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Article

Follow the Leader: How Culture Gives Rise to a Behavioral Bias That Leads to Higher Greenhouse Gas Emissions

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Abstract: This research investigates the influence of national culture, particularly power distance, on firms' carbon dioxide (CO_2) emissions. Drawing on a large international dataset spanning over a decade, we examine how power distance, agency conflict, and socioeconomic stability interact to shape firms' emission decisions. Our analysis reveals a significant positive relationship between power distance and firms' CO_2 emissions, indicating that firms located in countries characterized by higher power distance tend to emit more greenhouse gases (GHGs). Furthermore, we find that agency conflict moderates this relationship, with firms experiencing high levels of debt or paying substantial dividends exhibiting lower emissions in high power distance environments. Additionally, socioeconomic stability attenuates the positive association between power distance and emissions, suggesting that the effectiveness of cultural influences on emission decisions is contingent upon the stability of the societal context. These findings underscore the importance of considering cultural dimensions, agency dynamics, and socioeconomic conditions in understanding corporate environmental behavior. Our research contributes to the literature by providing empirical evidence of the nuanced interplay between national culture, agency conflict, and socioeconomic stability in shaping firms' emission decisions. Policymakers and practitioners can use these insights to develop more targeted environmental policies and strategies aimed at promoting sustainable development globally.

Keywords: greenhouse gas emissions; power distance; agency conflict; state fragility; behavioral finance; culture; corporate environmental performance; framing bias

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1. Introduction

Understanding the determinants of carbon dioxide (CO_2) emissions at both the firm and country levels is essential for devising effective environmental management strategies and policies. This paper contributes to this understanding by investigating the influence of national culture, particularly the dimension of power distance, on firms' CO_2 emission decisions. Power distance refers to the extent of equality in the distribution of power within a society, as well as the readiness of individuals with less power within organizations and institutions to tolerate disparities in power and wealth (Hofstede and Bond 1988). Knowing the determinants of corporate emissions at both the firm and country levels is crucial for crafting effective environmental management strategies and policies aimed at mitigating the impact of climate change. CO_2 emissions are a leading contributor to global warming and represent the most significant greenhouse gas produced by human activities, necessitating targeted policy interventions. By examining actual emissions data, rather than relying solely on environmental performance scales, this research offers a direct, tangible measure of corporate environmental behavior. The findings could inform both governmental policy-making and corporate strategy, providing guidance on how cultural dimensions can be integrated into regulatory frameworks and organizational practices to achieve more sustainable outcomes.

The relationship between firm performance and environmental management has garnered significant attention in the literature. Studies have consistently demonstrated a positive association between economic performance and environmental performance, suggesting that firms with better environmental practices often exhibit stronger financial performance (Al-Tuwaijri et al. 2004; Endrikat et al. 2014). Additionally, research has explored various determinants of CO_2 emissions at both the firm and country levels, including firm size, capital–labor ratio, R&D expenditure, cultural factors, and government regulations (Cole et al. 2013; Ibrahim and Law 2014).

While previous research has examined the impact of cultural factors on environmental outcomes, few studies have investigated how national culture influences firms' CO_2 emissions directly. National culture, characterized by dimensions such as power distance, individualism, masculinity, and uncertainty avoidance, can profoundly shape corporate strategies and behaviors (Hofstede 1980; Schwartz 2004). Understanding the influence of cultural dimensions on firms' environmental decisions is crucial for policymakers and practitioners seeking to design effective environmental policies and interventions.

Despite the growing body of literature on firm-level determinants of CO_2 emissions and the influence of cultural factors on corporate behavior, there remains a notable gap in understanding how power distance, specifically, affects firms' emission decisions. Existing studies often rely on synthetic measures of environmental performance or focus solely on national-level analyses. This paper seeks to address this gap by examining the direct relationship between power distance and firms' CO_2 emissions, using actual emissions data, and considering both firm- and country-level characteristics.

We also investigate the channels that moderate the impact of power distance on firm-level CO_2 emissions. One such channel pertains to agency conflict (Jensen and Meckling 1976). Agency conflict describes the tension between the different stakeholders of a firm (Panda and Leepsa 2017). Of interest to us is the friction between management and shareholders, wherein the former usurps wealth from the latter in the form of perquisites. The impasse between ownership and agent is at its zenith when management is entrenched. We hypothesize that the influence of power distance on GHG emissions is exacerbated when executive power is concentrated, as is the case when control has been wrestled away from ownership. We rely on evidence of waning entrenchment to document the agency conflict channel. Jensen (1986) maintains that debt can derail managerial excess by disgorging cash flows that should otherwise be distributed to shareholders. Thus, our proxies for the abatement of agency conflict are the use of debt and the extent to which dividends are paid out. We expect such measures to dampen the effect of power distance on emissions.

Another channel considers the state of the social order as a moderator of how emissions are impacted by culture. Power distance constitutes a social stance that values deference towards authority. Yet, for such a value to take hold upon corporate policy, the social order must be healthy enough to convey behavioral biases to economic agents. Thus, we surmise that the effect of power distance on corporate emissions is encumbered by weaknesses in the status quo. We assess the socioeconomic channel by observing the moderating effect that certain factors connoting societal frailty bear upon the emission–power distance relationship. The supposition is that the influence of power distance on emissions is diminished when social order is under duress.

In summary, this study aims to contribute to the literature by shedding light on the influence of national culture, specifically power distance, on firms' CO_2 emission decisions. By providing empirical evidence from a large international sample of firms, this research seeks to inform policymakers and practitioners on the importance of cultural considerations in shaping corporate environmental behavior.

The remainder of this paper is organized as follows: Section 2 provides a comprehensive review of the literature on firm-level and country-level determinants of CO_2 emissions, highlighting the role of cultural factors. Section 3 outlines the data sources and methodology employed in the empirical analysis. Section 4 presents the results of the regression analysis, examining the relationship between power distance and firms' CO_2 emissions. Finally, Section 5 offers the conclusions and implications of the findings.

2. Literature Review and Hypothesis Development

2.1. Determinants of Carbon Dioxide Emissions

2.1.1. Prior Literature on Firm-Level Determinants of Firm's Environmental Management Practices and Its Carbon Dioxide Emissions

The existing body of literature identifies several determinants that influence a firm's environmental management practices and its carbon dioxide emissions.

A significant strand of empirical research has focused on the relationship between firm performance and environmental management and confirms that there is a positive relationship between them. For example, Al-Tuwaijri et al. (2004) employ a 3SLS simultaneous model to examine the relationship between economic performance and environmental performance. Their findings suggest that better environmental performance correlates with better economic performance and more comprehensive environmental disclosures. Endrikat et al. (2014) propose that the relationship between corporate environmental performance and financial performance is not only positive but also partially bidirectional. Furthermore, Sariannidis et al. (2013) compare the environmental behavior differences between socially responsible firms versus conventional ones, finding that the financial performance of socially responsible firms is negatively impacted by global CO_2 emissions increases. The result is attributed to the costs associated with implementing environmental policies and changing investor attitudes towards such firms. Ambec and Lanoie (2008) argue against the conventional wisdom that environmental protection inherently increases costs. The authors suggest that enhancing a company's environmental performance can boost its economic or financial performance without necessarily leading to higher costs. Also, Ambec and Lanoie explore mechanisms for achieving a "win-win" scenario, such as product differentiation and cost reduction, and identify the conditions and types of firms most likely to benefit.

In addition, Cole et al. (2013) examine the determinants of CO_2 emissions for firms in Japan and identify firm size, capital–labor ratio, R&D expenditure, advertising expenditure, and export share as important determinants of emissions. In another contribution, Liu (2015) highlights additional factors, including raw material prices, government subsidies, international rules, social responsibility, government regulation, consumer awareness, low-carbon packaging, and recycling. Furthermore, Luo and Tang (2016) discuss the effects of emission trading schemes, competitor pressure, legal frameworks, and carbon exposure on the efficacy of a firm's carbon management systems. Damert et al. (2017) contribute to the discussion by explaining how stakeholder and regulatory pressures positively affect a firm's emission reduction efforts.

2.1.2. Prior Literature on Country-Level Determinants of Carbon Dioxide Emissions

Many studies have investigated how factors such as energy consumption, economic growth, and technological innovation influence countries'CO_2 emissions. Schipper et al. (1989) suggest that energy consumption patterns are influenced by personal activities and estimate that 45–55% of total energy use is driven by personal transportation, services, and household activities. Reinders et al. (2003) further investigate the energy requirements of households in 11 EU member states and find that differences in household energy requirements are primarily due to variations in total household expenditure. The study highlighted that indirect energy use is linearly related to household expenditure, with significant variations across different consumption classes. Bin and Dowlatabadi (2005) reveal that over 80% of energy use and CO_2 emissions in the U.S. are attributable to consumer demands and the economic activities supporting these demands. They argue that both direct and indirect influences must be considered to design effective energy and CO_2 emission policies.

Besides energy consumption, the relationship between a country's economic growth and its environmental pollution levels has been well discussed. For instance, Andreoni and Levinson (2001) present a model explaining the Environmental Kuznets Curve (EKC), which posits an inverse-U-shaped relationship between a country's income and its environmental pollution levels. Their research indicates that technological innovation plays a crucial role in reducing pollution, independent of economic growth dynamics or political institutions. This model emphasizes the importance of technological advancements in achieving sustainable environmental outcomes.

In addition, several studies have shown significant results regarding the unidirectional relationship between economic growth and CO_2 emissions. For instance, Menyah and Wolde-Rufael (2010) explore the causal relationship between CO_2 emissions, renewable and nuclear energy consumption, and real GDP in the U.S. from 1960 to 2007, finding a unidirectional causality running from GDP to renewable energy consumption. Kasman and Duman (2015) examine the causal relationships among energy consumption, CO_2 emissions, economic growth, trade openness, and urbanization in new EU member and candidate countries. Their findings reveal complex causal links, including short-run unidirectional causality from energy consumption, trade openness, and urbanization to carbon emissions, and from GDP to energy consumption.

Extending the research, Shahbaz et al. (2017) investigate the relationship between trade openness, economic growth, and CO_2 emissions across 105 countries categorized into low-, middle-, and high-income groups. They find that trade openness impedes environmental quality across all income groups, with varying impacts. Their panel VECM causality results indicate a feedback effect between trade openness and carbon emissions at the global and middle-income levels, while trade openness Granger-causes CO_2 emissions in high- and low-income countries.

Alongside these, cultural and social factors also significantly contribute to CO_2 emissions. Ibrahim and Law (2014) examine the effect of social capital on the EKC for CO_2 emissions using a sample of 69 countries. Their finding suggests that social capital has a moderating effect for CO_2 emission, as the environmental costs of economic development decrease while the level of social capital rises. Arshed et al. (2022) examine the moderating influence of culture on the effect of national income upon GHG emissions per capita using Hofstede's culture measures in a sample of 49 countries. They find that a country's cultural orientation could significantly influence household consumption patterns along with CO_2 emissions. This national-level study motivates us to explore the influence of culture at the firm level.

