



ANÁLISE DO PAPEL DA CULTURA NACIONAL NA RELAÇÃO ENTRE DESEMPENHO E *DISCLOSURE* AMBIENTAL

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RESUMO

Objetivo: O presente trabalho objetivou investigar o papel da cultura na relação entre o desempenho e o nível de divulgação (*disclosure*) ambiental.

Referencial teórico: O modelo de Hofstede foi utilizado para medição da cultura. Clarkson et. al. (2008) apresentam a base para verificação do nível de divulgação a partir de um *checklist* de itens presentes nos relatórios de sustentabilidade das entidades. A *proxy* para desempenho ambiental foi definida de maneiras diversas por autores, sendo utilizado para o presente estudo o *Ranking Global 100* da revista *Corporate Knights*.

Método: Os dados foram coletados para as entidades presentes nos rankings dos anos de 2019 e 2020, resultando numa amostra de 123 empresas com 191 observações empresa-ano. Foi utilizada a regressão de mínimos quadrados ordinários com dados empilhados.

Resultados e conclusão: Os resultados encontrados mostram uma relação positiva e significativa entre o *disclosure* e o desempenho ambiental apenas quando as dimensões culturais foram incluídas como mediadoras na relação. Verificou-se que a relação positiva diminui em função dos níveis de individualismo e de distância do poder e se intensifica em países com maiores níveis de masculinidade.

Implicações da pesquisa: O estudo contribui com a identificação do efeito moderador da cultura na relação entre desempenho e *disclosure* ambiental, além de contribuir para a avaliação dos gerentes quanto à divulgação de informações ambientais, principalmente para empresas multinacionais.

Originalidade/valor: São fornecidas evidências aos normatizadores e reguladores da importância da consideração dos aspectos culturais quando da implementação ou análise do cumprimento de diretrizes sobre o nível de divulgação e o desempenho ambiental.

Palavras-chave: Cultura, desempenho ambiental, *disclosure* ambiental, sustentabilidade.



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ANALYSIS OF THE ROLE OF NATIONAL CULTURE IN THE RELATIONSHIP BETWEEN PERFORMANCE AND ENVIRONMENTAL DISCLOSURE

ABSTRACT

Purpose: This study aims to investigate the role of culture in the relationship between performance and the level of environmental disclosure.

Theoretical framework: Hofstede's model was used with the cultural dimensions of power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence. Clarkson et. al. (2008) presents the basis for verifying the level of disclosure from a checklist of items present in the entities' sustainability reports. The proxy for environmental performance was defined in different ways by authors, the present study uses the Corporate Knights magazine's Ranking Global 100, which lists the 100 most sustainable entities in the world.

Method/design/approach: Ordinary least squares regression was used with stacked data collected for the years 2018 and 2019.

Results and conclusion: The results found show a positive and significant relationship between disclosure and environmental performance only when cultural dimensions were included as mediators in the relationship, contrary to models that relate the two aspects directly or even with the inclusion of cultural dimensions as independent variables. It was found that the positive relationship decreases as a function of individualism and power distance levels and intensifies in countries with higher levels of masculinity.

Research implications: The study contributes to the literature about the relationship between performance and environmental disclosure, adding a new perspective.

Originality/Value: Provides evidence to standard-setters and regulators of the importance of considering cultural aspects when implementing or analyzing compliance with guidelines on the level of disclosure and environmental performance.

Keywords: Culture, environmental performance, environmental disclosure, sustainability.

1 INTRODUCTION

The performance of entities beyond the financial results, in the environmental, social and governance spheres of sustainability, has been the object of growing interest from the market and society. Evidence of this is that, according to Google Trends, the search for the term "ESG" - that stands for environmental, social and governance - grew 257% between November 2018 and November 2021. One way in which entities can disclose their performance in the non-financial area is through sustainability reports or, more recently, through integrated reporting, a structure proposed by the International Integrated Reporting Council (IIRC). In most countries, social and environmental reporting is voluntary, being required by others through laws and regulations or listing requirements on stock exchanges (Ioannou & Serafeim, 2014). Among the existing reporting formats, the Global Reporting Initiative (GRI) provides the most widely used sustainability reporting standards in the world (KPMG, 2020).

Faced with the need to act on environmental and social challenges, the United Nations (UN) proposed, in 2015, the Sustainable Development Goals (SDGs), which constitute a global development agenda by 2030 with targets and indicators to be met to ensure human rights, end poverty, fight inequality and injustice, achieve gender equality, act against climate change, among others (Pacto Global, 2022). In this context, entities play an important role in achieving the SDGs, as the private sector is a "great holder of economic power, driving innovations and technologies, influencing and engaging the most diverse audiences – governments, suppliers, employees and consumers" (Pacto Global, 2022).



Environmental accounting is an instrument of transparency for entities, as it is the function of accounting to provide administrators, owners and other related people with information about the state of assets and the result of the activities carried out by the entity to achieve its ends (USP, 2022). As shown by Clarkson et al. (2008), the existing environmental accounting literature is divided into three groups: relevance of evaluating corporate environmental performance information, factors that affect managerial decisions to disclose potential environmental threats, and exploration of the relationship between environmental disclosures and environmental performance. The greatest difficulty in studying this last aspect is that the sustainable activities of an entity are not observable, and it is not possible to objectively measure them, impairing performance measurement (Herbohn et al., 2014).

Two theories are opposed regarding the relationship between environmental performance and the level of disclosure of environmental information. In the light of theories of voluntary disclosure based on economics, these two variables present a positive relationship, contrary to what is proposed by socio-political theories such as legitimacy theory (Clarkson, et al., 2008).

