Received: 6 May 2023 | Revised: 27 November 2023 | Accepted: 23 December 2023

DOI: 10.1002/csr.2709

RESEARCH ARTICLE

Corporate Social Responsibility and Environmental Management

WILEY

Carbon performance and financial debt: Effect of formal and informal institutions

Adrián Ferreras | Paula Castro | María T. Tascón

Facultad de CC. Económicas y Empresariales, Universidad de León, León, Spain

Correspondence
María T. Tascón, Facultad de CC. Económicas y Empresariales, Universidad de León, Campus de Vegazana, s/n, 24071 León, Spain.
Email: m.tascon@unileon.es

Funding information
Spanish Ministry of Science and Innovation, Grant/Award Numbers: PID2020-114797GB-I00, PID2021-124950OB-I00; University of León, Grant/Award Number: ULE2021/00154/001

Abstract

Climate change has led to a transformation of the economy, with institutions such as the European Commission pushing for decarbonization. Using a sample of 4607 European-listed firms from 2005 to 2019, we find evidence that political and financial factors moderate the relationship between carbon performance and financial debt. Environmentally responsible firms operating in countries with better democratic values, associated with higher degrees of freedom and law enforcement, are favored with more access to debt. Similarly, better carbon performers obtain more debt in countries with concentrated banking markets, greater financial stability, and lower government debt. Furthermore, the cultural factors uncertainty avoidance and long-term orientation moderate the relationship between carbon performance and financial debt, as well as the effect of political and financial institutions on this relationship. These results show the relevant role formal and informal institutions play in facilitating the decarbonization of firms, as well as the importance of coordinating European policies.

KEYWORDS
carbon performance, cultural factors, financial debt, financial framework, political factors

1 | INTRODUCTION

The European Union (EU) is committed to combating climate change by reducing greenhouse gas (GHG) emissions and transforming its production model into a low-carbon economy. To this end, the European Commission (EC) has developed short-, medium-, and long-term strategies. In response to recent crises, the EC has had to redouble its efforts to decarbonize the economy, positioning ecological transition as one of the two main pillars of the new Long-term EU Budget 2021–2027 and the NextGenerationEU recovery package (Buti & Messori, 2020).

This commitment puts pressure on firms to reduce their carbon emissions, turning environmental management into a determining factor in their strategy. Financial institutions are already considering environmental criteria in their credit assessments, affecting firms' cost of capital and access to financing (Kim et al., 2015; Maaloul, 2018), making it easier for environmentally responsible firms to access new debt. In that sense, a recently opened stream of research focuses on the relationship between financial debt and environmental performance (Fernández-Cuesta et al., 2019; Tascón et al., 2021). This study contributes to the literature by exploring how the institutional setting moderates the effect of carbon performance on firms' capital structure. As the institutional framework in which a company operates determines its financial decisions (Frank & Goyal, 2009), we hypothesize that political, financial, and cultural institutions have a moderating effect on this relationship, encouraging or hampering carbon performers from obtaining financial debt.

We analyzed carbon emissions and financial and institutional data from 2005 to 2019 for a sample of public firms from 27 European countries. Using governance indicators and information on macroeconomic, financial, and cultural factors, we apply regression analysis to test how these formal and informal institutions moderate the relationship between carbon performance and financial debt.

Our results indicate that for carbon performers as environmentally responsible firms, banking concentration and financial stability may encourage financial debt, while the growth in government debt and high deficits would exert the opposite effect. Regarding better political values associated with more freedom, law enforcement, and government efficiency, we find that they relate to carbon performers' better access to debt. When including the cultural framework, our study shows that the effect of environmental performance on a firm's debt and the effect of formal institutions on the financing of environmental performers are conditioned by two specific cultural factors: uncertainty avoidance and long-term orientation.

These findings have relevant implications for managers and creditors in their respective roles as designers and assessors of a firm's environmental strategy financing. Our results are also of interest to governments as policymakers and regulators who are interested in evaluating the effectiveness of their environmental policies.

The remainder of this work is organized as follows. In Section 2, we review previous literature on how carbon performance determines firms' capital structure and how the institutional framework affects the indebtedness of carbon emitters, leading to our hypotheses. In Section 3, we present the methodology and explain the proposed model. Section 4 presents the results. Finally, Section 5 presents the conclusions.

2 | LITERATURE REVIEW AND HYPOTHESES

2.1 | Role of institutional theory on firm's environmental management and indebtedness

According to institutional theory, firms comply with the pressures and expectations of formal and informal institutions (Scott, 2005). Formal institutions encourage firms to adopt environmentally responsible policies by considering the regulations and enforcement measures (monitoring and sanctions) adopted by governments (Berrone et al., 2013). Informal institutions such as professional organizations and other social actors, as creators of standards and norms, can also pressure firms to be environmentally responsible in line with those benchmarks (Scott, 2005). Formal and informal institutions include political, economic, social, and cultural domains (Ntim & Soobaroyen, 2013; Orazalin & Mahmood, 2021) and can be sources of coercive, mimetic, and normative isomorphism (DiMaggio & Powell, 1983) in geographical areas with homogeneous regulations, standards, and norms. In the same line, national institutions are the reasons against isomorphism between different countries, where country-specific formal rules, policies, and restrictions (at least in part) shape firms' environmental commitments (Nguyen et al., 2015; Orazalin & Mahmood, 2021). Furthermore, Caprar and Neville (2012) highlight the dual effect of culture in constructing the norms on sustainability to be applied by institutions and later in inducing firms to conform to the pressures exerted by those institutions.

Thus, the legitimization objective, supported by institutional and legitimacy theories, is added to the regulated objective to obtain environmental performance (Haque & Ntim, 2022) and must be integrated as part of the comprehensive objective of value creation, which implies survival (Gutiérrez-López et al., 2022) and financial performance (Trumpp & Guenther, 2017) of better carbon performers.

The financing part of the business is a contributing piece to this financial performance (Fernández-Cuesta et al., 2019). Debt is a way to obtain cleaner resources and production to comply with regulations and norms, while compliance allows the firm to obtain better credit terms (Du et al., 2017). In this study, we analyze not only how carbon performance affects the capital structure policies of a firm but also how the institutional framework (formal and informal) affects this relationship.

A bridge between institutional and capital structure theories is required. The trade-off theory (TOT) posits higher leverage in institutional settings encouraging lower agency costs of debt related to asset substitution, whereas the pecking-order theory (POT) posits higher leverage in institutional settings that promote or impose higher information asymmetry costs on firms (Gungoraydinoglu & Öztekin, 2011). Specifically, we consider negative political factors as sources of agency transaction costs for firms (Öztekin, 2015), deriving lower debt in line with TOT. A strong institutional environment can act as an external control mechanism for firms, mitigating agency costs with lower associated costs of financial leverage[1] (An et al., 2016). Similarly, the concentration of the banking business, which causes a reduction in information asymmetry between creditors and firms (Berger et al., 2004), is expected to induce debt increases, according to the POT.

2.2 | Capital structure and carbon performance of firms

The growing body of environmental regulations centered on GHG exposes firms to the transition risk associated with emission-cutting climate policies (Alogoskoufis et al., 2021), making it a relevant factor for the firm's strategy. When studying the effect of carbon performance on financial performance, there are two main approaches: win-win and win-lose (Boiral et al., 2012), depending on whether it leads to competitive gains for the firm (Dixon-Fowler et al., 2013; Trumpp & Guenther, 2017) or a negative cost–benefit balance (Kolk & Pinkse, 2010; Wang et al., 2014). However, there is no consensus in the literature regarding the correct approach.

Concerning the financing aspect of financial performance, a recent strand of literature has analyzed carbon performance as a determining factor of firms' capital structure. Thus, companies are granted easier access to new debt when exposed to less carbon risk (Fernández-Cuesta et al., 2019). The environmental transaction costs associated with carbon emissions reduce firms' speed of adjustment to target debt (Tascón et al., 2020). Similarly, the moderating effect of a firm's life cycle on the relationship between carbon performance

[1]This applies as well to the use of short-term debt to reduce managerial discretion, with strong institutional environments reducing its need (Gao & Zhu, 2015).

and financial debt has been analyzed, demonstrating that the relationship changes as firms go through the growth, maturity, and shake-out stages (Tascón et al., 2021). In line with Fernández-Cuesta et al. (2019), we expect low emitters to be less volatile firms with reduced future carbon risk and, subsequently, lower financial distress costs, allowing the firm to obtain more debt according to the TOT (Frank & Goyal, 2009). The baseline hypothesis is as follows:

> **Hypothesis 0.** Carbon performance positively affects the firm's financial debt.

2.3 | Effect of financial and political factors on carbon emissions and debt

The literature analyzes firms' capital structure first regarding firm-level characteristics and then as determined by the firm's institutional framework (Alves & Ferreira, 2011; López-Iturriaga & Rodriguez-Sanz, 2008). The choice between equity and debt, preference for short- or long-term debt, and cost of capital are strongly addressed by national institutions, such as the legal environment, creditor rights, and financial system development (Alves & Ferreira, 2011; De Jong et al., 2008; Fan et al., 2012).