Park et al. (2007) link culture and socioeconomics to environmental sustainability at the national level using Hofstede's cultural dimensions, educational levels, and per capita income to examine the environmental sustainability index (ESI) as a proxy for a country's environmental performance. They find a significant negative correlation between power distance and environmental sustainability, and a positive relationship between education levels and environmental sustainability. The results suggest that cultures with lower power distance are likely to achieve higher levels of environmental sustainability. While we consider Park et al.'s contribution an important one, we retain a degree of skepticism towards its findings for several reasons. First, the authors rely on a synthetic measure of environmental performance rather than actual emissions. Second, minimal attention has been given to endogeneity issues. In this paper, we present contrasting evidence, supported by economic arguments, at the firm level, to what is reported by Park et al. Several other studies have also provided consistent evidence that culture could pervasively impact environmental outcomes (Ringov and Zollo 2007; Peng and Lin 2009; Thanetsunthorn 2015; Gallego-Álvarez and Ortas 2017).

Another recent contribution is that of Wang et al. (2021), who relate the CDP's environmental ranking scores to Hofstede's cultural scales. The authors argue for a nonlinear relationship between power distance and environmental performance.[1] Rather than availing ourselves of the CDP's ranking system, we premise this study on self-reported GHG emissions. Since emissions data are self-reported, our results are just as likely to be biased as any other study. However, the use of available emissions data instead of an arbitrary rating measure (as in Wang et al. 2021 or Park et al. 2007) is a more direct and socially impactful way of approaching the corporate environmental performance issue. Furthermore, we disagree with Wang et al.'s assessment of a nonlinear relationship, for the reasons expressed below.

2.2. The Impact of National Culture on Corporate Decisions

2.2.1. Hofstede's Cultural Dimensions

According to Schwartz (2004), culture is defined as a set of "complex of meanings, beliefs, practices, symbols, norms, and values prevalent among people in a society," and it can be the most profound cause that influences the individual decision-making process. Hofstede (1980, 2011) developed a group of indices that characterize national culture in six dimensions: individualism, masculinity, power distance, uncertainty avoidance, long-term orientation, and indulgence. Such a framework has since been applied across various fields of business research, including economics, finance, accounting, and management. For example, Karolyi (2016) shows the role of cultural distance in explaining foreign biases in international portfolio holdings. Dang et al. (2019) show that stocks in countries with high individualism have a higher crash risk.

The influence of national culture extends to corporate policies, with numerous studies confirming that Hofstede's dimensions significantly affect firms' strategies and performance (Aggarwal et al. 2016). For example, Chang and Noorbakhsh (2009) highlight how national culture influences managers' preferences for cash holdings, with firms tending to hold more cash and liquid assets in countries characterized by high uncertainty avoidance, masculinity, and a long-term orientation.

Han et al. (2010) suggest that Hofstede's cultural indices effectively capture differences in firms' earnings management practices across countries. Bae et al. (2012) show that uncertainty avoidance, masculinity, and long-term orientation are significantly and negatively related to firms' dividend policy. Moreover, Zheng et al. (2012) show that firms located in countries with high uncertainty avoidance, high collectivism, high power distance, and high masculinity tend to choose more short-term corporate debt.

Further work by Shao et al. (2013) finds that firms in individualist countries tend to have more long-term investments and R&D spending rather than short-term investments and capital expenditures compared to firms in collectivistic countries. Notably, Dodd and Zheng (2022) explore the impact of board cultural diversity, based on Hofstede's cultural dimensions, on firm performance, finding a positive relationship between cultural diversity on the board and firm performance.

Finally, prior empirical studies show that national culture significantly influences a firm's environmental and social performance. Peng and Lin (2009) study the direct and indirect impact of power distance on social and institutional capacity for the environmental sustainability index at the country level. Also, Lu and Wang (2021) document how firms in low power distance countries tend to have better environmental performance (i.e., emissions per sales relative to peers). Lu and Wang's contribution is another that holds the unit of analysis at the firm level. Yet again, environmental performance is measured with a degree of subjectivity, as carbon intensity is rated in comparison to what are deemed comparable organizations. We emphasize that it is of greater relevance to observe actual carbon emissions at the firm level without preconceptions, accounting for other firm and national characteristics in a multivariate setting. Moreover, firms in feminine, high uncertainty avoidance, and long-term-oriented cultures tend to have better environmental performance and disclose more corporate social responsibility (CSR) information (Peng and Lin 2009; Kim and Kim 2010; Wang and Bansal 2012; García-Sánchez et al. 2013; Durach and Wiengarten 2017; Lu and Wang 2021).

In addition, Griffin et al. (2021) show that individualism positively correlates with better firm environmental and social performance, while Kim and Kim (2010) suggest that firms in collectivistic cultures are more inclined to disclose more CSR information. Overall, these findings underscore the importance of cultural considerations in shaping corporate strategies and sustainability practices globally.

2.2.2. The Impact of Power Distance on Corporate Behavior and Social Responsibility

Despite the contributions noted above, the effect of culture, particularly that of power distance, on a firm's CO_2 emissions has not yet been investigated in the literature at the firm level using actual emissions rather than an environmental scale. Lamb et al. (2021) survey the extant literature on emissions and identify the following sectors as being the major sources: energy, industry, construction, transportation, and agriculture. Although the study of emissions at the national level is edifying, we maintain that it is more relevant to examine the issue at the corporate level but within the context of national characteristics, such as culture. Thus, the primary objective of our research is to focus on how power distance influences firms' CO_2 emission decisions.

Power distance is defined as how equally or unequally power is distributed within a society and the willingness of less powerful members of organizations and institutions to accept differences in power and wealth (Hofstede and Bond 1988). Countries with high power distance cultures are more autocratic, and individuals are more willing to accept such unequal power hierarchies. However, countries with a low power distance culture value equality among their members more.

The difference between high versus low power distance within societies has been shown to significantly influence corporate behaviors and outcomes, such as those related to social responsibility. For instance, research has shown that in societies with high power distance, decision-making is often based on a balance between favors and loyalty rather than open discussion for the public interest. As a result, decisions within high power distance cultures tend to focus more on expediency over ethics and sustainability (Husted 1999; Hofstede 2001; Christie et al. 2003; Vitell et al. 2003).

Cohen et al. (1996) investigate the impact of culture on ethical sensitivity in accounting and find that individuals in high power distance countries are more likely to perceive questionable business practices as ethical compared to individuals in low power distance culture countries. Such findings are further confirmed by Smith and Hume (2005) and Lee et al. (2000).

Although several works have addressed how culture affects environmental performance in one form or another (e.g., Arshed et al. 2022; Wang et al. 2021; Park et al. 2007; Lu and Wang 2021), none have broached the issue while gauging actual emissions. In addition, none of the cited contributions have attempted to contextualize this relationship from a behavioral finance perspective. Critically, none of the authors mentioned above have presented evidence of the mechanism by which power distance, a domain of culture, drives corporate environmental performance. In that regard, we expand the extant understanding on firm-level emissions by claiming that variations in culture give rise to distinct behavioral biases. These behavioral biases encapsulate the values to which each society pivots. That is, we describe the framing effect as applied to corporate decisions (Kahneman and Tversky 1981; Hirshleifer 2015). Hirshleifer argues that decision-making can be a function of how information is presented. In his seminal contribution, Hirshleifer provides examples of the mechanisms by which framing occurs: "graphical, numerical, or verbal; probabilities versus frequencies" (2015). What if information is also framed in a cultural, albeit tacit, context? When information flows towards decision makers, it is laden with cultural cues. In the case of power distance, such cultural cues insinuate compliance with authority figures, such as managers, business leaders, and the polity.

The role of framing is understood in behavioral finance through prospect theory (Kahneman and Tversky 1981). The said theory emphasizes gains in relative, rather than absolute, utility, thereby engendering loss aversion. Framing modifies decision-making in a cultural context by conveying the proverbial sticks and carrots that characterize each culture. In settings with a high degree of power distance, leaders find themselves endowed with a docile populace that accounts for the disutility associated with dissent. In turn, when management weighs the trade-offs associated with GHG emissions, there is an incentive to externalize the consequences of emissions under such amenable circumstances. Consequently, power distance fosters a particular behavioral bias that drives GHG emissions.

In sum, we extend previous research and explore the role of cultural power distance in corporate carbon emissions. More specifically, we investigate whether power distance can explain differences in firm-level carbon emissions after considering firm- and country-level characteristics. Our main hypothesis is stated formally as follows:

H1. *Firms located in countries characterized by higher power distance tend to emit more GHGs.*

Unlike previous authors, we endeavor to identify the channels by which power distance affects emissions. Discernment of those channels is an extension of the behavioral bias explanation upon which Hypothesis 1 is premised. The requisite for such channels is that they underscore the extent to which the influence of power distance varies in their presence. Intuitively, a hierarchical culture should be more effective at exacerbating a firm's emissions when power is concentrated at the corporate and societal levels. At the company level, agency conflict (Jensen and Meckling 1976; Jensen 1986) is an apt way to conceptualize managerial entrenchment. Thus, the agency conflict channel must be validated by cross-sectional evidence that emissions increase (decrease) in the presence (absence) of managerial entrenchment for firms located in high power distance nations. At the societal level, there must be corresponding evidence that when the status quo is robust, power is further concentrated to allow firms to emit more GHGs. The health of the status quo can be characterized through the presence of political, economic, and social tensions. For firms located in high power distance environments, there is an expectation that emissions will increase (decrease) when such tensions are incidental (overwhelming). To that end, this study proposes two mechanisms that moderate the relationship between power distance and firm CO_2 emission.

The extent of agency conflict is reflected in how firms pay dividends or hold debt (Jensen 1986; Crutchley and Hansen 1989). Payment of dividends is emblematic of the alignment between managerial and ownership interests, while debt is considered a remedy to executive entrenchment. Thus, we expect that in countries with increasing power distance, firms with high amounts of debt or that pay plenty of dividends would have fewer carbon emissions. Therefore, strong input from shareholders in how the firm distributes its cash flows is an indication that the influence of management is reduced.

H2. *In countries with increasing power distance, firms with high amounts of debt or that pay plenty of dividends tend to have fewer carbon emissions.*

Second, socioeconomic stability should also moderate the relationship between power distance and GHG emissions. We contend that the relationship between power distance and emissions is diminished if the people who are in power are ineffective at running a country or maintaining social order. Van Gunten (2015) posits that cooperation among technocratic elites facilitates the implementation of reforms in the face of economic crisis. Kleinman et al. (2019) encounter evidence that a measure of the rivalry between various political and economic elites is inversely related to the enforcement of accounting regulations. We take such contributions as suggesting that contentious elites hamper a country's ability to govern itself effectively. In this study's context, the degree to which elites feud with each other is expected to dilute the effect of power distance on emissions. In general, social, political, and economic instability ought to undermine the perception of adherence to authority figures. A measure such as the fragile states index, of which factionalized elites are one determinant, can moderate the relationship between power distance and corporate

GHG emissions. Beyond sociological factors, a government's indebtedness depicts the vitality of the status quo. For example, Panizza and Presbitero (2014) demonstrate that public debt is inversely related to economic growth. Cooray et al. (2017) show that there is a mutually reinforcing mechanism between corruption and public debt. People tend to hold negative perceptions of public debt (Eller et al. 2021; Ciocîrlan et al. 2023). As such, public debt is a macroeconomic factor that bodes poorly for societal leadership. Along with factionalized elites and state fragility, fiscal indebtedness implies a threatened status quo and ensuing skepticism of those who hold the reins of the social order.

