otherwise	Deegan e Gordon (1996); Clarkson et al. (2008)	(+)	Bloomberg
<i>Size (Size)</i>	C	Natural logarithm of the net revenue of company <i>i</i> in year <i>t</i>	Cormier et al. (2005); Leal et al. (2018); McBrayer (2018)	(+)	Económica
<i>Profitability (Profit)</i>	C	Net margin of company <i>i</i> in year <i>t</i>	Rover et al. (2012); Coelho et al. (2013)	(+)	Económica
<i>Indebtedness (Ind)</i>	C	Debt in relation to the total of debt plus equity of company <i>i</i> in year <i>t</i> [$D/(D+E)$]	Rover et al. (2012); Lourenço e Branco (2013)	(+)	Económica

Note: Variable D: Dependent; I: Interest; C: Control. (1) *DmyPA* is not used in regressions, it is used in graphs and average difference tests.

Initial tests of heteroscedasticity were performed to identify the best panel model, (Breusch-Pagan/Cook-Weisberg test), multicollinearity (VIF test), first-order autocorrelation (Wooldridge test for panel data), and omitted variable test (Ramsey test). The tests indicated autocorrelation problems and omitted variables. The Breusch-Pagan, Chow, Hausman, and Hausman Robust tests were also applied using the variables of Equation 1 (without the lagged EDS variable), which indicated the fixed effects model as the best fit. After the definition of the fixed effects model, the robustness tests reinforced the presence of residual autocorrelation and heteroscedasticity (Wooldridge autocorrelation test and modified Wald test, respectively). The problem was confirmed with Fisher's test, which showed the stationarity of the dependent variable in all analyzed series.

The panel data model of the Arellano–Bover/Blundell–Bond System GMM methodology was used to mitigate the possible effects of regressors endogeneity. The model incorporated the lagged dependent variable and the explanatory variables, and the model adequacy was tested by Wald's Chi2 test. The Arellano-Bond AR (1) and AR (2) tests were used to verify first and second-order autocorrelation between the error and validity terms of the instruments, and the Sargan test, to check for overidentification of restrictions.

Equation (1) presents the model to be tested using panel data.

$$EDS_{i,t} = \beta_0 + \beta_1 EDS_{i,t-1} + \beta_2 ISE_{i,t} + \beta_3 MatPA_{i,t} + \beta_4 EnvSens_{i,t} + \beta_5 Size_{i,t} + \beta_6 Ind_{i,t} + \beta_7 Profit_{i,t} + \mu_{i,t} \quad (1)$$

The first hypothesis (H1) was tested using the model of Equation (1) for the full sample. For the second hypothesis (H2), the model was applied separately to the groups of environmentally sensitive companies versus the others, omitting the variable EnvSens. As the separate groups showed heteroscedasticity, the model with robust estimation was used.

The behavior of the variables of interest was tested in four other formats to assess the robustness of the findings using the following subsamples: (A) additionally balancing the panel, keeping only the companies that presented data in at least six of the nine years studied (exclusion of 17 companies); (B) maintaining the sample of A and replacing the insertion of the lagged dependent variable by the endogeneity control by considering autoregressive components (AR[1]) for the residuals; (C) shortening t to the most recent four years; and (D) covering only companies not included in the ISE. The tests were repeated for each subsample.

RESULTS

Descriptive analysis

Table 1 presents the descriptive characteristics of the quantitative variables (for the total sample and the sample subdivided between environmentally sensitive companies versus others), and Table 2 presents the dummy variables.