De Jong et al. (2008) find that country-specific factors have two types of impact on capital structure, direct, and indirect through the firm-specific determinants of leverage. In this work, we are interested in the indirect impact of institutional (country-specific) factors through a certain firm-specific determinant of leverage: the firm's carbon performance. In the following paragraphs, we explore the interaction between several formal institutions belonging to financial and political frameworks and firms' environmental responsibility as a previous step in analyzing the direct and indirect effects of formal institutions on debt.

A firm's capital structure is highly affected by financial factors, especially when firms rely on banking debt, owing to the role of banks as monetary policy transmitters (Beck et al., 2014). Banking concentration fosters relationship banking, incentivizing closer relationships between creditors and borrowers (González, 2015). According to the information-based hypothesis, relationship banking mitigates information asymmetries (Berger et al., 2004; Dell'Ariccia & Marquez, 2004) by acquiring hard and soft information about the firm and monitoring borrowers' evolving circumstances over time (Bolton et al., 2016). Consequently, firms benefit from lower interest rates, fewer collateral requirements, and higher amounts lent (Berger & Udell, 1995; Bharath et al., 2011).

Regarding financial stability, the effect of negative shocks on banks' balance sheets and worsening financial conditions have favored financial constraints for firms (Popov & Udell, 2012). Firms under financial constraints tend to burn most of their cash holdings, cut more in technology, and cancel and postpone their planned investments (Campello et al., 2010), thus hindering their transition to clean production.

Government-related financial factors are also relevant because of potential crowding-out effects. Increasing government debt issuance can reduce the demand for firms' debt, forcing firms to adjust their leverage levels (Demirci et al., 2019). Firms have also been found to absorb supply shocks from changes in the maturity structure of government debt by adjusting the maturity of their debt (Greenwood et al., 2010), which is especially relevant for long-term debt (Badoer & James, 2016). The use of the domestic financial sector to redirect savings to the government varies by country, depending on political characteristics (Becker & Ivashina, 2018). Accordingly, our Hypothesis 1 is as follows:

> **Hypothesis 1.** Bank concentration, financial stability, and lower government debt levels positively moderate the relationship between carbon performance and financial debt.

Regarding political factors, Arvin and Lew (2011) found that countries with better democratic values, which are considered freer, tend to produce fewer carbon emissions. Political rights and freedom of information encourage promoting environmental groups and movements, raising public awareness, and supporting environmental legislation (Payne, 1995). Free media ensures the diffusion of environmental problems at the local and global levels, increasing the available information for citizens and their knowledge of governmental climate change policies (Barrett & Graddy, 2000; Li & Reuveny, 2006; Obydenkova & Salahodjaev, 2017). Press freedom is also positively associated with environmental policy stringency and environmental tax revenue because citizens are more likely to accept monetary losses in exchange for better environmental quality (Martínez-Zarzoso & Phillips, 2020). Democratic values are associated with perceived individual climate responsibility and provide citizens with capabilities that facilitate engagement in climate action (Pohjolainen et al., 2021).

Povitkina (2018) found that democratic regimes are more committed to mitigating climate change and tend to emit less carbon, highlighting the moderating role of corruption. Corrupt institutions reduce government and social trust (Anderson & Tverdova, 2003; Rothstein & Eek, 2009), delay and distort policy implementation, nullify the positive effects of democratic values (Pellegrini & Gerlagh, 2006), and create barriers to the application of technical innovations and research and development (R&D) activities that can improve environmental quality (Balsalobre-Lorente et al., 2019). Therefore, corruption can reduce the effectiveness of governments in complying with environmental regulations and reducing emissions.

The rule of law is a determinant in turning economic growth into fewer carbon emissions, positively effecting environmental policy stringency (Chen, 2017; Culas, 2007). Better institutions apply law enforcement and effectively reduce emissions (Castiglione et al., 2015). In addition, high levels of protection for investors, shareholders, and creditors have been found to help reduce carbon emissions by encouraging financial market development and easing access to financing for environmentally responsible projects (Di Vita, 2009).

The political context also affects firms' capital structure, given that in countries with higher institutional development and more efficient legal systems, firms face fewer financial constraints (Beck et al., 2006; Demirgüç-Kunt & Maksimovic, 1998). In politically uncertain scenarios, the risk premium of securities increases (Pastor & Veronesi, 2013), discouraging firms from raising external funds. It can also increase the intermediation costs of debt, such as placement, monitoring, and asymmetric information costs (Gungoraydinoglu et al., 2017). Consequently, political uncertainty leads firms to hoard more cash to protect themselves from political risk (Lee & Wang, 2021). Corruption may result in reduced liquidity and increased leverage due to (or to avoid) expropriation by corrupt government administrations (Smith, 2016). It also distorts the allocation of bank funds to poor-quality investments (Park, 2012) and exacerbates agency problems within firms (Donadelli et al., 2014). In addition, corruption has been found to moderate the relationship between other political variables and the cost of debt, with democratic values, bureaucracy, and the rule of law having a stronger effect in low-corruption settings (Tee & Teoh, 2022).

Considering this, we can expect government-related political factors, such as voice and accountability, political stability, government effectiveness, the rule of law, and control of corruption, to positively moderate the effect of carbon performance on firm leverage. Therefore, our Hypothesis 2 is as follows:

> **Hypothesis 2.** Fair political governance positively moderates the relationship between carbon performance and financial debt.

2.4 | Effect of cultural factors on carbon emissions and debt

Cultural factors participate in informal institutions consisting of traditions, customs, norms, and religions (Chui et al., 2016). Culture addresses the beliefs and values that shape individual perceptions and managers' decisions (Aggarwal et al., 2016). Hence, cultural factors affect firms' strategies for the transition to cleaner production and their financial structure. Previous empirical results in the environmental research stream suggest that cultural elements enhance or hamper environmental behavior beyond regulatory incentives and economic frameworks (Luo & Tang, 2016). In the research stream concerning credit markets, cultural factors are found to influence financing channels, as they include personal interactions as part of the negotiations of credit contracts (Aggarwal et al., 2016; Aggarwal & Goodell, 2009), but also consider the subjective perception of the parts on future compliance (Zheng et al., 2012), which translates into different assessments of agency costs (TOT) and information asymmetry (POT).

We focus on two cultural factors that undoubtedly affect debt issues and contracting: uncertainty avoidance and long-term orientation. Uncertainty avoidance reflects society's tolerance of uncertain events and ambiguous situations in a country (Hofstede, 2001), whereas long-term orientation is attributed to a society in which members orient their thinking toward the distant future, worry about the future effects of current decisions, and sacrifice immediate rewards for future benefits (Disli et al., 2016).

The role of these two cultural dimensions in shaping human behavior and inducing social and institutional patterns of action concerning environmental responsibility (Disli et al., 2016; Husted, 2005) is expected to be positive. Societies with high uncertainty avoidance would act to remove or reduce sources of uncertainty with negative impacts on the environment (Parboteeah et al., 2012), and societies that think about the future will be willing to preserve the environment for the future (Parboteeah et al., 2005). However, the limited number of empirical studies addressing the relationship between culture and environmental performance are far from conclusive (Tata & Prasad, 2015), suggesting that a more granular analysis is necessary. Thus, uncertainty avoidance and long-term orientation have been found to improve the carbon disclosure propensity (Luo & Tang, 2016) and reduce the negative effects of carbon emissions on the market value of emitters (Choi & Luo, 2021). In addition, both cultural factors have been found to moderate the Environmental Kuznets Curve (EKC) relationship between income and emissions by reducing emissions but delaying the inflection point (where the curve reaches a maximum and starts decreasing emissions despite economic growth) (Disli et al., 2016). Concerning their effect on firms' environmental proactivity, Calza et al. (2016) found opposite results, negative for uncertainty avoidance and positive for long-term orientation. In contrast, Parboteeah et al. (2012) found significant positive effects of long-term orientation on the propensity to support sustainability initiatives but no effect of uncertainty avoidance. When only one of these cultural factors is analyzed, uncertainty avoidance is found to be related to high GHG emissions (Muttakin et al., 2022), still, it is non-significant in explaining environmental responsibility (Husted, 2005), and obtains mixed results in explaining eco-efficiency (Halkos & Tzeremes, 2013).

These diverse and contradictory results indicate the existence of a complex relationship. We focused on how uncertainty avoidance and long-term orientation affect a moderator factor for adopting environmental actions. Specifically, these cultural factors affect firm financing, determining a firm's environmental strategies (Kim et al., 2015).

Cultural factors are relevant in financial decision-making, especially in uncertain or ambiguous scenarios (Chang et al., 2012). Uncertainty avoidance is key because finance is a social activity practiced through relationships and expectation-based transactions (Lavezzolo et al., 2018), and financial intermediaries (banks) can reduce risk over time. Long-term orientation is expected to play an important role in debt maturity decisions. Therefore, in debt contracts and debt maturity, subjective perception works mainly through the assessment of agency costs (TOT) and information asymmetry (POT) (Chang et al., 2012). Thus, a borrower's environmental profile adds a different perception of information asymmetry and adverse selection

possibilities (POT), considering the subjective assessment of future environmental risks and contingent liabilities/losses. In previous studies, uncertainty avoidance and long-term orientation were negatively related to debt maturity (Chang et al., 2012). However, the efficient enforcement of covenants and the existence of collateral would offset the preference of lenders with uncertainty avoidance for short-term debt (Zheng et al., 2012).