H3. *Societal stability moderates the relationship between power distance and firms' emissions, such that emissions are lower for firms located in high power distance countries with increasing values of the factionalized elites index, fragile states index, and public debt as a share of GDP.*

3. Data

The data for this study consists of an international, unbalanced panel of over 1100 firms from 38 countries, observed between 2007 and 2018. The main analysis contains over 4300 observations. Firms from the United States, representing 33% of the panel, account for the most observations in the analysis.

The dependent variable in this study is the aggregate scope 1 emissions of a firm on a global scale, which has been normalized through a logarithmic transformation. A firm's global scope 1 emissions are sourced from the Carbon Disclosure Project (CDP).

The independent variable is Hofstede's (1980, 2011) power distance score for the country in which a firm is headquartered. The power distance scale has been compiled by Hofstede through a factor analysis procedure conducted upon survey data gathered from IBM employees in the 1970s. The structure of the power distance factor would be later confirmed by Hofstede in subsequent surveys. The composition of the power distance scale fundamentally addresses the issue of "human inequality" (Hofstede 2011). Examples of elements corresponding to power distance include: "Use of power should be limited and is subject to criteria of good and evil" as well as "Power is a basic fact of society antedating good or evil: its legitimacy is irrelevant" (please see Table 1 in Hofstede 2011 for further examples). While Hofstede's subsequent work confirms the stability of the power distance construct, Beugelsdijk et al. (2015) find evidence that the measure itself is relatively stable over time. Although there has been drift in terms of absolute power distance scores over time, the relative position of each country within the scale is generally unchanged. That is not to say that culture is immutable; only that the period of time covered in this study is too brief for meaningful cultural variations to take place.

Control variables for a firm's emissions follow Bolton and Kacperczyk (2023) as well as Griffin et al. (2021). As such, regressions of firms' GHG emissions control for the following firm characteristics: size (i.e., logarithmic transformation of market capitalization), book-to-market ratio, return on equity, debt-to-assets ratio, capital expenditures per assets, property plant and equipment (logarithmic), and the natural logarithm of the number of sectors in which a firm operates. Consistent with Griffin et al. (2021), financial variables have been restated to constant 2007 U.S. dollars. Such variables have been sourced from Compustat, while the number of sectors comes from the CDP. In addition, the following national characteristics are utilized as controls: net foreign direct investment inflows, GDP growth, government effectiveness, and a country's inclination towards globalization. The latter country-level factor is sourced from the KOF Swiss Economic Institute (Gygli et al. 2019; Dreher 2006), with the remaining national controls being gathered from the World Bank.

Sources of cross-sectional variation are found at both the company and national levels. At the firm level, we explore the moderating role of the debt ratio and the scale of dividend payouts (logarithmic). At the country level, the effect of power distance on firms' GHG emissions is contextualized in terms of two scales from the Fund for Peace: factionalized elites and the fragile state index, in addition to government debt expressed as a share of GDP (accessed through the World Bank).

Other variables used in robustness tests include a country's genetic distance from the country with the highest power distance score, Slovakia. Such a factor is used as an instrument for power distance and is obtained through replication data from Spolaore and Wacziarg (2017). Another variable used to validate the findings herein is Schwartz's (1999, 2008) hierarchy scale for countries. The hierarchy index is used as an alternative to the power distance measure.

All the variables in the study are winsorized using the middle 98% of measurements each year as a normative benchmark. Appendix A contains detailed definitions for the variables used herein. Tables 1 and 2 report summary statistics and correlations for the variables in the study at the firm and country levels, respectively. Panel B in Table 1 suggests that emissions are noticeably correlated with firms' dividends, investments, and net fixed assets. As for power distance, panel B in Table 2 shows strong correlations with almost all the other variables in the study. While most correlations are positive, there appear to be negative associations relative to fiscal debt, globalization, and government effectiveness.

Table 1. Summary statistics and correlations for firm characteristics.

Panel A: Descriptives						
		Mean	**Standard Deviation**	**5th Percentile**	**95th Percentile**	**N**
1	Global scope 1 emissions *	11.034	0.626	5.779	16.382	4356
2	Dividends *	4.899	0.607	0.000	7.955	4186
3	Debt ratio	0.254	0.060	0.012	0.526	4356
4	Size *	18.202	0.286	8.385	24.348	4356
5	Book-to-market	0.138	0.103	0.000	0.754	4356
6	Return on equity	0.053	7.082	−0.087	0.424	4356
7	Capital expenditure ratio	0.043	0.015	0.006	0.103	4356
8	PP&E *	7.515	0.251	4.629	10.265	4356
9	Sectors *	1.123	0.003	0.693	1.792	4356

Panel B: Rank Correlations								
	1	2	3	4	5	6	7	8
2	0.359							
3	0.260	0.084						
4	0.127	0.331	−0.116					
5	0.232	0.086	0.086	−0.690				
6	−0.111	0.210	−0.003	0.089	−0.089			
7	0.354	0.042	0.129	0.135	−0.101	0.026		
8	0.714	0.623	0.275	0.300	0.241	−0.099	0.389	
9	0.235	0.070	0.093	0.236	−0.082	−0.139	0.122	0.240

Notes: This table shows the firm characteristics and correlations for a panel of 1145 firms between 2007 and 2018. Standard deviations are for firms in the panel. Variable definitions are found in Appendix A. Each variable has been winsorized at the 1st and 99th percentile. All financial variables have been transformed to constant 2007 U.S. dollars. An asterisk (*) denotes a logarithmic transformation.

Table 2. Summary statistics and correlations for country characteristics.

Panel A: Descriptives						
		Mean	**Standard Deviation**	**5th Percentile**	**95th Percentile**	**Countries**
1	Power distance	51.421	19.544	18.000	77.000	38
2	Factionalized elites	4.057	2.414	1.119	8.462	37
3	Fragile state	44.191	22.051	20.532	80.200	37
4	Government debt as percent of GDP	66.531	41.991	14.500	151.400	38
5	Genetic distance from Slovakia	437.553	567.030	0.000	1390.000	38
6	Hierarchy	2.267	0.514	1.490	2.970	16
7	Foreign direct investment	4.754	7.363	0.357	25.685	38
8	GDP growth	2.394	1.799	−0.180	6.473	38
9	Globalization	79.434	8.756	62.793	89.984	38
10	Government effectiveness	1.132	0.734	−0.061	2.009	38

Panel B: Rank Correlations									
	1	2	3	4	5	6	7	8	9
2	0.661								
3	0.760	0.953							
4	−0.394	−0.327	−0.409						
5	0.488	0.464	0.487	−0.373					
6	0.687	0.790	0.827	−0.396	0.483				
7	0.539	0.374	0.506	−0.147	0.529	0.598			
8	0.416	0.641	0.703	−0.688	0.517	0.751	0.421		
9	−0.759	−0.774	−0.856	0.382	−0.508	−0.758	−0.747	−0.568	
10	−0.843	−0.841	−0.874	0.321	−0.358	−0.659	−0.506	−0.400	0.856

Notes: This table shows the national characteristics for countries in which a firm is headquartered. The data correspond to a panel of firms between 2007 and 2018. Standard errors describe the overall variability in the panel. Variable definitions are found in Appendix A. Each variable has been winsorized at the 1st and 99th percentile.

4. Methods

The study assesses the link between firms' global scope 1 emissions and power distance using fixed effects regression. Industry and year fixed effects are included to tackle Omitted Variable Bias (Griffin et al. 2021). Omitted variables can skew estimations upward or downward, depending on their correlation with power distance (Angrist and Pischke 2010). Additional tests are shown in Appendix A addressing alternative sources of said bias. Standard errors are clustered at the firm level using the ISIN designation to mitigate unobserved heterogeneity. Cross-sectional variation is explored through interaction terms pairing power distance with relevant company or national factors.

This study features several robustness tests. The first is aimed at curtailing endogeneity through two-stage least squares regression. Following Nash and Patel (2019), Frijns et al. (2022), Dodd et al. (2022), Choi et al. (2024), and Gaganis et al. (2020), we avail ourselves of the frontier method (i.e., genetic distance from the country with the maximum power distance) to lessen the impact of unobserved heterogeneity upon the coefficient of interest in this study. Thus, a country's power distance is instrumented by the corresponding genetic distance from the country that has the highest such score, Slovakia. In terms of relevance, Spolaore and Wacziarg (2009) present evidence showing that differences in national income are partially explained by genetic contrasts between populations. Bove and Gokmen (2018), as well as Harutyunyan and Özak (2016) argue that the relationship between genetic distance and economic outcomes can be explained by cultural variation between societies. Genetic proximity implies homogenous societal development and the rise of similar cultures and institutions, which account for distinct economic environments. Therefore, genetic distance from the country designated as the power distance frontier is a relevant factor for capturing cultural variation between countries.

Regarding the exclusion criterion, we start by noting that Spolaore and Wacziarg (2009) treat genetic distance as a temporal marker for the diffusion of ideas among common ancestors. In turn, the amalgamation of such ideas shapes national cultures. While it is possible that the same diffusion of ideas could lead to alternative explanations for disparate economic outcomes (e.g., technological advancement), we contend that culture could be, at least in part, a precursor to other forms of development.[2] Critically, Cook and Joseph (2001) identify culture, among other factors such as public policy and the role of universities, as a reason by which other nations have been unable to replicate Silicon Valley. In sum, economic activity necessitates that a cultural context occur. Moreover, culture forebears institutional and technological advancement, and common ancestry homogenizes cultural paradigms. Hence, we maintain that the genetic differences from the power distance frontier meet the exclusion requirement that would make it a suitable instrument for the independent variable in this study. Furthermore, we argue that for the instrumented variable to be correlated with the model's error term, it must be true that certain ethnicities have an intrinsic predisposition to generate more GHGs through economic activity. We hold such an argument to be, at best, less plausible than Spolaore and Wacziarg's cultural diffusion theory and at worst a fallacy.

Another robustness test accounts for sample bias, given the preponderance of observations from U.S. firms. To allay concerns that the power distance measure is nothing more than a contrast vis-à-vis the U.S., we introduce an indicator into the specification denoting whether a firm is based in that country. The final robustness check supplants Hofstede's power distance measure with a homologous alternative, Schwartz's (1999, 2008) hierarchy index. Power distance and hierarchy are conceptually adjacent concepts. Hofstede (2011) describes power distance as "the extent to which less powerful members of organizations and institutions... expect that power is distributed unequally". Schwartz (2006) defines hierarchy as a social norm in which "unequal distribution of power, roles, and resources" is accepted. In either case, the corresponding scale conveys a cultural inclination towards an imbalance of power. Therefore, replacing power distance with hierarchy in the regression of firms' emissions should result in similarly signed coefficients. Such a procedure would affirm the key result in this study despite any concerns that the power distance measure inadequately measures the cultural stance that we wish to capture through the analysis herein.