Among the possible aspects that influence environmental performance, it is possible to mention culture. Entities from different cultures will be more or less likely to adopt sustainable behavior (Richardson & Boyd, 2005). Furthermore, Gray (1988) argues that cultural values have a significant impact on national accounting systems, including the application and interpretation of standards and dissemination initiatives.

Pinheiro et al. (2022) identified that several studies examined only internal factors of the organization itself, such as corporate governance characteristics and financial performance, requiring further studies to examine external factors such as culture. Despite being an area still little explored in the existing literature, previous studies confirm that culture may be present in issues related to both environmental performance (Petruzzella et al., 2017; Koprowski et al., 2021) and environmental disclosure. (Gallego-Álvarez & Ortas, 2017; Gallego-Álvarez & Pucheta-Martínez, 2020). Lu and Wang (2020), in turn, analyzed the effect of culture on environmental performance, on the one hand, and the disclosure of corporate social responsibility, on the other.

However, in the literature, no studies were found that jointly relate aspects of national culture, environmental disclosure and environmental performance. Considering this gap in the study of the relationship between these three aspects, this article starts from the following research question: “What is the role of national culture in the relationship between environmental disclosure and environmental performance?”

To answer this question, the proposed study analyzes the potential effects of culture on the relationship between environmental disclosure and environmental performance, using ordinary least squares (OLS) regression with data stacked from the cultural dimensions of the Hofstede model, disclosure from sustainability reports and environmental performance from the Global 100 Ranking of Corporate Knights magazine.

The results of this study contribute to the literature on the relationship between disclosure and environmental performance by identifying the moderating effect. In practical terms, the knowledge of cultural influences allows information preparers to identify the appropriate level of disclosure of environmental matters in the reports, considering not only the local impacts, since companies increasingly operate in international markets. Additionally, it also assists standard-setters and regulators in implementing or verifying compliance with guidelines on disclosures and performance analysis.

The article is organized into five sections, including this introduction. Section 2 presents the theoretical framework, including the literature review and the development of hypotheses. Section 3 presents the research methodology and the definition of variables. The results are



presented in section 4. Finally, the conclusions, limitations and future perspectives are developed in section 5.

2 THEORETICAL FRAMEWORK

In this section, concepts and literature related to disclosure, environmental performance and culture will be presented, including research hypotheses.

2.1 Disclosure and environmental performance

Considering the global scenario, the disclosure of sustainability information is not yet mandatory for all entities and there is no mandatory model to be followed for such disclosure. The disclosure of environmental information is done by entities in several ways, such as through the sustainability report, integrated report or even within the annual report. Environmental information is also provided to organizations that prepare sustainability rankings and scores, such as the CDP, formerly the Carbon Disclosure Project.

Historically, it is possible to identify the 1980s as a great boost to environmental disclosures, with the creation of the Environmental Protection Agency (EPA) of the United States of America (USA) and the passage of clean air, clean water and endangered species laws (Brockett & Rezaee, 2012). In 1987, the term “sustainable development” was conceptualized in the Brundtland Report, at the World Commission on Environment and Development, created by the United Nations, as “development capable of meeting the needs of the present generation without compromising the ability to meet the needs of future generations” (Brundtland, 1987). GRI issued the first sustainability disclosure framework in 2000, going through successive updates to the current version of the GRI Sustainability Reporting Standards, or just GRI Standards. According to research by KPMG, the GRI Standard is the most used sustainability reporting framework in the world: 67% of the 100 largest entities in 52 countries use it to prepare their sustainability reports (KPMG, 2020).

With the creation of the International Sustainability Standards Board (ISSB) in November 2021, an entity under the trusteeship of the International Financial Reporting Standards Foundation (IFRS Foundation), non-financial disclosures will now comply with sustainability disclosure standards (IFRS Sustainability Disclosure Standards), as is the case with financial disclosures, which comply with the set of accounting standards (IFRS Accounting Standards). The result of this will be an evolution from fragmented voluntary structures to a mandatory standard setting (KPMG, 2021).

The relationship between environmental disclosure and environmental performance has been explored by some previous studies. In terms of corporate environmental performance, Trumpp et al. (2013) present the concept based on ISO 14031 as “results of an organization's management of its environmental aspects” with two dimensions: environmental management performance and environmental operational performance. Environmental performance cannot be observed directly, and must be considered as a construct, using indicators or measures as observable manifestations (Trumpp et al., 2013). Previous empirical studies have used information on environmental impact from existing databases, rankings and assessments prepared by organizations as indicators of the dimensions of the construct.

The first studies on the relationship between environmental disclosure and environmental performance found no significant association between the concepts. Wiseman (1982) used the ranking prepared by the Council on Economic Priorities (CEP) as a proxy for environmental performance and developed an environmental disclosure index in a sample of 26 American entities, finding no significant association between the two variables. Using the same proxies, Freedman & Wasley (1990) also found no significant association for a different sample of 50 American entities.



A negative association was found by Patten (2002), who used EPA toxic release inventory data normalized by sales to measure the environmental performance of 131 American entities and an adaptation of Wiseman's (1982) environmental disclosure index. Cowan & Deegan (2011) analyzed 25 Australian entities using national pollutant inventory (NPI) data and a content analysis of annual reports and also found a negative association between environmental performance and the disclosure of environmental information.

Despite the previous results, the literature more strongly identifies a positive association between environmental disclosure and environmental performance.

Clarkson et al. (2008) used a sample of 191 American entities to verify the relationship between environmental performance, measured by the pollution discharge data used by Patten (2002), and environmental disclosure through scores obtained by applying a checklist of items present in the report based on GRI Standards. As a result, a positive association was found between environmental performance and the level of discretionary environmental disclosures. Herbohn et al. (2014) used a sample of 339 Australian entities and developed a sustainability performance index based on the International Finance Corporation's Measuring Sustainability Framework for the environmental performance variable and a modified version of the Deloitte Sustainability Reporting Scorecard for the environmental disclosure variable. A positive association was also found between performance and environmental disclosure.