The convergence of environmental responsibility and financing interests in firms gives rise to opposing influences from uncertainty avoidance and long-term orientation: positive on environmental performance but negative on long-term debt, which is the main type of debt used to undertake the transition to cleaner production. We hypothesize that financing firms' transition to cleaner production is a determining factor in interacting of cultural factors and formal institutions with environmental performance. Therefore, we propose the following Hypothesis 3:

> **Hypothesis 3.** Uncertainty avoidance and long-term orientation moderate the effect of political and financial factors to reduce debt maturity for environmental performers.

3 | DATA AND METHODOLOGY

3.1 | Sample

We start with a sample of European listed firms from 31 countries participating in the European Union Emissions Trading System (EU-ETS) from 2005 to 2019, which resulted in 62,221 firm-year observations. We excluded firms from Norway, Iceland, and Liechtenstein since these countries are not subject to the Maastricht Treaty and, therefore, to the Stability and Growth Pact (SGP). Additionally, we filter our sample by deleting observations with missing data for any of the variables used in our model. This led to the elimination of Cypriot firms, because there were no Hofstede data for Cyprus. In doing so, we derived a final sample of 4607 listed firms from 27 European countries, with a total of 44,898 firm-year observations. Financial data were collected from Thomson Reuters Eikon; the European Commission provided carbon emissions through the data viewer of the European Union Transaction Log (EUTL); political factors were obtained from the World Bank; and macro-financial factors were obtained from the ECB, Eurostat, and World Bank. Cultural factors were proxied using Hofstede's variables.

3.2 | Methodology and model

We apply ordinary least squares (OLS) using cluster-robust standard errors at the year-industry level considering 49 Fama–French industry portfolios. This industry grouping is based on the 4-digit SIC codes (Fama & French, 1997). Financial data were winsorized at the 1% and 99% levels to exclude outliers from the analysis. To test Hypothesis 0, we regressed financial debt on carbon performance, including several control variables. The model is as follows:

$$DEBT_{it} = \alpha_0 + \alpha_1 CEP_{it} + \alpha_2 TANG_{it} + \alpha_3 SIZE_{it} + \alpha_4 PROF_{it} + \alpha_5 LIQ_{it} + \alpha_6 GGDP_{it} + \alpha_7 EUA_t + \sum_{k=1}^{48} S_k + \sum_{k=1}^{31} C_k + \sum_{t=2005}^{2019} Y_t + \varepsilon_{it} \quad (1)$$

To test Hypotheses 1 and 3, we add a series of macro-financial factors to check their interactions with carbon performance. The model is as follows:

$$DEBT_{it} = \alpha_0 + \alpha_1 CEP_{it} + \alpha_2 FIN_{it} + \alpha_3 CEP_{it}{}^{*} FIN_{it} + \alpha_4 TANG_{it} + \alpha_5 SIZE_{it} + \alpha_6 PROF_{it} + \alpha_7 LIQ_{it} + \alpha_8 GGDP_{it} + \alpha_9 EUA_t + \sum_{k=1}^{48} S_k + \sum_{k=1}^{31} C_k + \sum_{t=2005}^{2019} Y_t + \varepsilon_{it} \quad (2)$$

To test Hypotheses 2 and 3, we start with model (0) and add a series of political factors to estimate the following model:

$$DEBT_{it} = \alpha_0 + \alpha_1 CEP_{it} + \alpha_2 POLIT_{it} + \alpha_3 CEP_{it}{}^{*} POLIT_{it} + \alpha_4 TANG_{it} + \alpha_5 SIZE_{it} + \alpha_6 PROF_{it} + \alpha_7 LIQ_{it} + \alpha_8 GGDP_{it} + \alpha_9 EUA_t + \sum_{k=1}^{48} S_k + \sum_{k=1}^{31} C_k + \sum_{t=2005}^{2019} Y_t + \varepsilon_{it} \quad (3)$$

Definitions of the variables included in the models are listed in Table 1. DEBT, a firm's financial debt, is the dependent variable. CEP is the main independent variable under study and represents a firm's carbon performance. FIN represents the macro-financial factors interacting with CEP to assess their moderating effects. We select four financial variables: the Herfindahl index (HI) for total assets as a proxy for bank concentration following Casu and Girardone (2009), the Country Level Index of Financial Stress (CLIFS) developed by Duprey et al. (2017) as a proxy for systemic risk in financial markets, and the growth of public debt (GPD) and budget deficit (DEF) as the two main pillars of the SGP. POLIT represents the political factors interacting with CEP to assess their moderating effects. Following Coluccia et al. (2018) and Choi and Luo (2021), we took five political variables from the World Bank's Worldwide Governance Indicators (WGI) database: voice and accountability (VA), political stability and absence of violence (PSAV), government effectiveness (GE), rule of law (RL), and control of corruption (CC).

Finally, to test Hypothesis 3, we introduce national cultural variables.[2] We selected two of the six Hofstede variables, uncertainty

[2]To test H3, we reran Models (1) and (2) after dividing the sample into groups with high and low values of cultural factors.

TABLE 1 Definition of variables.

Variable	Definition	Source
DEBT	Total debt to total assets. Total debt is defined as short-term debt plus long-term debt.	Eikon
LDEBT	Long-term debt to total assets.	Eikon
SDEBT	Short-term debt to total assets.	Eikon
CEP	The negative total verified direct carbon emissions produced by the firm to total sales. Calculated as CEP $= -$ log (emissions)/log(sales). We use log variables to partly reduce the high volatility in the verified emissions (measured in Tons).	EC
Financial and economic factors		
HI	Concentration of banking business based on total assets. The HI is obtained by summing the squares of the market shares of all the credit institutions in each country's banking sector.	ECB
CLIFS	Country-level index of financial stress, using data from stock, bond and FOREX markets following Duprey et al. (2017). We use the annual country-specific difference from the European average, following this formula: $CLIFS_{country,t} - CLIFS_{EU\ average,t}$.	ECB
GPD	Year-on-year growth rate of the government/public debt-to-GDP ratio.	Eurostat
DEF	Government deficit/surplus-to-GDP ratio.	Eurostat
Political factors		
VA	Perception of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	World Bank
PSAV	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.	World Bank
GE	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	World Bank
RL	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Bank
CC	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	World Bank
National culture variables		
UA	Expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity.	Hofstede
LT	Expresses the fostering of virtues oriented toward future rewards, perseverance, and thrift.	Hofstede
Control variables		
TANG	Net property, plant, and equipment to total assets.	Eikon
SIZE	Logarithm of total assets.	Eikon
PROF	Operating income before depreciation to total assets. Operating income is measured as earnings before interests, taxes, depreciation, and amortization (EBITDA).	Eikon
LIQ	Current assets to current liabilities.	Eikon
GGDP	Year-on-year growth rate of the Gross Domestic Product (GDP).	Eurostat
EUA	Closing market price of the European Union Allowances (EUA) under the EU-ETS.	SendeCO2

avoidance (UA) and long-term orientation (LT). All models include tangibility of assets (TANG), firm size (SIZE), profitability (PROF), and liquidity (LIQ) as common control variables in the capital structure literature (Fernández-Cuesta et al., 2019; Frank & Goyal, 2009; Kieschnick & Moussawi, 2018; Rajan & Zingales, 1995) and the growth of gross domestic product (GGDP) and the price of EU ETS allowances (EUA) as macroeconomic control variables. In addition, dummies were used to control for sector, country, and year effects.

4 | EMPIRICAL RESULTS

4.1 | Descriptive statistics

The basic statistics of the variables are presented in Table 2. The dependent variable (DEBT) has a mean value of 25.16%, comparable to that of Schopohl et al. (2021) and Castro et al. (2020), with long-term debt (LDEBT) dominating short-term debt (SDEBT) (16.73% vs. 8.43% mean values). The mean CEP value was −0.0276, similar to

TABLE 2 Main statistics.

	Mean	SD	Min	Max
DEBT	0.2516	0.1731	0.0000	0.8527
LDEBT	0.1673	0.1538	0.0000	0.5271
SDEBT	0.0843	0.0908	0.0000	0.3255
CEP	−0.0276	0.1213	−0.8095	0.0000
HI	0.0796	0.0612	0.0174	0.4039
CLIFS	−0.0027	0.0486	−0.1828	0.3341
GPD	0.0189	0.0976	−0.2639	1.1882
DEF	−2.6906	3.2726	−32.1000	5.1000
VA	1.2223	0.2907	0.2201	1.7396
PSAV	0.6185	0.3777	−0.4738	1.5959
GE	1.3019	0.5551	−0.3597	2.3540
RL	1.3388	0.5871	−0.1382	2.1003
CC	1.3385	0.7399	−0.2673	2.4700
UA	63.5431	26.0704	23.0000	112.0000
LT	56.6935	14.5978	24.0000	83.0000
TANG	0.2435	0.2443	0.0000	0.9308
SIZE	19.0201	2.4777	12.1828	25.6338
PROF	0.0626	0.1795	−1.2181	0.4975
LIQ	2.1567	4.7806	0.0628	90.6923
GGDP	0.0174	0.0258	−0.1484	0.2516
EUA	11.7716	7.0343	1.3614	24.8418

Note: Variable definitions in Table 1.