5. Results

This study's objective is to show that firms located in countries with increasing power distance scores expend more GHG emissions. This is because such a cultural orientation inculcates acquiescence towards authority figures. Cultural cues afford corporate leadership less accountability in higher power distance countries, while there is an incentive to emit more GHGs, since the consequences of emissions are distributed throughout society. Therefore, the task at hand is to present evidence of how culture impels a behavioral bias that fosters an externality in the form of global scope 1 emissions.

The main findings for this study are displayed in Table 3, in which global emissions are regressed on the power distance score for the country in which a firm is headquartered, along with firm and country controls, industry and year fixed effects, as well as standard errors clustered at the firm level. Column 1 in Table 3 presents a partial specification in which only power distance and fixed effects are entered into the regression. Columns 2 and 3 introduce firm and national controls, respectively. Column 4 presents the full specification of the GHG emissions model, as described in the methodology section. Across all specifications, the coefficient of the power distance variable is positive and significant, at least at 95% confidence. The power distance coefficient for the full specification implies a statistically and economically impactful increase in a firm's GHG emissions, given the cultural orientation of its host country (β = 0.016, t = 2.12, p = 0.034). Therefore, an increase of one standard deviation in the power distance scale is expected to increase emissions by 37%.[3] To offer context in terms of the effect of power distance, as depicted here, an increase of one standard deviation in said scale is equivalent to contrasting firms in Japan (the median country at a score of 54) against firms in Singapore, which has a score of 74. Another such contrast would be comparing firms based in Austria (the minimum power distance country at 18) with the Netherlands, which scores 38 on the said scale. The power distance coefficients throughout Table 3 affirm Hypothesis 1.

Table 3. The effect of power distance on firms' greenhouse gas emissions.

	Global Scope 1 Emissions			
	(1)	**(2)**	**(3)**	**(4)**
Power distance	0.039 ***	0.041 ***	0.017 *	0.016 *
	(0.006)	(0.006)	(0.007)	(0.008)
Size		−0.092 ***		−0.078 ***
		(0.014)		(0.015)
Book-to-market		−0.035		−0.009
		(0.181)		(0.177)
Return on equity		−0.003 ***		−0.003 ***
		(0.001)		(0.001)
Debt ratio		0.097		−0.007
		(0.355)		(0.361)
Capital expenditure ratio		3.720 +		2.049
		(2.150)		(2.122)
PP&E		0.971 ***		0.986 ***
		(0.053)		(0.053)
Sectors		0.675 ***		0.573 ***
		(0.170)		(0.165)
Foreign direct investment			−0.021 *	−0.014
			(0.009)	(0.010)
GDP growth			−0.046 +	−0.044 +
			(0.028)	(0.026)
Globalization			−8.919 ***	−4.991 ***
			(1.122)	(1.052)
Government effectiveness			0.480 *	−0.216
			(0.187)	(0.174)
Constant	8.900 ***	2.601 ***	48.700 ***	26.000 ***
	(0.297)	(0.447)	(4.941)	(4.750)
Observations	5015	4351	4988	4351
Within R-square	0.0410	0.435	0.0867	0.452

Notes: This table shows regressions of firm's global scope 1 emissions on the power distance measure for a country in which they are headquartered, as well as control variables. The data consists of a panel of 1145 firms between 2007 and 2018. The specifications include year and industry fixed effects, as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

The figures in Table 3 permit us to make additional comments on the covariates of GHG emissions. First, a comparison of the coefficients of determination suggests that firm-level characteristics are more important than national features. The within-groups r-square for column 2, in which company controls are entered, is five times the size of the corresponding coefficient in column 3, where national controls are introduced. Second, certain firm characteristics are more predictive of emissions than others. According to the results in column 4, larger firms, by capitalization (β = −0.779, t = −5.36, p = 0.000), and high-performing firms, in terms of return on equity (β = −0.003, t = −3.54, p = 0.000), tend to have lower emissions. Also, firms with more fixed assets (β = 0.986, t = 18.63, p = 0.000) as well as diversified firms (β = 0.573, t = 3.48, p = 0.001) expend more GHGs. Third, firms located in countries with increasing income (β = −0.044, t = −1.78, p = 0.076) and that are more inclined towards globalization (β = −4.991, t = −4.75, p = 0.000) have lower scope 1 emissions.

Table 4 presents a series of robustness tests that validate the results from Table 3. Columns 1 and 2 display the results of the instrumental variable procedure. In the first stage, shown in column 1, power distance is instrumented by genetic distance from Slovakia. The instrument in question is a significant predictor of power distance in the presence of the covariates used in the emissions model (β = 0.011, t = 8.99, p = 0.000). The significance of the genetic distance coefficient suggests that the proposed instrument is empirically relevant. Moreover, the Kleibergen–Paap rank Lagrange multiplier test, which is robust to heteroskedasticity, suggests that the instrument for power distance is not weakly identified (p = 0.000). That is, the correlation between genetic distance from Slovakia and power distance is sufficiently informative to be used in a two-stage least squares (2SLS) procedure (Kleibergen and Paap 2006; Lu et al. 2018). The coefficient for the instrumented version of power distance, shown in column 2, validates the key finding in this study since it is similarly signed as any of the power distance coefficients from Table 3 (β = 0.073, t = 3.27, p = 0.001). We conclude that the effect of power distance on a firm's GHG emissions is robust to endogeneity.

The coefficient reflecting the effect of power distance in its instrumented form, shown in Column 2 of Table 4, implies that an increase of one standard deviation in power distance equates to an increase in GHG emissions of 319.77% ($e^{0.0734 \times 19.544} - 1 = 3.1977$). This effect is drastically larger than the one obtained from the OLS estimator shown in Table 3. Yet, we err in favor of the OLS coefficient, as parameters deduced from two-stage least squares are known to be less precise. To illustrate the point, the mean square error for the regression in Column 3 of Table 3 is 1.7945, while the corresponding value for the 2SLS regression is 1.857. Note that the only difference between such regressions is that the power distance coefficient is entered into its instrumented form in the latter estimation. Hence, the coefficient derived from the OLS regression, as seen in Column 3 of Table 3, is a more apt depiction of the effect of power distance on corporate GHG emissions. Moreover, we construe the findings from the 2SLS procedure as edifying in that they support the main result of this study, despite concerns for possible endogeneity. The tests undertaken in the remainder of this article employ the power distance scale in its original (i.e., non-instrumented) form.

Column 3 in Table 4 adds another control to the regression of global scope 1 emissions. Since a substantial number of observations in the sample come from the U.S., it is possible that the power distance coefficient might be susceptible to omitted variable bias along an unspecified national factor associated with being headquartered in the United States. Such a form of endogeneity is not likely to be abated through the combination of fixed effects and clustering of standard errors. Moreover, since power distance varies by country, it is challenging to account for the possible source of country-level endogeneity without including a precise factor. Therefore, a dummy variable for firms based in the U.S. is introduced to the regression to address endogeneity from an unobserved national factor. Consistent with the figures in Table 3, the power distance coefficient in column 3 of Table 4 remains positive and significant at 95% confidence (β = 0.016, t = 2.04, p = 0.042).[4] There may be additional firm and national characteristics related to GHG emissions absent from the model. Although we are confident that the industry fixed effects and standard errors clustered at the firm level alleviate much of the concern regarding omitted variable bias at the firm level, additional tests may be warranted. Table A3 in Appendix A shows supplementary regressions of various forms aimed at curtailing bias in the power distance coefficient through either additional controls or alternative fixed effects layouts.

Table 4. Robustness tests.

	Power Distance	Global Scope 1 Emissions		
	(1)	(2)	(3)	(4)
Power distance		0.073 **	0.016 *	
		(0.022)	(0.007)	
Genetic distance Slovakia	0.011 ***			
	(0.001)			
Hierarchy				1.140 *
				(0.508)
Size	0.304 ***	−0.113 ***	−0.175 **	−0.0832 ***
	(0.066)	(0.020)	(0.066)	(0.023)
Book-to-market	1.237 *	−0.066	−0.060	0.03
	(0.554)	(0.184)	(0.185)	(0.178)
Return on equity	−0.007 *	−0.002 *	−0.003 **	−0.001
	(0.004)	(0.001)	(0.001)	(0.004)
Debt ratio	1.168	−0.039	−0.125	0.717
	(1.656)	(0.370)	(0.371)	(0.462)
Capital expenditure ratio	−38.710 ***	4.419 +	1.351	0.649
	(8.739)	(2.321)	(2.163)	(3.304)
PP&E	0.908 ***	0.936 ***	1.053 ***	0.929 ***
	(0.228)	(0.059)	(0.077)	(0.080)
Sectors	0.104	0.523 **	0.556 ***	0.559 *
	(0.804)	(0.177)	(0.164)	(0.254)
Foreign direct investment	−0.035	−0.012	−0.015	0.015
	(0.034)	(0.010)	(0.010)	(0.027)
GDP growth	−0.175 +	−0.001	−0.035	−0.093 *
	(0.105)	(0.026)	(0.0244)	(0.046)
Globalization	−6.745	−1.220	−4.815 ***	1.950
	(10.390)	(1.767)	(1.054)	(2.645)
Government effectiveness	−16.550 ***	0.323	−0.256	−0.849 *
	(1.552)	(0.264)	(0.174)	(0.358)
U.S. firm			−1.307	
			(0.842)	
Constant	85.640 +		27.080 ***	−5.354
	(43.940)		(4.803)	(11.750)
Observations	4351	4351	4351	2320
Within R-square	0.578		0.456	0.460
Kleibergen–Paap rk LM	66.07			
[p-value]	[0.0000]			
Cragg–Donald Wald F	495.10			
Kleibergen–Paap Wald rk F	80.82			

Notes: This table shows an instrumental variables regression (columns 1 and 2) and fixed effects regression of firm's global scope 1 emissions on power distance (column 3) or hierarchy (column 4) measures for the country in which they are headquartered, as well as control variables. The data consist of a panel of firms between 2007 and 2018. The specifications include year and industry fixed effects, as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

Yet another robustness test deals with measurement errors in the power distance scale. Several authors have remarked on how cultural stances are difficult to quantify (Hofstede 1980; Guiso et al. 2006; Nash and Patel 2019). Hofstede (1980) sums up the inherent difficulty in measuring any aspect of culture by addressing the intangible nature of human behavior: "What we actually do when we try to understand social systems is use models. Models are lower-level systems that we can better understand and that we substitute for what we cannot understand. We simplify because we have no other choice"." In the face of such subjectivity, another way to validate our findings is to seek an alternative measure of the power distance construct. Nash and Patel note that many researchers have utilized the cultural scales developed by Schwartz. Among those scales, hierarchy presents itself as a suitable option for power distance. The key methodological difference between Hofstede's and Schwartz's scales is that the former attempts to uncover latent collective "mental programming" (Hofstede 1980), while the latter aims to document value orientations within groups (Schwartz 2006). Since Hofstede and Schwartz collected their data through surveys, the distinction in philosophical approaches leads to profound psychometric implications that go beyond the scope of this work. Furthermore, it is not within our purview to judge whether power distance or hierarchy measures the underlying construct more adequately. Rather, we limit ourselves to employing hierarchy as a substitute for power distance in a robustness test of our main finding.