Table 1. Descriptive statistics of quantitative variables

Variable	Average	Standard deviation	Minimum	Median	Maximum
<i>EDS</i>	32.2190	18.2427	1.5504	31.0078	74.3802
<i>MatPA</i>	0.2752	1.1597	0.0000	0.0000	12.7255
<i>SIZE</i>	15.6113	1.4842	6.0472	15.5989	19.8797
<i>IND</i>	46.9665	31.0996	-39.5179	45.1603	364.7738
<i>PROFIT</i>	43.2178	1075.5070	-6123.1280	7.7274	26177.3800
Descriptive statistics for Subgroup with EnvSens=0					
<i>EDS</i>	30.2497	18.7996	1.5504	30.2083	71.3178
<i>MatPA</i>	0.0397	0.1594	0.0000	0.0000	1.6412
<i>SIZE</i>	15.4638	1.3795	11.7112	15.5989	19.0505
<i>IND</i>	47.7905	34.7033	0.1114	45.1603	350.3081
<i>PROFIT</i>	6.1536	35.0739	-408.1836	7.4987	166.2098
Descriptive statistics for Subgroup with EnvSens=1					
<i>EDS</i>	34.8139	17.1652	2.3256	31.7829	74.3802
<i>MatPA</i>	0.5855	1.7083	0.0000	0.0000	12.7255
<i>SIZE</i>	15.8056	1.5930	6.0472	15.6996	19.8797
<i>IND</i>	45.8808	25.5951	-39.5179	45.7543	364.7738
<i>PROFIT</i>	92.0565	1636.8540	-6123.1280	7.9047	26177.3800

Table 2. Analytical statistics of qualitative variables

	ISE		<i>DmyPA</i>		<i>Total</i>	Average <i>EDS</i>	Average <i>MatPA</i>
	0	1	0	1			
<i>EnvSens</i> = 0	362	99	406	55	461	31.1009	0.0424
<i>EnvSens</i> = 1	241	137	191	187	378	35.0183	0.6094
<i>Total</i>	603	236	597	242	839		
Average <i>EDS</i>	26.4365	46.9936	28.0142	42.5920			
Average <i>MatPA</i>	0.2452	0.3518	0.0000	0.8589			
Mann-Whitney	<i>p-value</i> = 0.0000		<i>p-value</i> = 0.0000			<i>p-value</i> = 0.0004	

Median equality test of *EDS* in the groups separated by *ISE*, *DmyPA*, and *EnvSens*

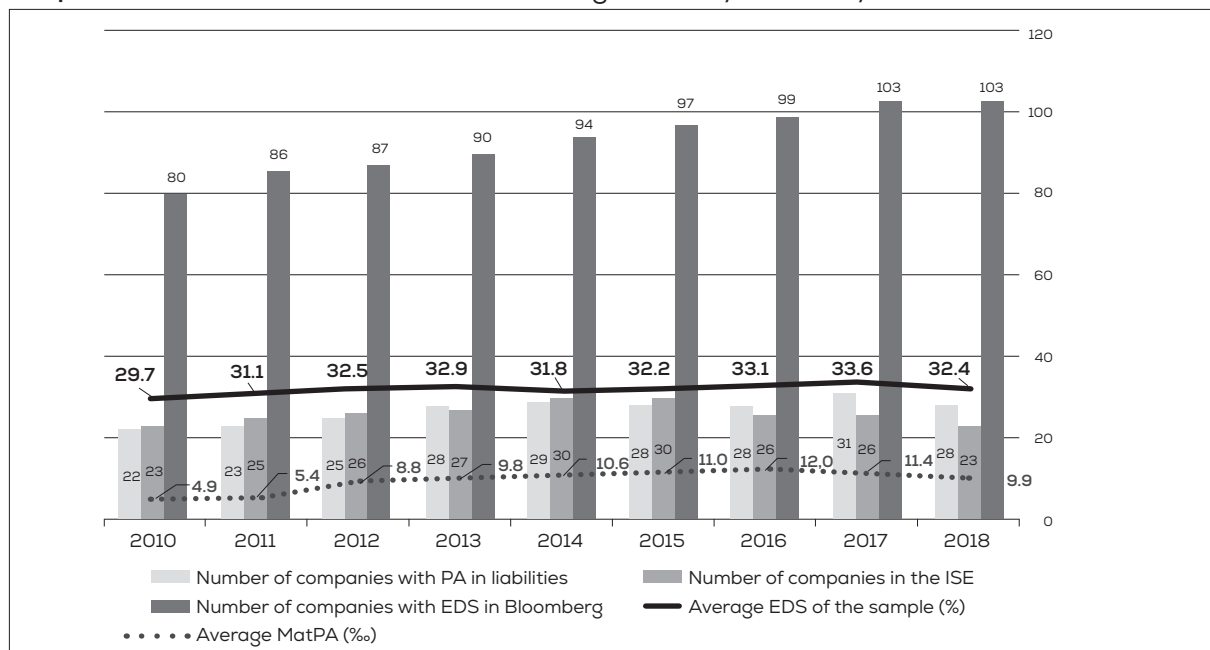
The discrepancy between the maximum and average values of *MatPA* in Table 1 results from the presence of the Brazilian state-owned oil company Petrobras, responsible for the