(Trumpp & Guenther, 2017) median values for industrial firms and the median and mean values for service firms. The wide range of values for the macro-financial factors testifies to the acuteness and disparity in the impact of the financial crisis on European countries. Greece and Ireland registered the largest imbalances, with the highest levels of banking systemic risk (CLIFS), growth in public debt (GPD), and budget deficit (DEF). Meanwhile, the highest levels of banking concentration (HI) are found in northern countries such as Estonia and Finland. With regard to political variables, higher volatility in CC, and to a lesser extent in GE and RL, indicates a greater spread of the public perception of government effectiveness, the rule of law, and corruption control, ranging from generally high values in core EU members to low values in Mediterranean countries and post-2004 members. The latter group of countries also showed lower levels of perception of freedom (VA), while pre-2004 members obtained less disperses values over 1. Political stability (PSAV) is also less dispersed, although some countries such as Spain and Greece registered negative values during some years in our sample. Regarding cultural variables, UA registered a higher dispersion than LT because of the higher values obtained by Portugal and Greece. The capital structure control variables present values consistent with those in previous studies (Fernández-Cuesta et al., 2019; Frank & Goyal, 2009; Kieschnick & Moussawi, 2018). Finally, the price of EU-ETS allowances ranged between a minimum value of 1.36 in 2007 and a maximum value of 24.84 in 2019 (untabulated), although it was low throughout most of the period. Low values can be attributed to the economic state, growth of renewable energy, and expectations on the setting of future caps in the ETS system, among other factors (Hintermann et al., 2016; Koch et al., 2014).

Table 3 shows the results of the mean differences in the three main variables under study between the groups using the first and third terciles of the selected institutional variables. We highlight the opposite signs obtained between financial and political factors and between the two cultural factors when these differences are applied to the explanation of total debt. In addition, the opposite sign was obtained for most variables between the levels and year-to-year variations in long-term debt. These preliminary results could be subject to country and time effects, which are addressed later in the regression analysis.

The results of the correlation analysis between the main variables in our model are reported in Panel A of Table 4. The high correlation between total and long-term debt is consistent with the firms' use of long-term debt to finance the relevant environmental investments required in their transition to cleaner production (Fernández-Cuesta et al., 2019). Total financial debt is positively related to three of four financial factors (HI, CLIFS, GPD) and one of two cultural factors (UA), and negatively related to three of five political factors (PSAV, RL, CC). The positive relationship between DEBT and HI is consistent with a reduction of information asymmetries promoted by banking concentration resulting in better conditions to obtain debt, as stated by the literature presented in section 2. However, the rest of variables seem to follow a counterintuitive correlation with DEBT. This could be attributed to the nature of our sample in terms of the countries selected and the period under analysis. In the years prior to the financial crisis, private credit experienced unprecedented growth that led to higher instability in the financial sector once the crisis had started. This, in turn, affected sovereign debt markets, with some countries significantly increasing their debt ratios and costs (Jordà et al., 2014). This phenomenon was especially acute in southern European countries, which had higher levels of DEBT, CLIFS, GDP, and UA, as well as lower levels of PSAV, RL, and CC. Conversely, long-term debt is negatively associated with carbon performance (CEP) and one of the two cultural factors (LT) and positively related to political and financial variables and one of the two cultural factors (UA). CEP is positively associated with most political factors, as well as half of the financial factors (HI, CLIFS), and negatively related to cultural variables. Negative correlations were observed between financial stress (CLIFS) and political factors, particularly PSAV. Similarly, there is a strong correlation between government debt and political variables: positive for surplus/deficit (DEF) and negative for debt growth (GPD). This indicates that better governance is associated with greater financial stability in the financial system and public finance. High positive correlations (over 0.7) are also observed between all the political variables except PSAV, as can be expected owing to the high level of interrelationships between the different governance sub-dimensions (Kaufmann et al., 2011). The lower correlation shown by PSAV may indicate that

TABLE 3 Mean differences (t-test): high versus low levels of financial, political, and cultural factors.

	DEBT	LDEBT	CEP	VarDEBT	VarLDEBT	VarCEP
HI	0.0114***	−0.0067***	0.0057***	−0.0285***	0.0000	0.0023**
CLIFS	0.0163***	0.0099***	0.0016	0.0289***	−0.0008	−0.0029***
GPD	0.0086***	0.0027	−0.0019	−0.0266***	0.0189*	−0.0004
DEF	0.0075***	0.0101***	0.0007	0.0230***	−0.0303***	−0.0009
VA	−0.0032	0.0303***	0.0102***	−0.0182***	−0.0460***	0.0008
PSAV	−0.0050**	0.0009	−0.0031**	0.0009	−0.0155	0.0027**
GE	−0.0107***	0.0249***	0.0127***	−0.0108*	−0.0439***	0.0004
RL	−0.0091***	0.0277***	0.0119***	−0.0129**	−0.0475***	0.0018*
CC	−0.0074***	0.0289***	0.0123***	−0.0075	−0.0491***	−0.0001
UA	0.0059***	−0.0254***	−0.0104***	0.0206***	0.0952***	−0.0031**
LT	−0.0078***	−0.0015	−0.0009	0.0056	0.0459***	−0.0003

Note: Variable definitions in Table 1. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

high levels of equality, transparency, and law enforcement are not as strongly related to the perception of political instability, the roots of which could be elsewhere, such as party system instability and electoral volatility (Lane & Ersson, 2007). A high negative correlation was established between UA and CC, being nearly as strong for VA and RL. This can be attributed to high uncertainty avoidance societies requiring lower levels of corruption control, according to the role of uncertainty avoidance in preventing deviations and unethical behaviors (Seleim & Bontis, 2009).

Panel B shows the correlation between the two variables of the base relationship and control variables in our model. Financial total debt (DEBT) is positively related to the tangibility of assets and total assets and negatively related to profitability, liquidity, and GDP growth. Long-term debt (LDEBT) exhibits a similar correlation pattern, although it is negatively associated with carbon performance (CEP) in contrast to the non-significant relationship of total debt.

4.2 | Impact of financial factors

Table 5 presents the moderating role of financial factors on the relationship between carbon performance and financial debt. In line with Hypothesis 0, this base relationship is positive and significant across all five regressions, consistent with Fernández-Cuesta et al. (2019) and Tascón et al. (2021). The second column shows the moderating effect of banking concentration. The positive and significant interaction term (CEP*HI) indicates that better carbon performers obtain more debt in a concentrated banking context. Column 3 shows the negative and significant interaction coefficient (CEP*CLIFS), suggesting that better carbon emitters obtain more financing under lower levels of financial stress. High systemic risk values reverse the base relationship and negatively influence the effect of carbon performance on financial debt. In Column 4, the interaction coefficient (CEP*GPD) is negative and significant, indicating that better carbon performers would obtain less financing when government debt increases. Similar to the systemic risk, a large increase in public debt reverses the relationship between carbon performance and leverage. Finally, the moderating effect of budget surplus/deficit was measured through the interaction (CEP*DEF). The positive and significant coefficient suggests that environmentally responsible firms have less financial debt in a context of higher deficits. The GPD and DEF results are consistent with the crowding-out effect of financial markets, in which private debt is put aside in favor of less risky investments such as government debt. These findings support our Hypothesis 1, showing that the financial context moderates carbon performers' access to financial debt.

Table 6 shows the moderating role of financial factors in the relationship between carbon emissions and long- and short-term financial debt. The base relationship is positive and significant but lower for short-term debt (and non-significant in column 5). This aligns with previous studies' findings that carbon performance is less of a determining factor for short-term financial debt (Fernández-Cuesta et al., 2019). Columns 1 and 5 show the moderating effects of banking concentration. The interaction term (CEP*HI) is positive and significant only for short-term debt. However, the remaining interactions with financial factors are significant only for long-term debt, showing the same pattern as that found for the total financial debt in Table 5.

4.3 | Impact of political factors

Table 7 shows the moderating role of political factors in the relationship between carbon emissions and total financial debt. The CEP coefficient is positive and significant across all five regressions except in (3), where the interaction coefficient captures the entire effect. The positive and significant interactions between political factors and carbon performance indicate that higher levels of freedom and equality (CEP*VA), political stability (CEP*PSAV), government quality (CEP*GE), legal enforcement (CEP*RL) and corruption control (CEP*CC) strengthen the positive effects of carbon performance on financial debt, supporting our Hypothesis 2. Therefore, the political

TABLE 4 Correlation analysis.