Schwartz's (1999, 2008) hierarchy measure replaces the power distance in column 4 of Table 4. The result is a coefficient that bears the same sign as our proxy of choice (β = 1.140, t = 2.24, p = 0.025). An increase of one standard deviation in the hierarchy implies that firms increase their GHG emissions output by 80%.[5] Such a result is reassuring in that hierarchy and power distance are positively correlated and conceptually similar. Furthermore, the power distance measure was originally gathered by Hofstede in the late 1960s and early '70s (Nash and Patel 2019), while Schwartz's hierarchy was observed through a different survey deployed between 1988 and 2007 (Schwartz 2008). Since the coefficients for power distance and hierarchy match despite their varying construction, we posit that such an outcome attests to the validity of our findings. In sum, there is abundant evidence that culture, specifically power distance, gives rise to a societal value system that influences corporate conduct, such that firms are more likely to emit GHGs due to deference to authority figures.

We contend that a cultural preference for power disparity (i.e., power distance) allows firms to emit more GHGs out of a behavioral bias that emphasizes respect for authority. For such a claim to be substantiated, it is necessary to present mechanisms that underlie the authority of management at both the firm and national levels. Moreover, it is essential to demonstrate that the relationship between power distance and emissions is moderated by such mechanisms. To that end, this study proposes an agency conflict channel and a socioeconomic channel to explain how power distance might impact emissions.

The evidence in support of the agency conflict mechanism (Hypothesis 2) is displayed in Table 5. The main specification for GHG emissions is modified to include an interaction term combining power distance and the debt-to-assets ratio (column 1), the interaction between power distance and logarithmic dividends (column 2), as well as the corresponding main effects. The interaction coefficient in column 1 suggests that firms with high debt obligations that are based in countries with increasing power distance tend to emit fewer GHGs (β = −0.060, t = −2.12, p = 0.034). Similarly, the interaction coefficient in column 2 implies that companies headquartered in high power distance countries and that pay more dividends have lower emissions (β = −0.007, t = −2.27, p = 0.023). Jensen's (1986) seminal contribution identifies debt as a mechanism for subverting agency conflict. The payment of dividends is the very disgorgement of funds from exploitative management. In combination, the results from Table 5 suggest that the presence of agency conflict mediates the relationship between power distance and emissions. We subscribe to the idea that firms with increasing debt or dividend payments are revealing of management that is not entrenched. That is, the presence of outside interests, whether from creditors or shareholders, stands opposed to the influence of management, such that the effect of power distance on emissions is attenuated. When outside interests prevail, the perceived authority of management diminishes in such a way that the behavioral bias to concede to executive discretion is less relevant. Conversely, managerial entrenchment in settings where power imbalances are accepted exacerbates emissions.

The findings related to the socioeconomic channel, which support Hypothesis 3, are provided in Table 6, where interactions between power distance and the factionalized elites index (column 1), fragile state index (column 2), and government debt as a share of GDP (column 3) are tested. The interaction term involving factionalized elites indicates that firms located in countries with increasing power disparity and a fragmented, contentious elite are likely to have lower emissions (β = −0.007, t = −2.22, p = 0.026). Such a result is noteworthy in that it shows how the behavioral bias arising from cultural regard for authority is weakened by the instability wrought through rivalry among the upper class. In column 2, the interaction term with the fragile state index reveals that firms based in countries with increasing values in said scale, as well as higher power distance, emit fewer emissions (β = −0.001, t = −3.36, p = 0.001). Therefore, the cultural cues that favor power imbalance, which in turn drive emissions, are overcome in the face of vulnerabilities at the societal level. Lastly, in column 3, the interaction term with public debt shows that firms located in countries with high power distance and that bear a high fiscal debt burden expend less GHGs (β = −0.001, t = −2.81, p = 0.005). The result is construed as signaling a weakening of the relationship proposed herein when the government finances a deficit through debt. Taken together, the findings in Table 6 suggest that compliance with authority figures (i.e., power distance) is eroded when societal challenges abound, such as when powerful political or economic groups quarrel to the detriment of society, when the social order is threatened, or when fiscal debt is excessive. In turn, the mechanism that raises emissions as a function of power distance weakens such that emissions decline.

Table 5. The agency conflict channel.

	Global Scope 1 Emissions	
	(1)	**(2)**
Power distance	0.030 **	0.052 **
	(0.010)	(0.018)
Power distance x Debt ratio	−0.060 *	
	(0.028)	
Power distance x Dividends		−0.007 *
		(0.003)
Dividends		0.304 *
		(0.138)
Size	−0.075 ***	−0.077 ***
	(0.015)	(0.015)
Book-to-market	0.016	−0.067
	(0.176)	(0.177)
Return on equity	−0.003 ***	−0.002
	(0.001)	(0.004)
Debt ratio	2.745 +	−0.015
	(1.422)	(0.372)
Capital expenditure ratio	2.037	1.938
	(2.125)	(2.048)
PP&E	0.979 ***	0.987 ***
	(0.053)	(0.057)
Sectors	0.569 ***	0.524 **
	(0.165)	(0.163)
Foreign direct investment	−0.015	−0.016
	(0.010)	(0.010)
GDP growth	−0.047 +	−0.048 +
	(0.024)	(0.025)
Globalization	−4.979 ***	−4.278 ***
	(1.045)	(1.105)
Government effectiveness	−0.279	−0.235
	(0.176)	(0.174)
Constant	25.430 ***	21.410 ***
	(4.700)	(5.224)
Observations	4351	4180
Within R-square	0.454	0.452

Note: This table shows regressions of firm's global scope 1 emissions on the power distance measure for a country in which they are headquartered, as well as interactions with moderating factors and control variables. The data consist of a panel of firms between 2007 and 2018. The specifications include year and industry fixed effects, as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

Table 6. The socioeconomic channel.

	Global Scope 1 Emissions		
	(1)	**(2)**	**(3)**
Power distance	0.033 **	0.039 **	0.076 ***
	(0.010)	(0.012)	(0.023)
Power distance × Factionalized elites	−0.007 *		
	(0.003)		
Power distance × Fragile State		−0.001 ***	
		(0.000)	
Power distance × Government debt as percent of GDP			−0.001 **
			(0.000)
Size	−0.053 **	−0.056 ***	−0.038 +
	(0.018)	(0.014)	(0.022)
Book-to-market	0.020	−0.009	0.026
	(0.178)	(0.176)	(0.178)
Return on equity	−0.003 ***	−0.003 ***	−0.003 ***
	(0.001)	(0.001)	(0.001)
Debt ratio	−0.011	0.005	0.023
	(0.359)	(0.356)	(0.369)
Capital expenditure ratio	2.332	2.142	2.826
	(2.106)	(2.069)	(2.101)
PP&E	0.951 ***	0.954 ***	0.932 ***
	(0.055)	(0.053)	(0.054)
Sectors	0.546 ***	0.541 ***	0.561 ***
	(0.164)	(0.163)	(0.170)
Foreign direct investment	−0.014	−0.015	−0.021 *
	(0.010)	(0.010)	(0.010)
GDP growth	−0.021	−0.029	−0.026
	(0.026)	(0.024)	(0.027)
Globalization	−6.045 ***	−4.141 ***	−4.688 ***
	(1.168)	(1.249)	(1.213)
Government effectiveness	−0.144	0.263	0.0614
	(0.214)	(0.225)	(0.253)
Factionalized elites	0.430 *		
	(0.183)		
Fragile state		0.093 ***	
		(0.017)	
Government debt as percent of GDP			0.046 **
			(0.016)
Constant	29.290 ***	18.750 **	20.690 ***
	(5.102)	(5.755)	(5.379)
Observations	4343	4343	4124
Within R-square	0.459	0.464	0.455

Note: This table shows regressions of firm's global scope 1 emissions on the power distance measure for a country in which they are headquartered, as well as interactions with moderating factors and control variables. The data consist of a panel of firms between 2007 and 2018. The specifications include year and industry fixed effects, as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

We have shown that where power inequity is accepted, firm emissions are higher (Table 3). We claim that the relationship is impelled by a behavioral bias wherein regard for authority creates a path of least resistance for corporate policy to engage in an externality in the form of GHG emissions. Such a hypothesis has been substantiated by demonstrating that the effect of power distance on emissions is stronger when management is entrenched (Table 5) and when socioeconomic conditions reinforce the status quo (Table 6).

We conclude our analysis by drawing out some empirical regularities. Thus, we proceed by analyzing GHG emissions separately for several of the industry clusters identified by Kenneth French.[6] The results are found in Table 7. The impact of power distance on emissions is strongest in the consumer durables ($\beta = 0.099$, $t = 3.06$, $p = 0.003$) and healthcare (β = 0.051, t = 2.09, p = 0.04) industries. The sign of the power distance coefficient is unexpectedly negative in the chemicals industry (β = −0.058, t = −3.21, p = 0.002). Due to probable type 2 errors, we reserve comments on the coefficients that are not significant in other industries, except for utilities (β = 0.026, t = 1.55, p = 0.126). The lack of significance at any conventional level for the power distance coefficient in the utilities subsample is expected, as firms within that sector are highly regulated. In such an environment, behavioral bias is unlikely to be of much importance. The differences in the sign and magnitude of the power distance coefficient between subsamples could be due to the idiosyncrasies within each sector (e.g., regulations, industry practices, competition, inherent variations in corporate emissions policies). Such differences merit further investigation that is specific to a particular sector. Furthermore, it would be advantageous to undertake follow-up studies for specific industries using larger sample sizes than those depicted in Table 7 to avoid the aforementioned type 2 error issue. We maintain that at the sector level, the absence of an effect does not imply an overall disassociation between power distance and GHG emissions. Rather, we subscribe to the idea that either the smaller sample size affects statistical power, or that omitted variables at the sectorial level may have produced an estimate that is biased towards zero. After all, the results from Tables 3, 4 and A3 do account for sector differences through the inclusion of fixed effects while validating the proposed effect through various specifications and estimators.

Table 7. Analysis by industry sectors.