maximum values in all the years analyzed, which represent on average 66% of the total sum of environmental provisions in the sample. Although MatPA was between zero and 12.7% of total assets, its general average in the period was less than 1%. Also noteworthy was the discrepancy of the net margin in two observations of the company MMX, corrected with winsorization.

Table 2 shows that 29% of the observations had environmental provisions, 28% were included in the ISE index, and 43% were environmentally sensitive. It is worth adding that, among environmentally sensitive companies, 50% had PA, with an average value of BRL 2.2 billion, while among non-environmentally sensitive companies, only 12% had PA, and their average value was much lower, only BRL 130 million (values not included in Table 2). There was also a higher average EDS among companies that belong to the ISE versus the others, higher among companies that had PA versus the others, and higher among potentially polluting companies versus the others, suggesting the relevance of these variables to explain the EDS. Finally, both companies included and not included in the ISE had PA, but the MatPA average was higher among companies included in the Brazilian benchmark index.

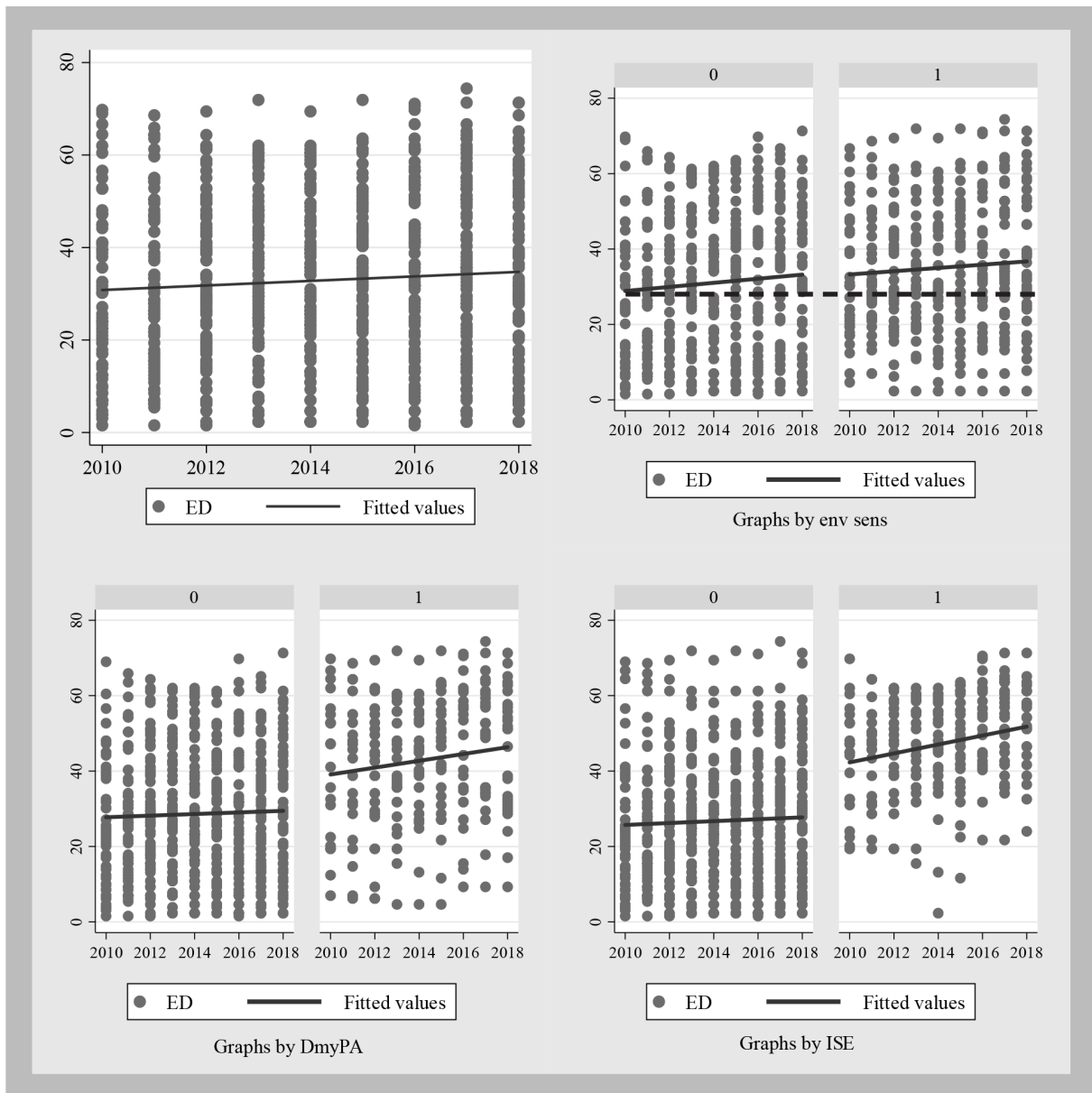
Graph 1 presents the historical evolution of the EDS and PA averages and the number of companies with EDS, ISE, and PA. The number of companies in this research (population with EDS available on Bloomberg) was increasing in the period, ranging from 80 to 103. However, the number of companies with PA or ISE was relatively stable (from 22 to 31 and from 23 to 30, respectively). The annual average of the EDS was relatively stable, varying between 29.7% and 33.6%, a level of environmental disclosure considered low (on a scale of 0.1 to 100). The annual average of the sum of the amounts of PA in the sample (not reported in the graph) fluctuated a lot, between BRL 17.7 billion and BRL 78.6 billion, with a growth trend over the years. The average annual materiality of PA (PA/Assets) ranged between 0.49% (or 4.9‰ in the graph) and 1.2%, with an increasing trend until 2016 and decreasing after that year.