	DEBT	LDEBT	CEP	HI	CLIFS	GPD	DEF	VA	PSAV	GE	RL	CC	UA	LT
Panel A: Main variables under study														
DEBT	1													
LDEBT	0.8523*	1												
CEP	0.0011	−0.0106*	1											
HI	0.0661*	0.0226*	0.0114*	1										
CLIFS	0.0505*	0.0322*	0.0149*	0.0972*	1									
GPD	0.0237*	0.0160*	−0.0075	−0.0097*	0.1976*	1								
DEF	−0.003	0.0111*	−0.0005	0.1050*	−0.1413*	−0.5833*	1							
VA	0.0063	0.0881*	0.0204*	0.0079	−0.1510*	−0.0581*	0.2262*	1						
PSAV	−0.0227*	0.0044	−0.0128*	0.2300*	−0.2274*	−0.1386*	0.4063*	0.5120*	1					
GE	−0.0042	0.0883*	0.0259*	0.0480*	−0.1143*	−0.0298*	0.2169*	0.9125*	0.4542*	1				
RL	−0.0094*	0.0907*	0.0274*	−0.0270*	−0.0979*	0.0072	0.1383*	0.9175*	0.4280*	0.9632*	1			
CC	−0.0183*	0.0801*	0.0272*	−0.0209*	−0.1197*	−0.0467*	0.2562*	0.9196*	0.4645*	0.9584*	0.9677*	1		
UA	0.0320*	−0.0623*	−0.0285*	0.1282*	0.0356*	−0.005	−0.1764*	−0.6447*	−0.3125*	−0.6465*	−0.6864*	−0.7158*	1	
LT	0.0075	0.0307*	−0.0141*	−0.2515*	−0.1627*	−0.0829*	0.2447*	0.1121*	−0.0273*	0.1411*	0.1153*	0.1218*	0.0968*	1

	DEBT	LDEBT	CEP	TANG	SIZE	PROF	LIQ	GGDP	EUA
Panel B: Control variables									
DEBT	1								
LDEBT	0.8523*	1							
CEP	0.0011	−0.0106*	1						
TANG	0.1577*	0.1334*	−0.1716*	1					
SIZE	0.1723*	0.2361*	−0.2430*	0.0955*	1				
PROF	−0.0551*	−0.0380*	−0.0669*	0.1443*	0.3082*	1			
LIQ	−0.1360*	−0.0491*	0.0328*	−0.1043*	−0.1150*	−0.0501*	1		
GGDP	−0.0792*	−0.0457*	−0.0059	0.0127*	−0.0720*	0.0293*	0.0288*	1	
EUA	0.0213*	−0.0174*	0.0022	0.0275*	0.0097*	0.0023	−0.0104*	−0.0347*	1

Note: Variable definitions in Table 1. * denotes significance at the 5% level.

TABLE 5 Effect of financial factors on the relationship between carbon performance and financial debt.

	(1)	(2)	(3)	(4)	(5)
CEP	0.0672***	0.0578***	0.0660***	0.0697***	0.0749***
	[0.0067]	[0.0089]	[0.0067]	[0.0068]	[0.0079]
HI		0.0170			
		[0.0436]			
CEP*HI		0.1241*			
		[0.0688]			
CLIFS			0.0210		
			[0.0209]		
CEP*CLIFS			−0.2046*		
			[0.1234]		
GPD				0.0054	
				[0.0129]	
CEP*GPD				−0.1149**	
				[0.0505]	
DEF					0.0010*
					[0.0005]
CEP*DEF					0.0028*
					[0.0015]
TANG	0.1094***	0.1095***	0.1093***	0.1094***	0.1092***
	[0.0061]	[0.0061]	[0.0061]	[0.0061]	[0.0061]
SIZE	0.0095***	0.0095***	0.0096***	0.0096***	0.0095***
	[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0007]
PROF	−0.1309***	−0.1310***	−0.1309***	−0.1309***	−0.1309***
	[0.0071]	[0.0071]	[0.0071]	[0.0071]	[0.0071]
LIQ	−0.0039***	−0.0039***	−0.0039***	−0.0039***	−0.0039***
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0003]
GGDP	−0.1667***	−0.1682***	−0.1399**	−0.1446**	−0.1891***
	[0.0556]	[0.0551]	[0.0607]	[0.0627]	[0.0564]
EUA	0.0008***	0.0019***	0.0019***	0.0019***	0.0019***
	[0.0002]	[0.0006]	[0.0006]	[0.0006]	[0.0006]
Constant	0.0816***	0.0183	0.0177	0.0184	0.0223
	[0.0261]	[0.0178]	[0.0179]	[0.0180]	[0.0181]
Observations	44,898	44,898	44,898	44,898	44,898
R-squared	0.1838	0.1839	0.1839	0.1839	0.1840
Industry dummies	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES
Adj. Rsq	0.182	0.182	0.182	0.182	0.182

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

environment moderates this relationship, making it easier for better carbon performers to obtain new financing in high-quality institutional governance settings. This finding is consistent with the lower agency transaction costs of debt obtained by carbon performers in this positive, political, institutional framework (Öztekin, 2015).

Table 8 shows the moderating role of political factors in the relationship between carbon emissions and long- and short-term financial debt. The baseline relationship is positive and significant when long-term debt is the dependent variable. The interaction coefficients indicate a low moderating impact of political factors on debt for environmentally responsible firms, with only political stability being significant for long-term debt. In contrast, three out of five political factors (VA, PSAV, and GE) effectively moderate the relationship for short-term debt. Our results indicate that debt maturity

TABLE 6 Effect of financial factors on the relationship between carbon performance and long- and short-term financial debt.

	Long-term debt				Short-term debt			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEP	0.0548***	0.0502***	0.0543***	0.0604***	0.0030	0.0158***	0.0155***	0.0145***
	[0.0077]	[0.0057]	[0.0057]	[0.0067]	[0.0048]	[0.0042]	[0.0044]	[0.0053]
HI	0.0670*				−0.0500			
	[0.0388]				[0.0336]			
CEP*HI	−0.0423				0.1664***			
	[0.0625]				[0.0328]			
CLIFS		0.0005				0.0205		
		[0.0192]				[0.0145]		
CEP*CLIFS		−0.2362**				0.0316		
		[0.1128]				[0.0536]		
GPD			0.0029				0.0025	
			[0.0110]				[0.0076]	
CEP*GPD			−0.1221***				0.0072	
			[0.0454]				[0.0270]	
DEF				0.0005				0.0005*
				[0.0005]				[0.0003]
CEP*DEF				0.0032**				−0.0004
				[0.0014]				[0.0008]
TANG	0.1001***	0.1002***	0.1002***	0.1001***	0.0094***	0.0091***	0.0092***	0.0091***
	[0.0054]	[0.0054]	[0.0054]	[0.0054]	[0.0035]	[0.0035]	[0.0035]	[0.0035]
SIZE	0.0123***	0.0123***	0.0123***	0.0123***	−0.0028***	−0.0028***	−0.0028***	−0.0028***
	[0.0006]	[0.0006]	[0.0006]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
PROF	−0.1024***	−0.1024***	−0.1024***	−0.1024***	−0.0285***	−0.0285***	−0.0285***	−0.0285***
	[0.0060]	[0.0060]	[0.0060]	[0.0060]	[0.0035]	[0.0035]	[0.0035]	[0.0035]
LIQ	−0.0006***	−0.0006***	−0.0006***	−0.0006***	−0.0033***	−0.0033***	−0.0033***	−0.0033***
	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
GGDP	−0.0055	0.0081	0.0189	−0.0078	−0.1627***	−0.1481***	−0.1635***	−0.1813***
	[0.0492]	[0.0519]	[0.0572]	[0.0508]	[0.0383]	[0.0387]	[0.0445]	[0.0397]
EUA	−0.0008**	−0.0008**	−0.0008**	−0.0008**	0.0027***	0.0027***	0.0027***	0.0027***
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0005]	[0.0005]
Constant	−0.0614***	−0.0588***	−0.0588***	−0.0569***	0.0797***	0.0766***	0.0773***	0.0792***
	[0.0137]	[0.0138]	[0.0138]	[0.0139]	[0.0110]	[0.0111]	[0.0111]	[0.0111]
Observations	44,898	44,898	44,898	44,898	44,898	44,898	44,898	44,898
R-squared	0.1971	0.1971	0.1972	0.1971	0.1338	0.1336	0.1335	0.1336
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.195	0.195	0.195	0.195	0.132	0.132	0.132	0.132

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

is a discriminant factor when the interaction between political institutions and environmental performance is analyzed. Thus, the political framework seems to exert a differential influence only in the short run, whereas carbon performance is the main relevant factor in the long run.

4.4 | Impact of cultural factors

After dividing the sample into countries with higher and lower median values of uncertainty avoidance and a long-term orientation, we reran the regressions to analyze the effects of financial and political

TABLE 7 Effect of political factors on the relationship between carbon performance and financial debt.