Industry Cluster	Consumer Nondurables	Consumer Durables	Manufacturing	Oil, Gas, and Coal Extraction	Chemicals and Allied Products	Business Equipment	Telephone and Television Transmission	Utilities	Wholesale, Retail, and Services	Healthcare, Medical Equipment, and Drugs
Power distance	−0.009	0.099 **	0.020	−0.044	−0.058 **	0.020	−0.032	0.026	0.019	0.050 *
	(0.013)	(0.032)	(0.016)	(0.059)	(0.018)	(0.025)	(0.027)	(0.017)	(0.018)	(0.024)
Size	−0.200 ***	−0.110 *	−0.113 **	−0.039	0.041	−0.067	−0.155 *	0.078	−0.060	−0.127 ***
	(0.037)	(0.049)	(0.036)	(0.120)	(0.054)	(0.043)	(0.060)	(0.096)	(0.079)	(0.033)
Book-to-market	−0.518	0.238	−0.199	0.797	1.348	0.248	−1.402	2.210 *	0.614	−1.851 *
	(0.884)	(0.433)	(0.608)	(1.220)	(1.372)	(0.440)	(1.515)	(1.061)	(0.445)	(0.924)
Return on equity	0.156	0.001	−0.007 $^{+}$	−0.909	0.115 ***	−0.003 **	−0.042	−0.440 $^{+}$	0.013	0.136
	(0.205)	(0.004)	(0.004)	(1.487)	(0.032)	(0.002)	(0.075)	(0.253)	(0.01)	(0.223)
Debt ratio	−3.235 ***	2.179	−0.192	0.075	2.021	1.352	−1.286	−1.452	1.747 $^{+}$	−1.124
	(0.915)	(1.568)	(0.909)	(3.838)	(1.465)	(0.950)	(1.930)	(1.666)	(0.882)	(0.822)
Capital expenditure ratio	4.105	9.380 $^{+}$	−7.003	1.908	12.850 **	−2.593	−3.850	−12.320	5.390	−12.650 *
	(3.431)	(5.332)	(5.866)	(9.146)	(4.763)	(3.942)	(6.305)	(9.181)	(7.672)	(6.195)
PP&E	1.116 ***	1.100 ***	0.933 ***	1.307 ***	1.473 ***	1.110 ***	0.742 ***	0.655 **	1.150 ***	0.886 ***
	(0.108)	(0.181)	(0.176)	(0.335)	(0.190)	(0.133)	(0.136)	(0.211)	(0.155)	(0.100)
Sectors	0.650 *	0.588	0.470	0.921	0.214	0.408	2.718 $^{+}$	1.491 *	0.009	−0.261
	(0.256)	(0.551)	(0.349)	(1.406)	(0.427)	(0.505)	(1.464)	(0.650)	(0.594)	(0.323)
Foreign direct investment	−0.018	−0.008	−0.036	0.018	0.022	−0.024	0.016	0.068	−0.001	−0.030
	(0.013)	(0.008)	(0.022)	(0.051)	(0.015)	(0.022)	(0.009)	(0.066)	(0.021)	(0.034)
GDP growth	−0.132 *	−0.364 *	0.049	−0.227	0.017	−0.064	−0.069	−0.064	−0.190	−0.142
	(0.057)	(0.153)	(0.044)	(0.252)	(0.071)	(0.106)	(0.119)	(0.105)	(0.146)	(0.113)
Globalization	−8.751 ***	1.357	−7.090 ***	−21.650 $^{+}$	−17.630 ***	−9.036 **	2.613	−2.187	3.043	−5.979 **
	(2.429)	(3.463)	(1.877)	(10.730)	(2.908)	(3.311)	(4.199)	(2.968)	(3.070)	(1.763)
Government effectiveness	−0.285	−0.350	0.282	−0.906	0.382	−0.335	−2.143 ***	1.220 **	−1.114 $^{+}$	0.140
	(0.518)	(0.501)	(0.351)	(1.310)	(0.572)	(0.589)	(0.486)	(0.460)	(0.598)	(0.897)
Constant	46.010 ***	−7.525	36.120 ***	100.500 $^{+}$	78.750 ***	41.510 **	−3.180	13.420	−10.180	31.310 ***
	(9.778)	(15.95)	(8.433)	(50.630)	(12.660)	(14.720)	(18.900)	(12.480)	(13.280)	(8.627)
Observations	389	198	847	120	347	581	131	246	291	303
Within R-square	0.686	0.637	0.490	0.582	0.606	0.561	0.625	0.393	0.585	0.634

Notes: This table shows regressions of firm's global scope 1 emissions for various industry cluster subsamples. The data consist of a panel of firms between 2007 and 2018. The specifications include year and industry fixed effects, as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{+}$ $p < 0.10$.

6. Discussion and Conclusions

In this paper, we have expanded our understanding of how culture influences corporate environmental behavior. We examine the relationship between one dimension of national culture, power distance, and firms' carbon dioxide (CO_2) emissions.

Using an extensive international panel of over 1100 firms from 38 countries, we find a significant positive relationship between power distance and firms' CO_2 emissions. Firms headquartered in countries characterized by higher power distance tend to emit more GHGs, even after controlling for firm- and country-level characteristics. Furthermore, our robustness checks confirm the validity of our findings against potential endogeneity concerns. The instrumented estimates suggest a stronger causal relationship between power distance and emissions than initially indicated by OLS estimates. This finding underscores the importance of considering cultural dimensions when designing environmental policies and interventions aimed at reducing emissions. We also find that agency conflict and socioeconomic stability are the moderation channels that moderate the impact of power distance on firm-level CO_2 emissions.

Overall, this study highlights the importance of considering cultural factors, particularly power distance, in understanding firms' carbon emission decisions. Our findings provide important insights into the role of power distance in shaping firms' emission decisions and have several implications. For policymakers, we suggest that understanding the influence of cultural dimensions, such as power distance, could enhance the effectiveness of multilateral environmental agreements. These agreements often focus primarily on economic and technological aspects; however, incorporating cultural insights could lead to more tailored and thus more successful environmental policies. For example, countries with high power distance might benefit from top-down enforcement strategies that emphasize compliance and clear directives from authorities, while countries with low power distance might respond better to policies that promote collaborative and participative approaches in environmental decision-making.

For corporate insiders, we propose that managers consider the cultural context when designing environmental strategies. In organizations within high power distance cultures, leadership should be more directive in implementing environmental policies, ensuring clear instructions and strict controls. Conversely, in low power distance cultures, engaging employees in decision-making and fostering an inclusive dialogue about sustainability practices could be more effective. This approach helps not only in formulating relevant policies but also in enhancing employee commitment and compliance.

For investors and external stakeholders, understanding the role of cultural factors such as power distance could inform their engagement strategies. Investors can tailor their expectations and investment approaches based on how cultural factors influence environmental management within firms. For instance, investors could focus on supporting firms that demonstrate an understanding of the cultural dimensions that affect environmental performance, potentially influencing corporate governance practices towards better sustainability outcomes.

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Appendix A

Table A1. Variable definitions.

Variable	Definition	Source
Book-to-market	A control variable observed as the ratio of a firm's book value of equity to its market value.	Compustat (seq, csho, prccd)
Capital expenditure ratio	A control variable expressed as the ratio of a firm's capital expenditures to its book value of assets.	Compustat (capx, at)
Debt ratio	A moderating factor as well as control variable, computed as the ratio of debt to assets.	Compustat (dlc, dltt, at)
Dividends	A moderating factor, observed as the natural logarithm of one plus a firm's cash dividends.	Compustat (dv)
Factionalized elites	A moderating factor quantifying a lack of social cohesion given rivalries among a country's elites along ethnic, religious, and socioeconomic differences	The Fund for Peace
Foreign direct investment	A control variable measuring foreign direct investment inflows into a country as a share of its GDP.	The World Bank
Fragile state	A moderating factor operationalized as a ranking measure of a country's "fragility" given challenges to its social cohesion, economic state, political environment, and social order.	The Fund for Peace
GDP growth	A control variable expressing the annual rate of growth of a country's GDP.	The World Bank
Genetic distance from Slovakia	An instrument for power distance operationalized as the difference in frequency between alleles that are common in Slovakia and each other country.	Spolaore and Wacziarg (2017)
Global scope 1 emissions	The dependent variable in the study, corresponding to a firm's global aggregate scope 1 emissions. The variable was normalized by taking the natural logarithm of one plus its value.	Carbon Disclosure Project
Globalization	A control variable measuring a country's openness to globalization given prevailing political, economic, and social factors.	KOF Swiss Economic Institute
Government debt as percent of GDP	A moderating factor that is observed as the ratio of a country's public debt to its GDP.	The World Bank
Government effectiveness	A control variable that quantifies the quality of a country's public services, policies, and the corresponding government's ability to formulate and implement such policies.	The World Bank
Hierarchy	An alternative to the independent variable in this study, which measures conformity towards inequities in the social order.	Schwartz (2008)
Power distance	The independent variable in the study, which measures the extent to which power imbalances are tolerated in a country's culture.	Geert Hofstede
PP&E	A control variable observed as the natural logarithm of one plus a firm's book value for property, plant, and equipment.	Compustat (ppent)
Return on equity	A control variable computed as the ratio of a firm's net income to its book value of equity.	Compustat (ni, seq)
Sectors	A control variable calculated as the natural logarithm of one plus the number of sectors in which a firm participates.	Carbon Disclosure Project
Size	A control variable expressed as the natural logarithm of one plus a firm's market capitalization.	Compustat (cscho, prccd)
U.S. firm	A control variable in the form of an indicator denoting whether a firm is headquartered in the United States.	Compustat (country)

Table A2. Countries represented in the study.

Country	Number of Firms	Mean Log Emissions	Standard Deviation
Australia	92	11.72296	2.748747
Austria	38	12.29426	3.357429
Belgium	41	10.03355	1.141079
Brazil	76	11.82196	2.476541
Canada	8	11.66184	1.070922
Chile	8	13.68941	1.531227
China	2	12.59879	3.793328
Hong Kong	8	11.44223	4.996441
Colombia	8	13.4106	3.117098
Denmark	71	8.120214	3.110313
Finland	127	9.969114	3.956354
France	234	10.82345	3.317557
Germany	187	11.99184	3.288026
Greece	2	9.980393	0.429913
Hungary	8	10.07157	0.132115
India	88	11.89611	2.887991
Ireland	29	7.541746	2.033273
Israel	8	14.16981	0.103474
Italy	83	12.21795	3.297049
Japan	978	11.59429	2.204139
Luxembourg	7	13.03363	0.086241
Malaysa	1	6.202536	0
Mexico	9	12.47752	1.400525
Netherlands	74	9.516177	2.71876
New Zealand	20	10.09884	4.422061
Norway	99	9.342451	4.009823
Philippines	5	12.18317	2.823668
Portugal	34	12.87169	2.900431
Republic of Korea	46	11.50173	2.586552
Russian Federation	6	16.03167	1.921682
Singapore	6	9.246007	2.149876
Spain	132	11.74879	3.580653
Sweeden	163	7.716819	3.701117
Switzerland	102	7.907221	2.72112
Thailand	13	13.41765	3.24026
Türkiye	21	11.42777	1.859792
United Kingdom	93	9.185903	2.832727
United States of America	1429	11.35527	2.974962

Table A3. Additional robustness tests.