Lu and Wang (2020) addressed the relationship between environmental performance and corporate social responsibility (CSR) disclosure, using a sample of 1,870 entities from 25 countries over the period 2010 and 2017. The proxies were sourced from the Sustainalytics database: carbon intensity (CO₂) (annual CO₂ equivalent emissions per annual sales) relative to peers for environmental performance and application level in accordance with GRI guidelines for disclosure on corporate social responsibility. Evidence was found to support a positive relationship between environmental performance and CSR disclosure, supporting the theory of voluntary disclosure.

Taking into account the studies presented, the existence of a positive association between disclosure of environmental information and the environmental performance of an entity is expected, and the following hypothesis is defined for this purpose:

H1: There is a positive association between environmental performance and environmental disclosure of entities.

2.2 Culture

The definition of “culture” can be found in studies of different areas, with different approaches. According to Kumar et al. (2019), “the prevailing belief among these definitions is that the culture of society influences, nurtures and shapes the values shared among its members”. Different cultural contexts influence the way organizations use their resources and their engagement in socially responsible practices (Horak et al., 2018), as well as the reporting of environmental information (Adams & Kuasirikun, 2000).

As evidenced by Garcia-Sanchez et al. (2016), cultural dimensions exert important pressures on companies, improving the transparency of corporate behavior. The model of national culture developed by Hofstede is one of the most used for studies on the influence of culture in several aspects (Lu & Wang, 2020). The initial model (Hofstede, 1980, 2001) had four dimensions (power distance, individualism, masculinity and uncertainty avoidance), Hofstede & Hofstede (2005) and Hofstede & Minkov (2010) added two more dimensions to the model (long term orientation and indulgence).

Power distance is the measure of acceptance of the unequal distribution of power. A high score on this dimension means that individuals accept the established hierarchy. Gallego-Alvarez & Pucheta-Martínez (2020) state that “a large power distance means that power positions are stratified vertically, creating different levels of power status”. Inequality can



manifest itself beyond the distribution of power, as in rights, responsibilities, individuals' contribution to the organization and what they receive in return (Gallego-Alvarez & Ortas, 2017).

Thus, power distance directly influences dialogue, since societies with lower power distance offer more stakeholder involvement and less polarization (Coulmont et al., 2015; Ringov & Zollo, 2007). At the same time, “high respect for authority leads to less chances of an open debate, implying a lower responsiveness in relation to any social issues, including environmental challenges” (Kumar et al., 2019). In this sense, a negative relationship was found between power distance and environmental disclosure (Gallego-Álvarez & Ortas, 2017; Vitolla et al., 2019; Lu & Wang, 2020) and also regarding environmental performance (Petruzzella et al., 2017; Lu & Wang, 2020).

Thus, the cultural dimension of power distance is expected to have a negative effect on the relationship between environmental performance and environmental disclosure, defining the second hypothesis as follows:

H2: The cultural dimension of power distance has a negative effect on the relationship between environmental performance and environmental disclosure.

The individualism dimension is the degree to which people in society are integrated into groups, as opposed to coletivism. “Identity in individualistic societies is based on the individual, while individual interests prevail over collective interests” (Halkos & Tzeremes, 2013). In an individualistic context, people are encouraged to be independent, think differently and form different interest groups (Kumar et al, 2019), which is important for environmental movements, encouraging environmental performance (Husted, 2005). On the other hand, in a more collectivist society, group interests are prioritized over individual interests, so there is more concern about the impact of business on society (Ho et al., 2012).

Studies have found a negative association between individualism and environmental disclosure (Gallego-Álvarez & Pucheta-Martínez, 2020; Vitolla, et al., 2019; Lu & Wang, 2020), “because collectivist countries are more sensitive to stakeholder interests, and disclosure is a channel for entities to show that they care” (Lu & Wang, 2020). However, there was divergence in terms of performance: Koprowski et al. (2021) found a negative association with performance in corporate social responsibility, while Lu & Wang (2020) found a positive association between individualism and environmental performance. As the second study directly addresses the environmental aspect of corporate social responsibility, the cultural dimension of individualism is expected to have a negative effect on the relationship between performance and disclosure.

Therefore, it is also predicted that the cultural dimension of individualism negatively influences the relationship between environmental performance and environmental disclosure, defining the third hypothesis as follows:

H3: The cultural dimension of individualism has a negative effect on the relationship between performance and environmental disclosure.

Masculinity versus femininity is the cultural dimension that indicates the division of values between genders, respectively assertiveness, material reward for success, achievement and heroism versus cooperation, care for others and modesty (Hofstede et al., 2010). “Societies with low masculinity are more oriented towards related parties” (Van der Laan Smith et al., 2005) and “tend to be more open, especially in the dissemination of social information, as they are more supportive societies” (Gray, 1988).

According to the findings of empirical studies by Gallego-Álvarez & Ortas (2017), Vitolla, et al. (2019) and Lu & Wang (2020), there is a negative association between masculinity and environmental disclosure. Previous studies have identified that the greater the degree of femininity, the greater the degree of sustainability, environmental management and commitment to sustainable development (Peng & Lin, 2009; Roy & Goll, 2014), according to



the findings of studies by Koprowski et al. (2021), Petruzzella et al. (2017) and Lu & Wang (2020) of a negative association between masculinity and environmental performance.

Thus, the cultural dimension of masculinity is expected to have a negative effect on the relationship between environmental performance and environmental disclosure, defining the fourth hypothesis as follows:

H4: The cultural dimension of masculinity has a negative effect on the relationship between environmental performance and environmental disclosure.