	(1)	(2)	(3)	(4)	(5)
CEP	0.0281**	0.0445***	0.0205	0.0422***	0.0475***
	[0.0132]	[0.0122]	[0.0244]	[0.0119]	[0.0106]
VA	−0.0214*				
	[0.0128]				
CEP*VA	0.0395*				
	[0.0202]				
PSAV		−0.0007			
		[0.0057]			
CEP*PSAV		0.0620***			
		[0.0169]			
GE			0.0032		
			[0.0078]		
CEP*GE			0.0187**		
			[0.0088]		
RL				−0.0134	
				[0.0095]	
CEP*RL				0.0201**	
				[0.0084]	
CC					0.0030
					[0.0063]
CEP*CC					0.0162**
					[0.0070]
TANG	0.1094***	0.1094***	0.1094***	0.1092***	0.1093***
	[0.0061]	[0.0061]	[0.0061]	[0.0061]	[0.0061]
SIZE	0.0096***	0.0096***	0.0096***	0.0096***	0.0096***
	[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0007]
PROF	−0.1311***	−0.1309***	−0.1308***	−0.1309***	−0.1309***
	[0.0071]	[0.0071]	[0.0071]	[0.0071]	[0.0071]
LIQ	−0.0039***	−0.0039***	−0.0039***	−0.0039***	−0.0039***
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0003]
GGDP	−0.1632***	−0.1657***	−0.1677***	−0.1738***	−0.1665***
	[0.0561]	[0.0556]	[0.0555]	[0.0557]	[0.0556]
EUA	0.0019***	0.0019***	0.0018***	0.0019***	0.0019***
	[0.0006]	[0.0006]	[0.0006]	[0.0006]	[0.0006]
Constant	0.0175	0.0138	0.0488*	0.0408	0.0133
	[0.0179]	[0.0210]	[0.0268]	[0.0255]	[0.0226]
Observations	44,898	44,898	44,898	44,898	44,898
R-squared	0.1841	0.1839	0.1840	0.1840	0.1839
Industry dummies	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES
Adj. Rsq	0.182	0.182	0.182	0.182	0.182

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLE 8 Effect of political factors on the relationship between carbon performance and long and short-term financial debt.

	Long-term debt					Short-term debt				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CEP	0.0510***	0.0265**	0.0407***	0.0384***	0.0395***	−0.0305*	0.0016	0.0038	0.0038	0.0079
	[0.0191]	[0.0110]	[0.0099]	[0.0096]	[0.0087]	[0.0157]	[0.0066]	[0.0085]	[0.0088]	[0.0074]
VA	0.0066					−0.0280***				
	[0.0108]					[0.0079]				
CEP*VA	0.0005					0.0390***				
	[0.0159]					[0.0122]				
PSAV		0.0037					−0.0044			
		[0.0048]					[0.0034]			
CEP*PSAV		0.0397***					0.0223***			
		[0.0142]					[0.0067]			
GE			0.0008					0.0024		
			[0.0065]					[0.0042]		
CEP*GE			0.0090					0.0097*		
			[0.0074]					[0.0058]		
RL				−0.0111					−0.0023	
				[0.0086]					[0.0058]	
CEP*RL				0.0106					0.0095	
				[0.0072]					[0.0058]	
CC					−0.0109**					0.0139***
					[0.0055]					[0.0044]
CEP*CC					0.0100					0.0062
					[0.0062]					[0.0046]
TANG	0.1002***	0.1003***	0.1002***	0.1001***	0.1003***	0.0091***	0.0091***	0.0092***	0.0091***	0.0091***
	[0.0055]	[0.0054]	[0.0054]	[0.0054]	[0.0054]	[0.0035]	[0.0035]	[0.0035]	[0.0035]	[0.0035]
SIZE	0.0123***	0.0123***	0.0123***	0.0123***	0.0124***	−0.0028***	−0.0028***	−0.0028***	−0.0028***	−0.0028***
	[0.0006]	[0.0006]	[0.0006]	[0.0006]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
PROF	−0.1024***	−0.1025***	−0.1024***	−0.1024***	−0.1024***	−0.0284***	−0.0286***	−0.0286***	−0.0285***	−0.0285***
	[0.0060]	[0.0060]	[0.0060]	[0.0060]	[0.0060]	[0.0035]	[0.0035]	[0.0036]	[0.0036]	[0.0035]
LIQ	−0.0006***	−0.0006***	−0.0006***	−0.0006***	−0.0006***	−0.0033***	−0.0033***	−0.0033***	−0.0033***	−0.0033***
	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
GGDP	0.0020	−0.0026	0.0019	−0.0041	0.0001	−0.1697***	−0.1606***	−0.1676***	−0.1697***	−0.1666***
	[0.0496]	[0.0505]	[0.0496]	[0.0496]	[0.0496]	[0.0385]	[0.0382]	[0.0388]	[0.0390]	[0.0388]

(Continues)

TABLE 8 (Continued)

	Long-term debt					Short-term debt				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EUA	−0.0008**	−0.0009***	−0.0008**	−0.0008**	−0.0008***	0.0026***	0.0028***	0.0027***	0.0027***	0.0027***
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0005]	[0.0005]	[0.0005]
Constant	−0.0676***	−0.0589***	−0.0597***	−0.0402*	−0.0393**	0.1163***	0.0765***	0.0735***	0.0810***	0.0527***
	[0.0218]	[0.0138]	[0.0166]	[0.0209]	[0.0177]	[0.0154]	[0.0110]	[0.0126]	[0.0145]	[0.0135]
Observations	44,898	44,898	44,898	44,898	44,898	44,898	44,898	44,898	44,898	44,898
R-squared	0.1971	0.1972	0.1971	0.1971	0.1972	0.1342	0.1337	0.1336	0.1336	0.1339
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.195	0.196	0.195	0.195	0.195	0.132	0.132	0.132	0.132	0.132

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

factors.[3] A total of four of the twelve[4] tables obtained were selected to illustrate the effect of the two cultural factors under analysis on the relationship between formal institutions (financial and political) and a firm's environmental performance. We present the tables in which long-term debt is the dependent variable because they reflect our main findings. On the one hand, both cultural factors exert a discriminant effect on debt maturity, with the distinction between long- and short-term debt being relevant to explaining the effects (see section 2.2). On the other hand, the transition to cleaner production requires relevant long-term capital investments and corresponding long-term financing (Fernández-Cuesta et al., 2019); thus, the results obtained for long-term debt are the most illustrative of the effect of cultural factors in combination with the environmental performance of emitter and non-emitter firms.

Table 9 shows the effect of carbon performance on long-term debt when the financial framework is considered and countries are classified as having higher (UA = 1) versus lower (UA = 0) uncertainty avoidance. It can be appreciated that the coefficient for carbon performance is generally higher at lower values of uncertainty avoidance. This is consistent with a higher propensity to commit to future obligations and increase a firm's risk, especially when the obligations may compromise the firm's solvency in the long run, consistent with Chang et al. (2012). The significant coefficients for the interactions between carbon performance and financial factors in Table 9 indicate that our results in Table 6 are mainly accounted for by firms obtaining long-term debt and countries with higher uncertainty avoidance. Thus, a reduction in long-term debt induced by financial stress affects good carbon performers only in an uncertainty avoidance culture. Regarding banking concentration, the non-significant coefficient in Table 6 for the interaction with carbon performance hides opposite effects: positive when uncertainty avoidance is higher and negative for lower values of this cultural factor (Table 9). In the case of the growth rate of the government debt-to-GDP ratio, the effect is negative and significant, independent of the country's uncertainty avoidance profile. The coefficients obtained for the interaction of government deficits and surpluses with carbon performance in Table 9 indicate that the positive effect on long-term debt found in Table 6 is addressed by firms in countries with uncertainty avoidance.

In Table 10, the same analysis is performed for higher and lower levels of the long-term orientation cultural factors. A remarkable difference was observed in the coefficients of carbon performance to explain long-term debt. The effect was stronger in countries with a weaker long-term orientation (LT = 0) in all models. It is precisely in countries with a weaker long-term orientation that banking concentration and a framework of financial stress act to reduce the debt of environmental performers. Again, growth in government debt is a negative factor for environmental performers in obtaining long-term

[3]The table containing the direct impact of the two cultural factors and their interactions with environmental performance, on debt, long-term debt, and short-term debt is not included for brevity, but it is available upon request. In our sample, the cultural factors do not exert a significant direct effect on debt as the effect of both cultural factors is opposite for long-term debt versus short term debt (significant in all cases).

[4]Two states of each of the two cultural factors multiplied by three types of dependent variables, namely total debt, long-term debt, and short-term debt.

TABLE 9 Effect of financial factors on the relationship between carbon performance and long-term financial debt by uncertainty avoidance groups.

	(1) UA = 1	(2) UA = 0	(3) UA = 1	(4) UA = 0	(5) UA = 1	(6) UA = 0	(7) UA = 1	(8) UA = 0
CEP	0.000	0.071***	0.045***	0.057***	0.050***	0.060***	0.067***	0.060***
	[0.014]	[0.010]	[0.007]	[0.009]	[0.007]	[0.009]	[0.010]	[0.009]
HI	0.011	0.060						
	[0.053]	[0.054]						
CEP*HI	0.667***	−0.167**						
	[0.187]	[0.067]						
CLIFS			−0.008	0.019				
			[0.026]	[0.032]				
CEP*CLIFS			−0.344*	−0.168				
			[0.197]	[0.129]				
GPD					0.003	−0.006		
					[0.015]	[0.017]		
CEP*GPD					−0.126**	−0.136**		
					[0.056]	[0.063]		
DEF							0.000	0.001
							[0.001]	[0.001]
CEP*DEF							0.006**	0.001
							[0.002]	[0.002]
TANG	0.101***	0.101***	0.101***	0.101***	0.101***	0.101***	0.101***	0.101***
	[0.008]	[0.006]	[0.008]	[0.006]	[0.008]	[0.006]	[0.008]	[0.006]
SIZE	0.013***	0.012***	0.013***	0.012***	0.013***	0.012***	0.013***	0.012***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
PROF	−0.111***	−0.098***	−0.111***	−0.098***	−0.111***	−0.098***	−0.111***	−0.098***
	[0.009]	[0.008]	[0.009]	[0.008]	[0.009]	[0.008]	[0.009]	[0.008]
LIQ	−0.001***	−0.000	−0.001***	−0.000	−0.001***	−0.000	−0.001***	−0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
GGDP	0.111	−0.076	0.108	−0.057	0.130	−0.079	0.114	−0.095
	[0.076]	[0.065]	[0.079]	[0.068]	[0.086]	[0.076]	[0.079]	[0.067]
EUA	−0.000	−0.001***	−0.000	−0.001***	−0.000	−0.001***	−0.000	−0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	−0.078***	−0.045***	−0.079***	−0.043**	−0.079***	−0.043**	−0.078***	−0.040**
	[0.019]	[0.017]	[0.018]	[0.017]	[0.018]	[0.017]	[0.018]	[0.018]
Observations	22,481	22,417	22,481	22,417	22,481	22,417	22,481	22,417
R-squared	0.228	0.182	0.228	0.182	0.228	0.182	0.228	0.182
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.225	0.179	0.225	0.179	0.225	0.179	0.225	0.179

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

debt, both for higher (LT = 1) and lower long-term orientation (LT = 0). Finally, surplus (deficit) positively (negatively) affects environmental performers' acquisition of long-term debt, but only in countries with a stronger long-term orientation (LT = 1).