	Global Scope 1 Emissions		
	(1)	**(2)**	**(3)**
Power distance	0.016 *	0.015 +	0.022 *
	(0.008)	(0.007)	(0.009)
Multiple sectors	0.288		
	(0.231)		
Environmental taxes (share of GDP)			0.406 *
			(0.179)
Environmental policy stringency			−0.037
			(0.136)
Country share of global scope 1 emissions			1.337 +
			(0.762)
Size	−0.079 ***	−0.074 ***	−0.090 **
	(0.015)	(0.015)	(0.028)

Table A3. *Cont.*

	Global Scope 1 Emissions		
	(1)	**(2)**	**(3)**
Book-to-market	−0.009	0.119	−0.045
	(0.178)	(0.188)	(0.179)
Return on equity	−0.003 ***	−0.003 **	−0.003 ***
	(0.001)	(0.001)	(0.001)
Debt ratio	−0.027	−0.006	−0.034
	(0.361)	(0.350)	(0.363)
investment	2.038	−1.081	1.449
	(2.107)	(1.858)	(2.172)
Capital expenditure ratio	0.984 ***	0.975 ***	1.059 ***
	(0.053)	(0.049)	(0.052)
Sectors	0.316	0.567 ***	0.528 **
	(0.242)	(0.156)	(0.169)
Foreign direct investment	−0.015	−0.018 *	−0.011
	(0.010)	(0.009)	(0.009)
GDP growth	−0.044 +	−0.040 +	−0.041 +
	(0.025)	(0.023)	(0.024)
Globalization	−4.987 ***	−5.126 ***	−6.651 ***
	(1.050)	(1.062)	(1.330)
Government effectiveness	−0.214	−0.221	0.069
	(0.174)	(0.161)	(0.253)
Constant	26.151 ***	26.812 ***	31.633 ***
	(4.736)	(4.840)	(5.777)
Observations	4351	4354	4212
Within R-square	0.453	0.464	0.481
Industry fixed effects	Yes	No	Yes
Primary sector fixed effects	No	Yes	No

Notes: This table shows regressions of firm's global scope 1 emissions on the power distance measure for a country in which they are headquartered, as well as control variables. The specifications include year as well as standard errors clustered at the firm level (shown in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$.

Table A3 shows additional regressions of firms' GHG emissions on power distance to address missing variables at the firm and national levels. In column 1, we attempt to control for unobserved sector characteristics by introducing an indicator of when a firm participates in more than one sector. Column 2 further explores endogeneity along the sector dimension by replacing the industry fixed effects from the original specification (as in Table 3) with the primary sector fixed effects per the CDP. The regression in Table 3 attempts to account for some of the variance due to unobserved national policies, such as energy efficiency regulation, carbon pricing, and renewable energy initiatives. Such effects are partially captured by introducing a covariate for the percentage of global scope 1 emissions attributed to a country. The share of global Scope 1 emissions (direct emissions from owned or controlled sources) is used as a proxy to highlight the relative contribution of a country to global emissions. It provides a contextual baseline for understanding the scale of emissions that national policies aim to regulate (International Energy Agency 2020; Le Quéré et al. 2018).

Additionally, the specification in column 3 controls for a country's tax revenue related to environmental regulation as a share of GDP, and an index describing the strength of environmental regulation in a country, both of which have been sourced from the OECD. Environmental taxes, as a share of GDP, serve as a proxy for a country's commitment to decarbonization because they reflect the extent to which a government is leveraging fiscal policy to incentivize reductions in environmental harm. These taxes directly impact the cost structure for businesses and consumers, encouraging more sustainable practices and investment in green technologies (OECD 2010; Sterner 2007). The OECD's Environmental Policy Stringency Index is a composite measure designed to capture the rigidity and scope of a country's environmental regulations. It encompasses various dimensions of environmental policies, including regulations on emissions, energy efficiency, and other relevant factors (Botta and Koźluk 2014; Albrizio et al. 2014).

Adding data sourced from the OECD has decreased the sample size used for analysis compared to that which was employed for the regressions found in Table 3. The decrease represents slightly over 3% of the original sample size (4351 observations vs. 4212). The difference also amounts to 10 countries being excluded from the analysis in Table A3. The likes of Brazil, China, India, and Russia are no longer included in the sample for the regression in column 3 of Table A3. Although we are concerned about sample bias through the inclusion of OECD data, we are cautiously relieved that the sign of the power distance coefficient remains unchanged relative to this study's main findings. The same can be said for the variations in specification shown in columns 1 and 2.

Notes

1. In unreported results, we attempted to replicate Wang et al.'s (2021) results within our own sample and specification. However, there is not enough evidence to substantiate the claim of a quadratic relationship between power distance and GHG emissions at any reasonable degree of statistical confidence.
2. For example, Redmond (2003) posits that technological development prompts institutional reform, while Dolfsma and Seo (2013) suggest that government policies can drive technological progress.
3. From Table 2, the standard deviation for power distance is 19.544. Thus, the increase in emissions is given by $e^{(19.544 \times 0.0161)} - 1 = 0.3698$. Notice that a unit increase in power distance results in an increase in emissions of 1.62%.
4. In an unreported result, we also controlled for being headquartered in Japan (the second most frequent country in the sample), along with the U.S. indicator. The result is a qualitatively similar power distance coefficient ($\beta = 0.0142$, $t = 1.82$, $p = 0.069$).
5. $e^{(1.14 \times 0.514)} - 1 = 0.7967$
6. Please see Kenneth R. French—Detail for 12 Industry Portfolios (dartmouth.edu) for details on industry designations.

References

Aggarwal, Raj, Mara Faccio, Omrane Guedhami, and Chuck C. Y. Kwok. 2016. Culture and finance: An introduction. *Journal of Corporate Finance* 100: 466–74. [CrossRef]

Albrizio, Silvia, Tomasz Kozluk, and Vera Zipperer. 2014. *Environmental Policies and Productivity Growth: Evidence Across Industries and Firms*. OECD Economics Department Working Papers, No. 1176. Paris: OECD.

Al-Tuwaijri, Sulaiman A., Theodore E. Christensen, and K. E. Hughes, II. 2004. The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. *Accounting, Organizations and Society* 29: 447–71. [CrossRef]

Ambec, Stefan, and Paul Lanoie. 2008. Does it pay to be green? A systematic overview. *The Academy of Management Perspectives* 22: 45–62.

Andreoni, James, and Arik Levinson. 2001. The simple analytics of the environmental Kuznets curve. *Journal of Public Economics* 80: 269–86. [CrossRef]

Angrist, Joshua D., and Jörn-Steffen Pischke. 2010. The credibility revolution in empirical economics: How better research design is taking the con out of econometrics. *Journal of Economic Perspectives* 24: 3–30. [CrossRef]

Arshed, Noman, Kamran Hameed, Asma Saher, and Naveed Yazdani. 2022. The cultural differences in the effects of carbon emissions—An EKC analysis. *Environmental Science and Pollution Research* 29: 63605–21. [CrossRef] [PubMed]

Bae, Sung C., Kiyoung Chang, and Eun Kang. 2012. Culture, corporate governance, and dividend policy: International evidence. *Journal of Financial Research* 35: 289–316. [CrossRef]

Beugelsdijk, Sjoerd, Robbert Maseland, and André Van Hoorn. 2015. Are scores on H ofstede's dimensions of national culture stable over time? A Cohort Analysis. *Global Strategy Journal* 5: 223–40. [CrossRef]

Bin, Shui, and Hadi Dowlatabadi. 2005. Consumer lifestyle approach to US energy use and the related CO_2 emissions. *Energy Policy* 33: 197–208. [CrossRef]

Bolton, Patrick, and Marcin Kacperczyk. 2023. Global pricing of carbon-transition risk. *The Journal of Finance* 78: 3677–754. [CrossRef]

Botta, Enrico, and Tomasz Koźluk. 2014. *Measuring Environmental Policy Stringency in OECD Countries: A Composite Index Approach*. OECD Economics Department Working Papers, No. 1177. Paris: OECD.

Bove, Vincenzo, and Gunes Gokmen. 2018. Genetic distance, trade, and the diffusion of development. *Journal of Applied Econometrics* 33: 617–23. [CrossRef]

Chang, Kiyoung, and Abbas Noorbakhsh. 2009. Does national culture affect international corporate cash holdings? *Journal of Multinational Financial Management* 19: 323–42. [CrossRef]

Choi, Ahrum, Jingyi Jia, Byron Y. Song, and Gaoguang Zhou. 2024. Cultural tightness and financial reporting behavior around the world. *Journal of Business Research* 178: 114656. [CrossRef]

Christie, P. Maria Joseph, Ik-Whan G. Kwon, Philipp A. Stoeberl, and Raymond Baumhart. 2003. A cross-cultural comparison of ethical attitudes of business managers: India Korea and the United States. *Journal of Business Ethics* 46: 263–87. [CrossRef]
Ciocîrlan, Cecilia, Andreea Stancea, and Valentin Stoica. 2023. Public debt expectations: The more you know about public debt, the less optimistic you are. *Management Dynamics in the Knowledge Economy* 11: 190–207. [CrossRef]
Cohen, Jeffrey R., Laurie W. Pant, and David J. Sharp. 1996. A methodological note on cross-cultural accounting ethics research. *The International Journal of Accounting* 31: 55–66. [CrossRef]
Cole, Matthew A., Robert J. R. Elliott, Toshihiro Okubo, and Ying Zhou. 2013. The carbon dioxide emissions of firms: A spatial analysis. *Journal of Environmental Economics and Management* 65: 290–309. [CrossRef]
Cook, Ian, and Richard Joseph. 2001. Rethinking Silicon Valley: New perspectives on regional development. *Prometheus* 19: 377–93. [CrossRef]
Cooray, Arusha, Ratbek Dzhumashev, and Friedrich Schneider. 2017. How does corruption affect public debt? An empirical analysis. *World Development* 90: 115–27. [CrossRef]
Crutchley, Claire E., and Robert S. Hansen. 1989. A test of the agency theory of managerial ownership, corporate leverage, and corporate dividends. *Financial Management* 18: 36–46. [CrossRef]
Damert, Matthias, Arijit Paul, and Rupert J. Baumgartner. 2017. Exploring the determinants and long-term performance outcomes of corporate carbon strategies. *Journal of Cleaner Production* 160: 123–38. [CrossRef]
Dang, Tung Lam, Robert Faff, Hoang Luong, and Lily Nguyen. 2019. Individualistic cultures and crash risk. *European Financial Management* 25: 622–54. [CrossRef]
Dodd, Olga, and Bowen Zheng. 2022. Does Board Cultural Diversity Contributed by Foreign Directors Improve Firm Performance? Evidence from Australia. *Journal of Risk and Financial Management* 15: 332. [CrossRef]
Dodd, Olga, Bart Frijns, and Alexandre Garel. 2022. Cultural diversity among directors and corporate social responsibility. *International Review of Financial Analysis* 83: 102337. [CrossRef]
Dolfsma, Wilfred, and DongBack Seo. 2013. Government policy and technological innovation—A suggested typology. *Technovation* 33: 173–79. [CrossRef]
Dreher, Axel. 2006. Does globalization affect growth? Evidence from a new index of globalization. *Applied Economics* 38: 1091–110. [CrossRef]
Durach, Christian F, and Frank Wiengarten. 2017. Environmental management: The impact of national and organisational long-term orientation on plants' environmental practices and performance efficacy. *Journal of Cleaner Production* 167: 749–758. [CrossRef]
Eller, Markus, Branimir Jovanovic, and Thomas Scheiber. 2021. What do people in CESEE think about public debt. *Focus on European Economic Integration* Q3/21: 35–58.
Endrikat, Jan, Edeltraud Guenther, and Holger Hoppe. 2014. Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance. *European Management Journal* 32: 735–51. [CrossRef]
Frijns, Bart, Frank Hubers, Donghoon Kim, Tai-Yong Roh, and Yahua Xu. 2022. National culture and corporate risk-taking around the world. *Global Finance Journal* 52: 100710. [CrossRef]
Gaganis, Chrysovalantis, Iftekhar Hasan, and Fotios Pasiouras. 2020. National culture and housing credit. *Journal of Empirical Finance* 56: 19–41. [CrossRef]
Gallego-Álvarez, Isabel, and Eduardo Ortas. 2017. Corporate environmental sustainability reporting in the context of national cultures: A quantile regression approach. *International Business Review* 26: 337–53. [CrossRef]
García-Sánchez, Isabel-María, Lázaro Rodríguez-Ariza, and José-Valeriano Frías-Aceituno. 2013. The cultural system and integrated reporting. *International Business Review* 22: 828–38. [CrossRef]
Griffin, Dale, Omrane Guedhami, Kai Li, and Guangli Lu. 2021. National culture and the value implications of corporate environmental and social performance. *Journal of Corporate Finance* 71: 102123. [CrossRef]
Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2006. Does culture affect economic outcomes? *Journal of Economic Perspectives* 20: 23–48. [CrossRef]
Gygli, Savina, Florian Haelg, Niklas Potrafke, and Jan-Egbert Sturm. 2019. The KOF globalisation index–revisited. *The Review of International Organizations* 14: 543–74. [CrossRef]
Han, Sam, Tony Kang, Stephen Salter, and Yong Keun Yoo. 2010. A cross-country study on the effects of national culture on earnings management. *Journal of International Business Studies* 41: 123–41. [CrossRef]
Harutyunyan, Ani, and Ömer Özak. 2016. Culture, diffusion, and economic development. *Economics Letters* 158: 94–100. [CrossRef]
Hirshleifer, David. 2015. Behavioral finance. *Annual Review of Financial Economics* 7: 133–59. [CrossRef]
Hofstede, Geert. 1980. Culture and organizations. *International Studies of Management & Organization* 10: 15–41.
Hofstede, Geert. 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations across Nations*. New York: Sage Publications.
Hofstede, Geert. 2011. Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture* 2: 8. [CrossRef]
Hofstede, Geert, and Michael Harris Bond. 1988. The Confucius connection: From cultural roots to economic growth. *Organizational Dynamics* 16: 5–21. [CrossRef]
Husted, Bryan W. 1999. Wealth, culture, and corruption. *Journal of International Business Studies* 30: 339–59. [CrossRef]