Uncertainty avoidance measures tolerance for uncertainty and ambiguity, as opposed to optimism. A high score on this dimension means that members of that society would be uncomfortable with novelty and uncertain situations, using law, rules, and codes of conduct to reduce them (Hofstede, 1980). Uncertainty avoidance is related to a greater need for information, as “stakeholders may feel less insecure if they have access to more information about the company” (Luo & Tang, 2013).

In this sense, a positive relationship was found between uncertainty avoidance and environmental disclosure, as found by Gallego-Álvarez & Ortas (2017), Gallego-Álvarez & Pucheta-Martínez (2020), Vitolla, et al. (2019) and Lu & Wang (2020). Kumar et al. (2019) also relate uncertainty avoidance to a greater focus on environmental performance, as environmental degradation can lead to unknown situations. Studies by Lu & Wang (2020), Ho et al (2012) and Ringov & Zollo (2007) corroborate this positive relationship between uncertainty avoidance and environmental performance.

Therefore, the cultural dimension of uncertainty avoidance is expected to have a positive effect on the relationship between environmental performance and environmental disclosure, defining the fifth hypothesis as follows:

H5: The cultural dimension of uncertainty avoidance has a positive effect on the relationship between environmental performance and environmental disclosure.

The long-term orientation dimension, as opposed to short-term orientation, relates to values such as persistence, saving money, honesty, adaptation, skill and discipline (Hofstede, 2011). Short-term oriented societies “are less likely to be interested in sustainability initiatives, as the costs of sustainability are immediate and the benefits are in the future” (Tata & Prasad, 2015).

Previous studies have found a positive relationship between the cultural dimension and environmental dissemination (Gallego-Álvarez & Ortas, 2017; Gallego-Álvarez & Pucheta-Martínez, 2020; Lu & Wang, 2020) and also environmental performance (Koprowski et al., 2021; Petruzzella et al., 2017; Lu & Wang, 2020).

Thus, the cultural dimension of long-term orientation is expected to have a positive effect on the relationship between environmental performance and environmental disclosure, defining the sixth hypothesis as follows:

H6: The cultural dimension of long-term orientation has a positive effect on the relationship between environmental performance and environmental disclosure.

The last cultural dimension of Hofstede's model, indulgence versus restraint, relates to the control of individual desires and impulses. An indulgent society has individuals who value their individual freedom and leisure, as well as the pursuit of happiness, having less moral discipline and not prioritizing social order (Hofstede, 2011). In this way, they show less interest in monitoring the entities' financial, environmental and social issues (Vitolla et al., 2019).

Previous studies have found a negative relationship between indulgence and environmental disclosure (Gallego-Álvarez & Ortas, 2017; Gallego-Álvarez & Pucheta-Martínez, 2020; Vitolla, et al., 2019; Lu & Wang, 2020) and also between environmental performance (Petruzzella et al., 2017).



Therefore, the cultural dimension of indulgence is expected to have a negative effect on the relationship between environmental performance and environmental disclosure, defining the seventh hypothesis as follows:

H7: The cultural dimension of indulgence has a negative effect on the relationship between environmental performance and environmental disclosure.

3 METHOD

This section presents the research methodology, addressing population, sample, period, data collection, and econometric models with the definition of variables.

3.1 Population, sample, period and data collection

The study population is comprised of the entities that appeared in the Corporate Knights' Global 100 Ranking for the years 2019 and 2020. This instrument presents the 100 most sustainable entities in the world, among companies listed on the stock exchange with revenues exceeding one billion dollars. Corporate Knights is the world's largest circulation magazine focused on sustainability and responsible business, founded in 2002 and aims to be "the voice of clean capitalism" (Corporate Knights, 2014).

The final grade for preparing the ranking is composed of 21 indicators, 17 of which are weighted according to the relative impact of the specific industry in relation to the others, and five receive predetermined fixed weights. The indicators are divided into natural resources, financial and personnel management, with details presented in Appendix A.

The ranking methodology employs information from two years prior to the reference year: the results for the years 2019 and 2020 are based on 2017 and 2018, respectively. As some companies repeat from one year to the next and it was not possible to access all sustainability reports, the final sample contains 123 entities, distributed across 25 countries and 35 sectors, resulting in 191 company-year observations. Appendix B presents the distribution of observations by country and Appendix C the distribution by sectors.

The indices of the cultural dimensions of power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence were used as proxies of the national culture, presented in Appendix D.

The environmental disclosure, a dependent variable of this study, was analyzed using a checklist of items found in the entities' sustainability reports presented in Appendix E. Control variables classically considered in studies of this nature were also used, namely size, profitability, leverage, legal origin of the country and environmental sensitivity.

The sources and characteristics of the variables used in the present study can be described as follows:

a) Environmental performance of the entity (Performance): percentage value obtained through an adaptation of the Global 100 Ranking score, selecting only indicators related to resource management (energy, carbon, water, waste) and clean revenue with proportional weights. The methodology used to calculate this score is available for public access on the Corporate Knights website.

b) Disclosure level: percentage value obtained through a 14-item checklist, based on the study by Clarkson et al. (2008), with attribution of scores to the entities' sustainability reports for the years 2017 and 2018.

c) Cultural dimensions (as independent variables): value between 0 and 100 obtained from Hofstede (1994) and Hofstede et al. (2010): power distance (PD), individualism (Ind), masculinity (Masc), uncertainty avoidance (UA), long-term orientation (LTO), indulgence (Indulg).

d) Cultural dimensions (as mediating variables): value of dimensions by Hofstede (1994) and Hofstede et al. (2010) multiplied by the entities' environmental performance. These



variables were proxies to verify whether culture is a relevant and significant characteristic to be considered in order to understand the relationship between performance and disclosure.

e) Control variables: size, return on assets (ROA), leverage, environmental sensitivity, legal origin of the country, detailed in Table 1.