Table 11 shows the effect of carbon performance on long-term debt when the political framework is considered, and countries are classified as having higher (UA = 1) versus lower (UA = 0) uncertainty avoidance. First, the results concerning the effects exerted on firms'

TABLE 10 Effect of financial factors on the relationship between carbon performance and long-term financial debt by long-term orientation groups.

	(1) LT = 1	(2) LT = 0	(3) LT = 1	(4) LT = 0	(5) LT = 1	(6) LT = 0	(7) LT = 1	(8) LT = 0
CEP	0.037***	0.080***	0.038***	0.070***	0.039***	0.073***	0.059***	0.076***
	[0.012]	[0.011]	[0.008]	[0.008]	[0.008]	[0.008]	[0.009]	[0.010]
HI	−0.017	0.125***						
	[0.080]	[0.044]						
CEP*HI	0.009	−0.115*						
	[0.151]	[0.064]						
CLIFS			0.013	−0.014				
			[0.031]	[0.025]				
CEP*CLIFS			0.110	−0.414***				
			[0.179]	[0.129]				
GPD					−0.021	0.017		
					[0.014]	[0.019]		
CEP*GPD					−0.206**	−0.092*		
					[0.084]	[0.048]		
DEF							0.001	0.001
							[0.001]	[0.001]
CEP*DEF							0.012***	0.002
							[0.003]	[0.002]
TANG	0.124***	0.075***	0.124***	0.076***	0.124***	0.076***	0.124***	0.075***
	[0.006]	[0.008]	[0.006]	[0.008]	[0.006]	[0.008]	[0.006]	[0.008]
SIZE	0.012***	0.013***	0.012***	0.013***	0.012***	0.013***	0.012***	0.013***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
PROF	−0.104***	−0.104***	−0.104***	−0.104***	−0.104***	−0.104***	−0.104***	−0.104***
	[0.007]	[0.009]	[0.007]	[0.009]	[0.007]	[0.009]	[0.007]	[0.009]
LIQ	−0.000**	−0.001***	−0.000**	−0.001***	−0.000**	−0.001***	−0.000**	−0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
GGDP	0.057	−0.006	0.059	0.002	0.026	0.050	0.039	−0.005
	[0.078]	[0.060]	[0.077]	[0.068]	[0.085]	[0.075]	[0.078]	[0.061]
EUA	−0.001*	−0.001*	−0.001*	−0.001*	−0.001**	−0.001*	−0.001*	−0.001*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	−0.063***	−0.076***	−0.064***	−0.070***	−0.064***	−0.071***	−0.067***	−0.068***
	[0.017]	[0.018]	[0.016]	[0.018]	[0.016]	[0.018]	[0.017]	[0.018]
Observations	24,537	20,361	24,537	20,361	24,537	20,361	24,537	20,361
R-squared	0.226	0.185	0.226	0.185	0.226	0.185	0.226	0.185
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.223	0.182	0.223	0.182	0.223	0.182	0.224	0.182

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

debt in Table 7 can be disentangled by considering debt maturity and the uncertainty avoidance cultural factor. Specifically, for UA = 1, the models including positive political factors such as voice and accountability, government effectiveness, the rule of law, and control of corruption show carbon performance as a positive inductor of long-term debt, but there is no additional effect for better carbon performers when these political factors improve. However, in countries with lower levels of uncertainty avoidance (UA = 0), CEP is only a direct inductor of debt for the model that includes PSAV. For the remaining models, CEP is not a direct inductor of debt; a significant positive

TABLE 11 Effect of political factors on the relationship between carbon performance and long-term financial debt by uncertainty avoidance groups.

	(1) UA = 1	(2) UA = 0	(3) UA = 1	(4) UA = 0	(5) UA = 1	(6) UA = 0	(7) UA = 1	(8) UA = 0	(9) UA = 1	(10) UA = 0
CEP	0.0672**	−0.0520	0.0025	0.0823***	0.0366***	−0.0148	0.0354***	−0.0243	0.0355***	−0.0051
	[0.0276]	[0.0595]	[0.0154]	[0.0190]	[0.0113]	[0.0383]	[0.0112]	[0.0408]	[0.0101]	[0.0301]
VA	0.0272**	0.0201								
	[0.0122]	[0.0335]								
CEP*VA	−0.0190	0.0799*								
	[0.0265]	[0.0428]								
PSAV			0.0024	0.0010						
			[0.0057]	[0.0101]						
CEP*PSAV			0.0881***	−0.0316						
			[0.0228]	[0.0195]						
GE					−0.0091	0.0075				
					[0.0081]	[0.0105]				
CEP*GE					0.0123	0.0446**				
					[0.0115]	[0.0225]				
RL							−0.0018	−0.0385		
							[0.0095]	[0.0242]		
CEP*RL							0.0136	0.0485**		
							[0.0118]	[0.0236]		
CC									−0.0044	−0.0220
									[0.0066]	[0.0138]
CEP*CC									0.0155	0.0353**
									[0.0109]	[0.0160]
Observations	22,481	22,417	22,481	22,417	22,481	22,417	22,481	22,417	22,481	22,417
R-squared	0.2288	0.1817	0.2281	0.1818	0.2281	0.1819	0.2281	0.1819	0.2283	0.1818
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.226	0.179	0.225	0.179	0.225	0.179	0.225	0.179	0.225	0.179

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

effect on long-term debt occurs through the interaction terms of CEP with voice and accountability (VA), government effectiveness (GE), rule of law (RL), and control of corruption (CC). Unlike the other political factors, voice and accountability appears as a significant positive inductor of long-term debt independently of the firm's environmental performance when uncertainty avoidance is higher. Regarding political stability and the absence of violence (PSAV), the opposite behavior emerges compared to the other four political factors. It is a positive inductor of long-term debt through the interaction term with CEP only when uncertainty avoidance is higher (UA = 1).

In Table 12, the same analysis of the effect of carbon performance on a firm's indebtedness, considering the political framework, is made by distinguishing countries by the cultural factor of long-term orientation. A clear pattern is appreciated, with a positive direct effect of CEP on the firm's long-term debt but only for countries with lower long-term orientation values. In contrast, the interaction of political factors with carbon performance is significant only in countries with a long-term orientation. The pattern is not maintained for control of corruption, as there is no direct effect of CEP on debt, and the interaction with carbon performance is not significant in any case.

4.5 | Robustness checks

To corroborate our results, we use the variation in sales to control whether carbon performance improves stem from increased efficiency

TABLE 12 Effect of political factors on the relationship between carbon performance and long-term financial debt by long-term orientation groups.

	(1) LT = 1	(2) LT = 0	(3) LT = 1	(4) LT = 0	(5) LT = 1	(6) LT = 0	(7) LT = 1	(8) LT = 0	(9) LT = 1	(10) LT = 0
CEP	−0.020	0.062***	−0.001	0.066***	0.016	0.056***	0.005	0.063***	0.033	0.039
	[0.019]	[0.013]	[0.016]	[0.015]	[0.013]	[0.014]	[0.015]	[0.015]	[0.030]	[0.027]
VA	−0.017	−0.008								
	[0.010]	[0.007]								
CEP*VA	0.017*	0.011								
	[0.009]	[0.010]								
PSAV			0.008	0.009						
			[0.009]	[0.006]						
CEP*PSAV			0.088***	0.012						
			[0.024]	[0.017]						
GE					−0.017	−0.008				
					[0.010]	[0.007]				
CEP*GE					0.017*	0.011				
					[0.009]	[0.010]				
RL							−0.011	−0.015		
							[0.017]	[0.010]		
CEP*RL							0.025**	0.005		
							[0.010]	[0.011]		
CC									−0.005	0.007
									[0.016]	[0.015]
CEP*CC									0.004	0.027
									[0.024]	[0.022]
Observations	24,537	20,361	24,537	20,361	24,537	20,361	24,537	20,361	24,537	20,361
R-squared	0.226	0.185	0.226	0.185	0.226	0.185	0.226	0.185	0.226	0.185
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adj. Rsq	0.224	0.182	0.223	0.182	0.223	0.182	0.223	0.182	0.223	0.182

Note: The standard errors are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

or a reduction in the firm's activity, following Fernández-Cuesta et al. (2019). We also control for two relevant capital structure factors: the variation in tangibility associated with a firm's collateral (Rampini & Viswanathan, 2013) and the variation in liquidity, given its importance as a source of internal funding (Myers & Majluf, 1984). We proxy them using three dummy variables: DSALES, which takes the value of one when a firm's sales grow and zero otherwise; DTANG, which takes the value of one when a firm's tangibility grows and zero otherwise; and DLIQ, which takes the value of one when a firm's liquidity grows and zero otherwise. Additionally, we rerun our models using a Tobit model to check whether the findings hold when different methodologies are used. In general, additional analyses performed (untabulated) confirmed that our results were robust.