Graph 1. Evolution of the main variables throughout the years analyzed



Graph 2 presents the behavior of the EDS variable over time in four panels formed from the dummy variables: observations without grouping; the observations grouped between those that had PA (1) and those that did not (0); grouped between environmentally sensitive companies (1) and not (0), and grouped between those included in the ISE (1) and those that were not included (0).

Graph 2. Evolution of the level of environmental disclosure (EDS). Companies separated into groups: for operating in environmentally sensitive sectors (1) or not (EnvSens); for presenting environmental provisions (PA) (1) or not (DmyPA); for inclusion in the ISE (1) or not (ISE) (Stata)



Obs.: The black dashed line in the graph where companies were grouped by EnvSens shows a line parallel to the X-axis to aid in the interpretation of the black line.

Graph 2 suggests that the variables of interest in this study impact the level of environmental disclosure. While the average level of disclosure of all the companies studied showed little growth over time, the level of disclosure of companies included in the ISE and companies that recognized some environmental provision is visibly different from the zero group, both due to the higher level of disclosure and the slope of the fit line, showing more significant growth over time. For the panel that separates companies that belong to environmentally sensitive sectors ($EnvSens = 1$) from the others, there was a slight upward trend in EDS over time in both groups. However, the level of disclosure in the environmentally sensitive group was always higher, suggesting that potentially polluting companies tend to have a higher level of environmental disclosure than the others.

From these graphs, statistical tests were performed to check the power of the variables of interest to differentiate the level of environmental disclosure, shown in Table 2. As the EDS and the other quantitative variables of the study did not present normal distribution, the Mann-Whitney test was used, with a null hypothesis that the groups have the same median. For the three dummies tested, ISE, DmyPA, and EnvSens, the median of EDS in group zero was statistically different from the median of EDS in group 1, suggesting that the variables of interest may have explanatory power in econometric models for predicting the dependent variable.