Table 1

Control variables

Variable	Metric	Source
Size	Natural logarithm of the book value of total assets	Clarkson. et al. (2008), Petruzzella et al. (2017), Gallego-Álvarez & Pucheta-Martínez (2020)
Return on assets (ROA)	Net income on total assets	Clarkson. et al. (2008), Petruzzella et al. (2017), Gallego-Álvarez & Pucheta-Martínez (2020)
Leverage	Debt on total assets	Clarkson. et al. (2008), Petruzzella et al. (2017), Gallego-Álvarez & Pucheta-Martínez (2020)
Environmental sensitivity	Dummy variable, where 1 if the entity's activities have a major impact on the environment and 0 otherwise	Vitolla, et al. (2019)
Country's legal origin	Dummy variable, where 1 is for common law countries and 0 is for code law countries	Koprowski, et al. (2021)

Source: Prepared by the authors

Econometric models are described in the next section.

3.2 Econometric models

To investigate the relationship between performance and environmental disclosure, as well as the potential effect of cultural dimensions on this relationship, five regression models were designed and executed. The regressions were generated by the Ordinary Least Squares (OLS) method, with stacked data from two periods. Data stacking was chosen to avoid excessive loss of observations, as not all entities were ranked in the two years of study. The executed models can be described as follows:

M1) simple linear regression between disclosure and performance;

M2) inclusion of control variables to M1;

M3) inclusion of culture variables as independent to M1, to verify if the cultural dimensions explain the level of environmental disclosure;

M4) inclusion of control variables to M3;

M5) inclusion, in M1, of the variables that capture the mediating effect of culture on the relationship between performance and disclosure.

Thus, H1 was tested by all models and H2 to H7 were tested by M3, M4 and M5, in order to investigate the effect of cultural dimensions as explanatory variables of the level of environmental disclosure or even as mediators of the relationship between performance and environmental disclosure.



	M1	M2	M3	M4	M5
Y	<i>Disclosure</i>	<i>Disclosure</i>	<i>Disclosure</i>	<i>Disclosure</i>	<i>Disclosure</i>
β0	Constant	Constant	Constant	Constant	Constant
β1	Performance	Performance	Performance	Performance	Performance
β2		Size	PD	PD	PD x Perform
β3		ROA	Ind	Ind	Ind x Perform
β4		Leverage	Masc	Masc	Masc x Perform
β5		Legal origin	UA	UA	UA x Perform
β6		Sensitivity	LTO	LTO	LTO x Perform
β7			Indulg	Indulg	Indulg x Perform
β8				Size	
β9				ROA	
β10				Leverage	
β11				Legal origin	
β12				Sensitivity	

The executed models are represented in Table 1.

Table 1

Econometric models (M)

Source: Prepared by the authors

To verify the consistency of the models, the assumptions of normality and homoscedasticity of the residuals were analyzed. Homoscedasticity was verified using the Breusch-Pagan test and normality using the χ^2 test. As previously mentioned, collinearity was analyzed using the variance inflation factor (VIF).

The maximum significance level accepted in this study is 10%. The results were generated in the Gretl 2019d system. There was no treatment for possible outliers.

The results are presented in the next section.

4 RESULTS AND DISCUSSIONS

This section presents the results of the study with the division into subsections dealing with the analysis of the econometric models in 4.1 and the discussion of the results in 4.2.

4.1 Analysis of econometric models

Pearson's correlation matrix is presented in Table 3.

Table 3

Pearson's correlation

	Disc	Perfor m	PD x Perform	IND x Perform	MAS x Perform	UA x Perform	LTO x Perform	INDUL G x Perform
Disc	1,000 0	0,0225	-0,0436	- 0,1937** *	0,0278	-0,0375	0,0910	-0,0793
Perform		1,0000	0,5356** *	0,6474** *	0,3121** *	0,5351** *	0,4659** *	0,7600** *
PD x Perform			1,0000	0,0225	0,3517** *	0,7221** *	0,5792** *	0,0964
IND x Perform				1,0000	0,2283** *	0,1391* *	-0,1001	0,7873** *
MAS x Perform					1,0000	0,4325** *	0,3120** *	0,0505
UA x Perform						1,0000	0,6395** *	0,0646
LTO x Perform							1,0000	-0,0509



INDULG x Perform	1,0000
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Source: Prepared by the authors

Based on the data in Table 3, it is possible to highlight that there is no correlation between environmental performance and environmental disclosure. Environmental disclosure has a negative and significant correlation at 1% with the variable Ind x Performance, which indicates a preliminary result that this cultural dimension can negatively moderate the relationship between environmental performance and culture, while the other cultural dimensions as mediators do not correlate with environmental disclosure. All mediating cultural dimensions are correlated with the performance variable and this is expected, since the mediating culture variable is calculated by multiplying the cultural dimension with performance. It is important to check whether this correlation is high enough to generate multicollinearity problems.

Table 4 shows the values of the coefficients of the variables (with emphasis on significance), the explanatory power of the models (R^2), the p-value of the F test, the p-value of the Breusch-Pagan test (homoscedasticity of the residues) and the p-value of the x^2 test (residual normality).