Ibrahim, Mansor H., and Siong Hook Law. 2014. Social capital and CO_2 emission—Output relations: A panel analysis. *Renewable and Sustainable Energy Reviews* 29: 528–34. [CrossRef]
International Energy Agency. 2020. *Global CO_2 Emissions in 2019*; Paris: IEA.
Jensen, Michael C. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review* 76: 323–29.
Jensen, Michael C., and William H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3: 305–60. [CrossRef]
Kahneman, Daniel, and Amos Tversky. 1981. *The Simulation Heuristic*; Springfield: National Technical Information Service.
Karolyi, G. Andrew. 2016. The gravity of culture for finance. *Journal of Corporate Finance* 41: 610–25. [CrossRef]
Kasman, Adnan, and Yavuz Selman Duman. 2015. CO_2 emissions, economic growth, energy consumption, trade and urbanization in new EU member and candidate countries: A panel data analysis. *Economic Modelling* 44: 97–103. [CrossRef]
Kim, Yungwook, and Soo-Yeon Kim. 2010. The Influence of Cultural Values on Perceptions of Corporate Social Responsibility: Application of Hofstede's Dimensions to Korean Public Relations Practitioners. *Journal of Business Ethics* 91: 485–500. [CrossRef]
Kleibergen, Frank, and Richard Paap. 2006. Generalized reduced rank tests using the singular value decomposition. *Journal of Econometrics* 133: 97–126. [CrossRef]
Kleinman, Gary, Betsy Beixin Lin, and Rebecca Bloch. 2019. Accounting enforcement in a national context: An international study. *International Journal of Disclosure and Governance* 16: 47–67. [CrossRef]
Lamb, William F., Thomas Wiedmann, Julia Pongratz, Robbie Andrew, Monica Crippa, Jos G. J. Olivier, Dominik Wiedenhofer, Giulio Mattioli, Alaa Al Khourdajie, and Jo House. 2021. A review of trends and drivers of greenhouse gas emissions by sector from 1990 to 2018. *Environmental Research Letters* 16: 073005. [CrossRef]
Lee, Cynthia, Madan Pillutla, and Kenneth S. Law. 2000. Power-distance, gender and organizational justice. *Journal of Management* 26: 685–704. [CrossRef]
Le Quéré, Corinne, Robbie M. Andrew, Pierre Friedlingstein, Stephen Sitch, Julia Pongratz, Andrew C. Manning, Jan Ivar Korsbakken, Glen P. Peters, Josep G. Canadell, Robert B. Jackson, and et al. 2018. Global Carbon Budget 2017. *Earth System Science Data* 10: 405–48. [CrossRef]
Liu, Yong. 2015. Dynamic study on the influencing factors of industrial firm's carbon footprint. *Journal of Cleaner Production* 103: 411–22. [CrossRef]
Lu, Guanyi, Xin David Ding, David Xiaosong Peng, and Howard Hao-Chun Chuang. 2018. Addressing endogeneity in operations management research: Recent developments, common problems, and directions for future research. *Journal of Operations Management* 64: 53–64. [CrossRef]
Lu, Jing, and Jun Wang. 2021. Corporate governance, law, culture, environmental performance and CSR disclosure: A global perspective. *Journal of International Financial Markets, Institutions and Money* 70: 101264. [CrossRef]
Luo, Le, and Qingliang Tang. 2016. Determinants of the Quality of Corporate Carbon Management Systems: An International Study. *The International Journal of Accounting* 51: 275–305. [CrossRef]
Menyah, Kojo, and Yemane Wolde-Rufael. 2010. CO_2 emissions, nuclear energy, renewable energy and economic growth in the US. *Energy Policy* 38: 2911–15. [CrossRef]
Nash, Robert, and Ajay Patel. 2019. Instrumental variables analysis and the role of national culture in corporate finance. *Financial Management* 48: 385–416. [CrossRef]
OECD. 2010. *Taxation, Innovation and the Environment*. Paris: OECD Publishing.
Panda, Brahmadev, and Nabaghan Madhabika Leepsa. 2017. Agency theory: Review of theory and evidence on problems and perspectives. *Indian Journal of Corporate Governance* 10: 74–95. [CrossRef]
Panizza, Ugo, and Andrea F. Presbitero. 2014. Public debt and economic growth: Is there a causal effect? *Journal of Macroeconomics* 41: 21–41. [CrossRef]
Park, Hoon, Clifford Russell, and Junsoo Lee. 2007. National culture and environmental sustainability: A cross-national analysis. *Journal of Economics and Finance* 31: 104–21. [CrossRef]
Peng, Yu-Shu, and Shing-Shiuan Lin. 2009. National culture, economic development, population growth and environmental performance: The mediating role of education. *Journal of Business Ethics* 90: 203–19. [CrossRef]
Redmond, William H. 2003. Innovation, diffusion, and institutional change. *Journal of Economic Issues* 37: 665–79. [CrossRef]
Reinders, Angelina H. M. E., Kees Vringer, and Komelis Blok. 2003. The direct and indirect energy requirement of households in the European Union. *Energy Policy* 31: 139–53. [CrossRef]
Ringov, Dimo, and Maurizio Zollo. 2007. The impact of national culture on corporate social performance. *Corporate Governance: The International Journal of Business in Society* 7: 476–85. [CrossRef]
Sariannidis, Nikolaos, Eleni Zafeiriou, Grigoris Giannarakis, and Garyfallos Arabatzis. 2013. CO_2 emissions and financial performance of socially responsible firms: An empirical survey. *Business Strategy and the Environment* 22: 109–20. [CrossRef]
Schipper, Lee, Sarita Bartlett, Dianne Hawk, and Edward Vine. 1989. Linking life-styles and energy use: A matter of time? *Annual Review of Energy* 14: 273–320. [CrossRef]
Schwartz, Shalom. 2006. A theory of cultural value orientations: Explication and applications. *Comparative Sociology* 5: 137–82. [CrossRef]
Schwartz, Shalom. 2008. *The 7 Schwartz Cultural Value Orientation Scores for 80 Countries*. Berlin: ResearchGate.

Schwartz, Shalom H. 1999. A theory of cultural values and some implications for work. *Applied Psychology: An International Review* 48: 23–47. [CrossRef]

Schwartz, Shalom H. 2004. Mapping and interpreting cultural differences around the world. In *Comparing Cultures, Dimensions of Culture in a Comparative Perspective*. Leiden: Brill, pp. 43–73.

Shahbaz, Muhammad, Samia Nasreen, Khalid Ahmed, and Shawkat Hammoudeh. 2017. Trade openness–carbon emissions nexus: The importance of turning points of trade openness for country panels. *Energy Economics* 61: 221–32. [CrossRef]

Shao, Liang, Chuck C. Y. Kwok, and Ran Zhang. 2013. National culture and corporate investment. *Journal of International Business Studies* 44: 745–63. [CrossRef]

Smith, Aileen, and Evelyn C. Hume. 2005. Linking Culture and Ethics: A Comparison of Accountants' Ethical Belief Systems in the Individualism/Collectivism and Power Distance Contexts. *Journal of Business Ethics* 62: 209–20. [CrossRef]

Spolaore, Enrico, and Romain Wacziarg. 2009. The diffusion of development. *The Quarterly Journal of Economics* 124: 469–529. [CrossRef]

Spolaore, Enrico, and Romain Wacziarg. 2017. *Replication Data for: 'The Diffusion of Development'*. Cambridge, MA: Harvard Dataverse.

Sterner, T. 2007. Fuel Taxes: An Important Instrument for Climate Policy. *Energy Policy* 35: 3194–202. [CrossRef]

Thanetsunthorn, Namporn. 2015. The impact of national culture on corporate social responsibility: Evidence from cross-regional comparison. *Asian Journal of Business Ethics* 4: 35–56. [CrossRef]

Van Gunten, Tod S. 2015. Cohesion, consensus, and conflict: Technocratic elites and financial crisis in Mexico and Argentina. *International Journal of Comparative Sociology* 56: 366–90. [CrossRef]

Vitell, Scott J., Joseph G. P. Paolillo, and James L. Thomas. 2003. The perceived role of ethics and social responsibility: A study of marketing professionals. *Business Ethics Quarterly* 13: 63–86. [CrossRef]

Wang, Haifei, Ting Guo, and Qingliang Tang. 2021. The effect of national culture on corporate green proactivity. *Journal of Business Research* 131: 140–150. [CrossRef]

Wang, Taiyuan, and Pratima Bansal. 2012. Social responsibility in new ventures: Profiting from a long-term orientation. *Strategic Management Journal* 33: 1135–53. [CrossRef]

Zheng, Xiaolan, Sadok El Ghoul, Omrane Guedhami, and Chuck C. Y. Kwok. 2012. National culture and corporate debt maturity. *Journal of Banking & Finance* 36: 468–88.