Table 3 presents the correlation indices for all pairs of variables used in the regression. The correlation calculation methodology depends on the type of variable: Pearson's correlation for pairs of scalar variables, the Phi coefficient for pairs of nominal variables, and the point-biserial correlation for pairs with a scalar and a nominal variable. The highest correlations with EDS were ISE and Size, suggesting that these variables will be significant in the econometric model. The absence of a high correlation between the explanatory variables is worth noting.

Table 3. Indices of correlation between the variables

	<i>EDS</i>	<i>MatPA</i>	<i>Size</i>	<i>Profit</i>	<i>Ind</i>	<i>ISE</i>	<i>EnvSens</i>
<i>EDS</i>	1						
<i>MatPA</i>	0.131***	1					
<i>Tam</i>	0.424***	0.068**	1				
<i>Rent</i>	0.147***	-0.016	0.057	1			
<i>End</i>	0.105***	-0.185***	0.215***	-0.298**	1		
<i>ISE</i>	0.507***	0.041	0.314***	0.043	0.064	1	
<i>EnvSens</i>	0.156***	0.229***	0.126***	0.01	0	-0.163***	1
	Point-biserial correlation			Pearson correlation		Phi coefficient	

Note: ***, **, and * indicate significance at the level of 1%, 5%, and 10%, respectively.

Regression analysis

To test the hypothesis that the ISE explains the level of environmental disclosure both in potentially polluting companies and in others (H1), and the hypothesis that the MatPA is more relevant to explain the level of environmental disclosure in potentially polluting companies than being included in the ISE index (H2), the dynamic panel model systemic GMM was used, in three regressions: (1) considering all observations, (2) taking only the non-polluting group, and (3) taking the polluting group. Table 4 presents the results.

Table 4. Results of data panel analyses

Var / Coef.	Dynamic panel data Arellano-Bover/Blundell-Bond			
	Expected effect	GMM standard errors	Robust standard errors	
		All companies	EnvSens = 0	EnvSens = 1
EDS lag1	+	0.7002 ***	0.8403 ***	0.4081 ***
ISE	+	2.6147 ***	3.4578 ***	-0.4263
MatPA	+	0.3375	-1.6137	0.9555 *
EnvSens	+	3.6325	omitted	omitted
Tam	+	2.1152 **	2.0277 **	0.2522
End	+	0.0486 **	-0.0719 ***	-0.0388
Rent	+	0.0011	-0.0016	0.0092
Constante		-26.2952 **	-21.7982 *	11.4518
Wald chi ²		168.4500 ***	170.5000 ***	30.0100 ***
Observações		726	410	316
P-v. Sargan test		0.2595	--	--
P-v. Abond AR (2)		--	0.5796	0.1053

Note: ***, **, and * indicate significance at the level of 1%, 5%, and 10%, respectively.

The three models showed significance at the 5% level, both for Wald's Chi² and for the assumption tests (the model for potentially polluting companies showed a low but significant p-value in the test for the presence of autocorrelation).

In Column 1, which covers all observations, the Arellano-Bover/Blundell-Bond model showed significance at the 1% level for the variable EDS lagged by one year and for the

variable ISE, while Size and Ind were significant at the level of 5%. MatPA, EnvSens, and Profit variables were not significant. About 70% of the environmental disclosure behavior of year t tended to be repeated in the following year (EDS lag1), confirming McBrayer's (2018) findings of persistence in ESG disclosure decisions. These results confirm H1, indicating the prevalence of the proactive image theory as an explanation of the level of environmental disclosure when considering companies as a whole, since the ISE variable was significant, while the MatPA and EnvSens variables were not.

From Column 2, which considers only non-polluting companies, the result was similar to the model with all companies, but the values of the ISE and lagged EDS coefficients were higher, showing even greater persistence in the behavior of environmental disclosure. The different results of the indebtedness variable are worth noting: it had a negative coefficient and greater significance, indicating that more indebted non-potentially polluting companies tend to present a lower level of disclosure.