Table 4

Main results

	M1	M2	M3	M4	M5
Constant	0,6904	0,6154	0,997	0,862	0,6778
Performance	-0,0256	-0,0785	-0,0114	-0,0366	0,3774**
PD			-0,0026**	-0,0029**	
Ind			-0,0034***	-0,0036***	
Mas			0,0009*	0,0011**	
UA			< -0,0000	< -0,0000	
LTO			-0,0003	-0,0007	
Indulg			0,0002	0,0004	
PD x Perform					-0,0031**
Ind x Perform					-0,0044***
Mas x Perform					0,0014*
UA x Perform					-0,0005
LTO x Perform					0,0001
Indulg x Perform					0,0003
Size		0,0150		0,0220	
ROA		-0,0143		-0,0817	
Leverage		0,0838		0,1216	
Legal origin		0,0136**		0,0028	
Sensibility		-0,0598		-0,0326	
R²	0,069%	3,389%	11,629%	13,836%	9,743%
P-value F	0,7415	0,3957	0,0001	0,0018	0,0008
Breusch-Pagan	0,0570	0,0048	0,0017	0,0018	0,0099
x²	< 0,0000	< 0,0000	< 0,0000	< 0,0000	< 0,0000
Greater VIF	-	1,171	3,233	5,378	10,2

Source: Prepared by the authors

First, Table 4 indicates that the p-value of the Breusch-Pagan test of M1 was 0.057 (10% significance), and all other p-values of the Breusch-Pagan and x^2 tests were significant at 1%. These results indicate that the model residuals are heteroscedastic with non-normal distribution. Given this heteroscedasticity, the results were generated by White's robust standard errors. On the other hand, the assumption of normality of residuals can be relaxed, as each model has 191



observations, more than what is indicated to assume normality according to the central limit theorem (Wooldridge, 2009).

Another assumption to highlight is collinearity. No model has collinearity problems, as all the VIFs calculated are in the range considered to be acceptable, which is up to 10 (Gujarati & Porter, 2011). M5, which has a VIF of 10.2, was considered in the study even 0.2 above the limit, as it was found that when removing the variable with the highest p-value from the model (LTO x Perform, with p-value of 0.94), the highest VIF decreases to 6.53, with no changes in the significance and signs of the other variables. Similarly, if the second variable with the highest p-value is removed (Indulg x Perform, with p-value of 0.85), the highest VIF decreases to 3.37, without changing the significance and signs of the other variables. It is noteworthy that a model that includes cultural variables as mediators and control variables was generated (it would be model 6), but the VIF of some variables exceeded the acceptable limit, so it was chosen not to analyze the results of this regression.

Regarding the explanatory power and general validity of the models, it is observed that M1 and M2 were not significant as a whole, since the p-value of the F test is 0.7415 and 0.3957, respectively. These high p-values indicate that there is no explanatory power in the regressions, that is, the independent variables are not related to disclosure. It is noteworthy that despite the non-significance of model 2, the control variable Legal Origin was positive and significant in the t test, that is, there is a significant relationship between Legal Origin and Disclosure, but this relationship is not significant enough to validate the whole model.

On the other hand, M3, M4 and M5 were all significant at 1%, which indicates that they are models with explanatory validity. The explanatory power ranged from 9.7% to 13.8%. In models 3 and 4, no significant relationships were found between performance and disclosure. In these two models, the cultural dimensions Power Distance and Individualism were significant and negative and Masculinity was significant and positive, which indicates that in countries with cultures with higher levels of power distance and individualism and with lower levels of masculinity, lower levels of disclosure of environmental information by entities will be expected.

Unlike the results of M1 to M4, in M5 a positive and significant relationship at 5% between performance and disclosure is highlighted. This indicates that the entities that have higher environmental performance also disclose more environmental information, as foreseen in Hypothesis 1. This relationship became significant from the moment the mediating cultural variables were considered in the measurement, which may indicate the importance of considering culture as a fundamental characteristic of social, economic and environmental relationships.

Finally, three mediating cultural variables were significant. The mediating variables PDxPerform and INDxPerform assumed a negative sign, accepting the hypotheses H2 and H3, while the variable MASCxPerform assumed a positive sign, rejecting the hypothesis H4. These signs indicate that the positive relationship between performance and disclosure decreases the more the country is individualistic and with higher levels of power distance and intensifies in countries with higher values of masculinity.

The inclusion of cultural variables as mediators identified that the relationship between Performance and Disclosure changes according to some cultural aspects, that is, depending on the culture of a country, Disclosure may be more or less related to performance. To clarify this effect, an example is analyzed from Table 5.



Table 5

Example of the Cultural Impacts on the Performance x Disclosure Ratio of a Dutch Entity

	1	2	3 = 1 x 2
	Coefficient	Performance x Cultural Dimension	Impact on the coefficient of performance
Performance	0,3774		
PDxPerform	-0,0031	33,26	-0,10309856
INDxPerform	-0,0044	70,02	-0,3080704
MASCxPerform	0,0014	12,25	0,01715392

Source: Prepared by the authors

Table 5 shows data from a Dutch entity that participated in the analysis of this research (the organization was chosen on purpose to reinforce the understanding of the results). The coefficients in column 1 were taken from Table 4. Column 2 represents the value of the country's culture variable multiplied by the entity's performance. The last column represents the variation in the coefficient of the variable Performance generated by each cultural dimension. It is observed that for this entity, the value of the Performance coefficient, after considering the mediation of culture, was adjusted to -0.0166 (0.3774 - 0.103 - 0.308 + 0.017), that is, due to cultural aspects, this entity started to have an almost null relationship between performance and disclosure.

Briefly, the example specified in Table 5 reinforces the following: in general, there is a positive relationship between environmental performance and environmental disclosure, but some cultural issues can affect the choices and behaviors of managers, which can lead to this relationship being null or even negative.

The results found are discussed in the next section.

4.2 Discussion of results

The mixed results of this study regarding H1 in the association between performance and environmental disclosure are in line with those obtained in previous studies, as they found different conclusions for this relationship: Patten (2002), Cowan & Deegan (2011) and Cho et al. (2012) found a negative relationship, while Clarkson et al. (2008) and Lu & Wang (2020) found a positive relationship, the latter, it is important to note, is the majority in the literature on the subject. Hummel & Schlick (2016) argue that empirical studies have found mixed results for the relationship between disclosure and performance, making it necessary to shift the focus from quantity of disclosure to quality.

Despite the aforementioned finding, the present study intended, as a novelty, to analyze the relationship between environmental disclosure and environmental performance from the inclusion of the influence of culture in this interaction.

Thus, if, on the one hand, the findings from M1 to M4 do not support H1, since a significant relationship was not found between environmental disclosure and environmental performance, the same was not observed in M5. In that model, cultural dimensions were included as mediators of performance, in order to verify the direction and strength of the relationship between the constructs. With the aforementioned inclusion, a positive and significant relationship at a level of 5% was found in M5 between environmental disclosure and environmental performance. As such, this finding is in line with H1, corroborating the understanding of the importance of culture being considered in this relationship.

Additionally, by including cultural dimensions as independent variables in M3 and M4, results were found in line with the aforementioned studies that negatively related environmental disclosure to power distance and individualism, although, in the opposite sense, positively related to masculinity (Vitolla et al. al., 2019; Lu & Wang, 2020; Petruzzella et al., 2017).



A possible explanation for the positive effect of masculinity on the relationship between disclosure and performance is that in a society with a high masculinity index, competitiveness is valued and the disclosure of environmental information would be a differentiating factor in a more competitive market (Pineiro et al. al., 2022).

Analyzing the effect of each cultural dimension, the findings with the dimensions as independent variables remain: negative relationship with power distance and individualism and positive relationship with masculinity, leaving the others without significance, accepting H2 and H3 and rejecting hypotheses H4, H5 , H6 and H7. Thus, the positive relationship between performance and environmental disclosure decreases the more the country is individualistic and with higher levels of power distance, and intensifies in countries with higher values of masculinity.

Table 6 summarizes the hypotheses, findings and results of this study.

Table 6
Hypotheses, findings and results

Hypotheses	Findings	Result
H1: There is a positive association between an entity's environmental performance and disclosure of environmental information.	Not significant/Positive	Accept
H2: The cultural dimension of power distance has a negative effect on the relationship between environmental performance and environmental disclosure.	Negative	Accept
H3: The cultural dimension of individualism has a negative effect on the relationship between environmental performance and environmental disclosure.	Negative	Accept
H4: The cultural dimension of masculinity has a negative effect on the relationship between environmental performance and environmental disclosure.	Positive	Reject
H5: The cultural dimension of uncertainty avoidance has a positive effect on the relationship between environmental performance and environmental disclosure.	Not significant	Reject
H6: The cultural dimension of long-term orientation has a positive effect on the relationship between environmental performance and environmental disclosure.	Not significant	Reject
H7: The cultural dimension of indulgence has a negative effect on the relationship between environmental performance and environmental disclosure.	Not significant	Reject

Source: Prepared by the authors

The conclusion with limitations and future perspectives are developed in the following section.

5 FINAL CONSIDERATIONS

The present study aimed to investigate the role of culture in the relationship between environmental disclosure and environmental performance.

The results found allow us to conclude that culture exerts a potential moderating effect on the relationship between environmental disclosure and environmental performance, as the regression model that contains cultural dimensions as moderating features a significant positive relationship between environmental disclosure and environmental performance, while the models that do not consider this approach present a non-significant relationship. The cultural dimensions of power distance and individualism have a negative moderating effect, while masculinity has a positive moderating effect. It was possible to empirically prove what the theory indicated that the cultural aspect should be considered in dissemination (Gallego-Álvarez & Pucheta-Martínez, 2020; Gray, 1988) and in environmental performance (Petruzzella et al., 2017; Richardson & Boyd, 2017; 2005).

These results contribute to the existing literature in the area of performance and disclosure of environmental information by adding the cultural aspect to the relationship between the two, identifying its moderating effect. Previous studies have focused on the relationship of culture as an explanatory variable. In practical terms, the knowledge of cultural



influences allows information preparers to identify the appropriate level of disclosure of environmental matters in the reports, considering not only the local impacts, since companies increasingly operate in international markets. It also contributes to assisting standard-setters and regulators when implementing or verifying compliance with guidelines on disclosures and performance analysis in the environmental area.

It is worth relating the results found to goal 12.6 of the Sustainable Development Goals of the 2030 Agenda, as the mediating effect of culture in the relationship between environmental performance and disclosure influences “encouraging companies, especially large and transnational companies, to adopt sustainable and sustainable practices to integrate sustainability information into their reporting cycle” (Pacto Global, 2021).

The study has some limitations inherent to the method, such as manual data collection, a sample of 191 observations and the use of proxies. The sustainability reports of each entity available on the respective website were searched, but in some cases it may happen that the information not found in the sustainability report is present in another report released by the entity such as the annual report, for example, and the attribution of scores is compromised. Future research may use different data sources to analyze the moderating effect of culture, such as databases with a greater number of observations.

Future studies may use different proxies to measure variables such as the cultural dimensions of the GLOBE Project (Global Leadership and Organizational Behavior Effectiveness) and existing databases such as Thomson Reuters for information on environmental performance and disclosure. The sample and period can also be enlarged to see if there have been changes in the relationship over time.