Column 3, focused on potentially polluting companies, offers a notably different result. Only the lagged EDS and MatPA variables were significant. The coefficient of the lagged variable was much lower than in the other models: only about 40% of the EDS value at t was explained by the EDS at $t-1$ (versus 84% in Column 2), suggesting that the level of disclosure among potentially polluting companies is not as persistent as among non-polluting ones. These results partially confirm H2: on the one hand, they indicate the validity of the reactive theory of legitimacy to explain the level of environmental disclosure among potentially polluting companies, since the MatPA variable was significant (at the level of 10%); but, on the other hand, they refute the validity of the proactive image theory in this context, since ISE had no significance.

However, the result of this model in Column 3 is less robust than the others (at the 11% significance level, the model violated one of its assumptions). Thus, to assess the robustness of these results, the variables of interest were tested using four more different models, as defined in the method section. The results of these tests are presented in Table 5 (focused on the variables of interest).

Table 5. Behavior of variables of interest in other estimation models

	t<6 was not included		Idem without lagged variable		t: 2015 to 2018 (balanced)		Only ISE=0
	Dynamic data panel		Panel GLS EA		Panel GLS EA - Driscoll-Kraay		Panel GLS EA
	<i>EnvSens = 0</i>	<i>EnvSens = 1</i>	<i>EnvSens = 0</i>	<i>EnvSens = 1</i>	<i>EnvSens = 0</i>	<i>EnvSens = 1</i>	<i>All</i>
Observ	384	302	438	342	216	160	548
<i>ISE</i>	3.3712 ***	-0.0483	5.057 ***	2.384 **	9.3723 ***	5.2721	<i>omitted</i>
<i>MatPA</i>	-1.7134	0.9795 **	-1.059	1.049 ***	-1.8134	0.8741 **	0.8648 ***
Wald chi2	184.13 ***	59.69 ***	65.39 ***	24.14 ***	1039.0 ***	11315.6 ***	70.12 ***

Note: ***, **, and * indicate significance at the level of 1%, 5%, and 10%, respectively.

The first test covers a more balanced set of observations after excluding companies without EDS in at least six of the nine years studied. The subsample of 90 companies showed similar results to the original model (Table 4): for non-potentially polluting companies, ISE was significant and MatPA was not, while for polluters ISE was not significant and MatPA was (now at the level of 5 %). Next, 18 companies were excluded from the subsample, leaving the panel fully balanced: 71 companies for nine periods (not shown in the table). The behavior of the variables of interest was maintained, improving the Abond AR(2) result to 0.1631, reinforcing the previous results.

The second test, still with the subsample of 90 companies, was performed without the inclusion of the lagged EDS variable, but with the inclusion of AR(1) error terms and used the random-effects model, as indicated by the Hausman test. The model showed significance, and the result changed very little. The MatPA variable remained significant only in the potentially polluting group (now at 1%), but ISE became significant in this group. However, ISE was less significant than MatPA among polluters, also confirming H2.

The third test used only the most recent four years in a balanced panel model with random effects and Driscoll-Kraay correction (indicated by the tests). The behavior of the variables of interest remained similar to that of Table 4 and Test 1. This test was performed to better contrast the findings of [Coelho et al. \(2013\)](#), [Rosa et al. \(2015\)](#), and [Rover et al. \(2012\)](#) who, by studying only potentially polluting companies, found the significance of the ISE (these studies covered shorter periods [up to three years] and from long ago [up to 2011 at most]).

Finally, to isolate the effect of simultaneously a) being included in the ISE (proactive strategy of creating value through differentiation in sustainable practices – image theory), and b) recognizing to have generated environmental damage by including PA in their balance sheet (reacting to adverse environmental events – legitimacy theory), the fourth test was carried out, covering only companies that were not included in the ISE. In other words, the objective was to analyze what motivates environmental disclosure in companies that do not adopt a proactive strategy of creating value through sustainable practices (not in the ISE). The panel model with random effects indicated by the statistical tests, especially the Hausman test, showed that MatPA was significant at the 1% level to explain the level of disclosure in these companies.