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APPENDIXES

Appendix A – Indicators of the Global 100 Ranking

Indicator	Category	Weight
Clean Revenue Score (*)	Clean Revenue	Fixed
Energy Productivity Score (*)	Resource management	Relative
Carbon Productivity Score (*)	Resource management	Relative
Water Productivity Score (*)	Resource management	Relative
Waste Productivity Score (*)	Resource management	Relative
VOC Productivity Score	Resource management	Relative
NOx Productivity Score	Resource management	Relative
SOx Productivity Score	Resource management	Relative
PM Productivity Score	Resource management	Relative
Innovation Capacity Score	Financial management	Relative
% Taxes Paid Score	Financial management	Relative
CEO-Average Worker Pay Score	Financial management	Relative
Pension Fund Status Score	Financial management	Relative
Supplier Score	Financial management	Fixed
Lost-time Injury Rate Score	Employee management	Relative
Fatalities per FTE employee Score	Employee management	Relative
Employee Turnover Score	Employee management	Relative
% Women on Board Score	Employee management	Fixed



% Women Senior Executives Score	Employee management	Fixed
Sustainability Paylink Score	Employee management	Fixed
Sanction Deduction	Deduction due to sanctions	Relative

Note: (*) indicators used to compose the environmental performance variable
Source: Prepared by the authors

Appendix B – Distribution of the 191 company-year observations by country

Country	2020	2019	Country	2020	2019
United States of America	16	19	South Korea	2	3
Canada	11	6	Spain	3	3
France	9	10	Australia	2	2
Japan	8	6	Belgium	2	2
Finland	6	7	China	2	0
United Kingdom	4	6	Switzerland	1	2
Germany	5	5	Taiwan	2	2
Sweden	3	3	Austria	1	1
Denmark	5	4	Ireland	1	1
Brazil	3	4	Norway	1	0
Italy	4	2	South Africa	1	0
Holand	3	2	Hong Kong	1	0
Singapore	3	2	Total	99	92

Source: Prepared by the authors

Appendix C – Distribution of the 123 companies by sector

Sector	Qt	Sector	Qt
Banks and Investment Services	18	IT Consulting & Services	1
Pharmaceuticals and Biotechnology	14	Internet Companies	1
Construction & Engineering Services	8	Transportation Equipment	1
Electronic Products	8	Water Utilities	1
Technology Hardware	7	Diagnostics and Drug Delivery	1
Power Generation	7	Aerospace and Defense	1
Software and Related Services	5	Freight	1
Telecommunications	5	General Merchandise Retail	1
Packaged and Processed Food and Ingredients	3	Manufacturing Equipment	1
Industrial Conglomerates	4	Medical Devices	1
Clothing and Accessory Retail	4	Food or other Chemical Agents	1
Insurance	4	Household Appliances and Furn.	1
Vehicles and Parts	4	Grocery and Diversified Stores	1
Real Estate	3	Human Resource Services	1
Communications Equipment	3	Chemicals	1
Personal Products	3	Consulting and Professional Services	1
Oil & Gas	3	Mining	1
Construction Materials	2	Forest Products	1

Source: Prepared by the authors

Appendix D – Countries: legal origin and cultural dimensions values

Country	Legal Origin	PD	IND	MAS	UA	LTO	INDULG
South Africa	<i>Common law</i>	49	65	63	49	34	63
Germany	<i>Code law</i>	35	67	66	65	83	40
Australia	<i>Common law</i>	38	90	61	51	21	71
Austria	<i>Code law</i>	11	55	79	70	60	63
Belgium	<i>Code law</i>	65	75	54	94	82	57



Brazil	<i>Code law</i>	69	38	49	76	44	59
Canada	<i>Common law</i>	39	80	52	48	36	68
China	<i>Code law</i>	80	20	66	30	87	24
South Korea	<i>Code law</i>	60	18	39	85	100	29
Denmark	<i>Code law</i>	18	74	16	23	35	70
Spain	<i>Code law</i>	57	51	42	86	48	44
U.S	<i>Common law</i>	40	91	62	46	26	68
Finland	<i>Code law</i>	33	63	26	59	38	57
France	<i>Code law</i>	68	71	43	86	63	48
Netherlands	<i>Code law</i>	38	80	14	53	67	68
Hong Kong	<i>Code law</i>	68	25	57	29	61	17
Ireland	<i>Common law</i>	28	70	68	35	24	65
Italy	<i>Code law</i>	50	76	70	75	61	30
Japan	<i>Code law</i>	54	46	95	92	88	42
Norway	<i>Code law</i>	31	69	8	50	35	55
United Kingdom	<i>Common law</i>	35	89	66	35	51	69
Singapore	<i>Code law</i>	74	20	48	8	72	46
Sweden	<i>Code law</i>	31	71	5	29	53	78
Switzerland	<i>Code law</i>	34	68	70	58	74	66
Taiwan	<i>Code law</i>	58	17	45	69	93	49

Source: Prepared by the authors

Appendix E – Checklist based on Clarkson et al. (2008) for disclosure level

Item (Clarkson et al., 2008)	Description
A1.2	Existence of an environmental and/or a public issues committee in the board
A1.3	Existence of terms and conditions applicable to suppliers and/or customers regarding env. practices
A1.5	Implementation of ISO14001 at the plant and/or firm level
A2.2	Independent verification/assurance about environmental information disclosed in the EP report/web
A2.6	External environmental performance awards and/or inclusion in a sustainability index
A2.9	Participation in industry specific associations/initiatives to improve environmental practices
A3.1	EPI on energy use and/or energy efficiency
A3.2	EPI on water use and/or water use efficiency
A3.3	EPI on green house gas emissions
A3.7	EPI on waste generation and/or management (recycling, re-use, reducing, treatment and disposal)
A5.1	CEO statement on environmental performance in letter to shareholders and/or stakeholders
A5.2	A statement of corporate environmental policy, values and principles, environ. codes of conduct
A5.3	A statement about formal management systems regarding environmental risk and performance
A6.3	An overview of how the business operations and/or products and services impact the environment.

Source: Prepared by the authors