It is worth saying that the models presented in the study were run with and without sector and year control, but there was no significant difference.

Thus, both the base model and the robustness tests consistently indicated that adopting a proactive strategy to create value through differentiation in sustainable practices (image theory, being included in the ISE) explains the level of environmental disclosure among companies in non-polluting sectors. Among potentially polluting companies, the legitimacy theory prevails to explain the level of environmental disclosure since being included in the ISE was not significant, but MatPA was (ISE appeared in test 2, but MatPA was more significant). Thus, in potentially polluting companies, the motivation to increase environmental disclosure seems to be an attempt at self-legitimacy in reaction to damage caused to the environment.

CONCLUSION

This research explored which of two opposing theories best explains the motivation of companies for environmental disclosure: the image theory, through which the company increases its environmental disclosure as a proactive strategy to create value differentiating socio-environmental practices (proxy: adherence to the ISE); or the legitimacy theory by which the company increases its environmental disclosure in search of self-legitimacy toward its stakeholders, reacting to damage caused to the environment (proxy: MatPA in its balance sheet). It also investigated how these theories explain the behavior of potentially polluting versus non-polluting companies.

A panel data analysis examined data from listed non-financial Brazilian companies with EDS on Bloomberg available from 2010 to 2018, observing their disclosure behavior regarding the environmental provisions (MatPA) and their inclusion in the ISE, separating between environmentally sensitive (or potentially polluting) and non-polluting companies.

The results indicated that for non-environmentally sensitive companies, being included in the ISE was significant to explain the level of environmental disclosure, whereas presenting environmental provision was not. However, the opposite occurs among environmentally sensitive companies, where the inclusion in the ISE did not have statistical significance, but the materiality of environmental provisions did. In both groups, the disclosure of a given year is significantly associated with the previous year.

These results contribute to the CSR or ESG reporting literature by confirming the coexistence of antagonistic theories to explain environmental disclosure, but in different contexts: non-potentially polluting companies tended to invest in disclosure as a strategy to create value and differentiate themselves (proxy: included in the ISE), corroborating the image theory, whereas potentially polluting companies tended to use environmental disclosure as a reaction to adverse environmental events (proxy: MatPA), in a defensive strategy of mitigating damage in search of self-legitimacy toward their stakeholders, confirming the legitimacy theory. Thus, both theories coexist, but each theory explains the motivation of a distinct group of companies: the image theory explains the motivation of non-environmentally sensitive companies, while the legitimacy theory explains the potentially polluting companies' motivation to disclose.

These results also contribute to the practice of CSR or ESG reporting by alerting investors and consumers that high environmental disclosure does not always indicate high environmental performance. On the contrary, it may indicate an attempt of self-legitimizing in the event of causing environmental damage. They also show that non-polluting companies interested in differentiation need to effectively incorporate their good environmental practices into their identity to ensure credibility and avoid being confused with those that only seek to regain legitimacy in the face of damages caused.

It is important to be cautious when interpreting these results, considering them as associations and not causality despite the robustness tests performed. Finally, studies seeking to extend the results obtained in this research must carefully consider the particularities of the sample analyzed, focused on the Brazilian market and on companies that are larger and more relevant to the market – criteria for an organization to be included in the ESG index available in the Bloomberg database.

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AUTHORS' CONTRIBUTIONS

Maisa de Souza Ribeiro, Edilene Santana Santos e Mariana Simões Ferraz do Amaral Fregonesi worked on the conceptualization and theoretical-methodological approach. The theoretical review was conducted by Maisa de Souza Ribeiro, Edilene Santana Santos e Lucelma Maria dos Santos Cunha. Data collection was coordinated by Maisa de Souza Ribeiro e Lucelma Maria dos Santos Cunha. Data analysis included Mariana Simões Ferraz do Amaral Fregonesi, Edilene Santana Santos e Maisa de Souza Ribeiro. Maisa de Souza Ribeiro, Edilene Santana Santos, Mariana Simões Ferraz do Amaral Fregonesi and Lucelma Maria dos Santos Cunha worked together in the writing and final revision of the manuscript.