5 | CONCLUSIONS

This study incorporates the institutional framework as a moderating factor in the relationship between carbon performance and firms' capital structure. More specifically, we focus on the effect of two sets of variables related to formal institutions: political factors and the macro-financial framework. We then added two cultural factors as part of informal institutions: uncertainty avoidance and long-term orientation, which are relevant cultural factors in firms' decision-making on environmental management and financial strategies.

Using a sample of listed firms in 27 European countries, our results indicate that financial and political factors are key elements in the effect of carbon performance on financial debt, which is

consistent with institutional theory. Environmentally responsible firms benefit from financial environments with higher bank concentration and stability. Banks will be keener in developing tighter, long-term relationships with firms, reducing financial restraints (TOT and POT), and allowing companies to invest in their decarbonization. An increase in government debt and budget deficits can lead to a crowding-out effect, which reduces firms' access to new debt. At higher levels, government debt growth and financial instability reverse the relationship between carbon performance and leverage. Concerning political factors, better carbon performers in countries with better democratic and governmental values, such as press freedom, law enforcement, and corruption control, obtain more financing. Political coercive pressures induce firms to adopt cleaner production and creditors to finance cleaner projects.

When the cultural framework is added to models that include formal institutions, our results support Hypothesis 3, which is consistent with the effect of cultural perception on agency costs and information asymmetry (TOT, POT). In countries with weaker uncertainty avoidance cultures, environmental responsibility is a more relevant factor in obtaining debt (and long-term debt). Regarding the financial institutions considered, their moderation effect occurs mainly for obtaining long-term debt and in countries with a higher uncertainty avoidance culture. Regarding the long-term orientation cultural factor, environmental responsibility is also a more relevant factor for obtaining debt (and long-term debt) at lower levels of the cultural factor. Unlike the case of uncertainty avoidance culture, the negative moderating effect of financial institutions on obtaining debt by environmental performers is addressed by lower levels of this cultural factor.

The cultural framework considered in models incorporating political institutions has produced insightful results. Long-term debt has a significant relationship with carbon performance in countries with higher uncertainty avoidance values when the models include voice and accountability (VA), government effectiveness (GE), rule of law (RL) and control of corruption (CC); however, the interaction of these political factors with the firm's carbon performance is only significant at lower values of uncertainty avoidance. In contrast, when the cultural factor considered is long-term orientation, models including the political factors voice and accountability (VA), political stability and absence of violence (PSAV), government effectiveness (GE) and rule of law (RL) show the opposite pattern; that is, a direct positive effect of carbon performance on long-term debt only in countries with lower levels of long-term orientation, and a better positive effect of these political factors on long-term debt for good environmental performers only in countries with lower levels of cultural factors.

We contribute to the literature by incorporating formal and informal institutional perspectives into the scarce literature addressing the effects of environmental issues on capital structure. We bridge institutional theories and the capital structure theoretical framework by analyzing both formal and informal institutions as moderators of how firms' debt responds to carbon performance. Furthermore, this is the first study to analyze the effect of cultural factors on moderating formal institutions' influence in two potentially conflicting areas: indebtedness and environmental responsibility.

The results of this study are of interest to creditors, increasingly exposed to environmental and carbon risks, managers of firms facing stringent climate change regulations, policymakers and regulators developing them, and other stakeholders, researchers, and academics. Our results indicate that environmentally conscious firms' financing depends on the formal and informal institutional contexts in which they operate. Managers should address this issue when designing and implementing their carbon-related strategies. Creditors should also consider this when setting their financing policies because green investments are risky and long-term oriented. However, these results can be especially relevant for institutions, as high government quality creates an adequate environment for firms to implement their decarbonization processes.

ACKNOWLEDGMENTS

We are grateful for the helpful suggestions received to previous versions of the paper from the participants at the XXI International Congress AECA, the 44th Annual Congress of the European Accounting Association (EAA), and the VII International Meeting of Specialization for Research in Economy and Business.

FUNDING INFORMATION

We acknowledge financial assistance from the Spanish Ministry of Science and Innovation (PID2021-124950OB-I00, and PID2020-114797GB-I00) and the University of León (ULE2021/00154/001).

ORCID

Adrián Ferreras https://orcid.org/0000-0002-6524-9662
Paula Castro https://orcid.org/0000-0002-7936-9833
María T. Tascón https://orcid.org/0000-0002-5868-0008

REFERENCES

Aggarwal, R., Faccio, M., Guedhami, O., & Kwok, C. C. Y. (2016). Culture and finance: An introduction. *Journal of Corporate Finance*, *41*, 466–474. https://doi.org/10.1016/j.jcorpfin.2016.09.011

Aggarwal, R., & Goodell, J. W. (2009). Markets and institutions in financial intermediation: National characteristics as determinants. *Journal of Banking and Finance*, *33*(10), 1770–1780. https://doi.org/10.1016/j.jbankfin.2009.03.004

Alogoskoufis, S., Dunz, N., Emambakhsh, T., Hennig, T., Kaijser, M., Kouratzoglou, C., & Salleo, C. (2021). ECB's economy-wide climate stress test. *European Central Bank Occasional Paper Series*, *281*, 1–91.

Alves, P. F. P., & Ferreira, M. A. (2011). Capital structure and law around the world. *Journal of Multinational Financial Management*, *21*(3), 119–150. https://doi.org/10.1016/j.mulfin.2011.02.001

An, Z., Li, D., & Yu, J. (2016). Earnings management, capital structure, and the role of institutional environments. *Journal of Banking & Finance*, *68*, 131–152. https://doi.org/10.1016/j.jbankfin.2016.02.007

Anderson, C. J., & Tverdova, Y. V. (2003). Corruption, political allegiances, and attitudes toward government in contemporary democracies. *American Journal of Political Science*, *47*(1), 91–109. https://doi.org/10.2307/3186095

Arvin, B. M., & Lew, B. (2011). Does democracy affect environmental quality in developing countries? *Applied Economics*, *43*(9), 1151–1160. https://doi.org/10.1080/00036840802600277

Badoer, D. C., & James, C. M. (2016). The determinants of long-term corporate debt issuances. *The Journal of Finance*, *71*(1), 457–492.

Balsalobre-Lorente, D., Shahbaz, M., Jabbour, C. J. C., & Driha, O. M. (2019). The role of energy innovation and corruption in carbon emissions: Evidence based on the EKC hypothesis. In M. Shahbaz & D. Balsalobre (Eds.), *Energy and environmental strategies in the era of globalization* (pp. 271–304). Springer. https://doi.org/10.1007/978-3-030-06001-5_11

Barrett, S., & Graddy, K. (2000). Freedom, growth, and the environment. *Environment and Development Economics*, *5*(4), 433–456. https://doi.org/10.1017/S1355770X00000267

Beck, T., Colciago, A., & Pfajfar, D. (2014). The role of financial intermediaries in monetary policy transmission. *Journal of Economic Dynamics and Control*, *43*, 1–11. https://doi.org/10.1016/j.jedc.2014.04.010

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2006). Bank concentration, competition, and crises: First results. *Journal of Banking & Finance*, *30*(5), 1581–1603. https://doi.org/10.1016/j.jbankfin.2005.05.010

Becker, B., & Ivashina, V. (2018). Financial repression in the European sovereign debt crisis. *Review of Finance*, *22*(1), 83–115. https://doi.org/10.1093/rof/rfx041

Berger, A. N., Demirgüç-Kunt, A., Levine, R., & Haubrich, J. G. (2004). Bank concentration and competition: An evolution in the making. *Journal of Money, Credit and Banking*, *36*(3), 433–451. https://www.jstor.org/stable/3838945

Berger, A. N., & Udell, G. F. (1995). Relationship lending and lines of credit in small firm finance. *The Journal of Business*, *68*(3), 351–381. https://www.jstor.org/stable/2353332

Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity as the mother of 'green' inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, *34*(8), 891–909. https://doi.org/10.1002/smj.2041

Bharath, S. T., Dahiya, S., Saunders, A., & Srinivasan, A. (2011). Lending relationships and loan contract terms. *The Review of Financial Studies*, *24*(4), 1141–1203. https://doi.org/10.1093/rfs/hhp064

Boiral, O., Henri, J. F., & Talbot, D. (2012). Modeling the impacts of corporate commitment on climate change. *Business Strategy and the Environment*, *21*(8), 495–516. https://doi.org/10.1002/bse.723

Bolton, P., Freixas, X., Gambacorta, L., & Mistrulli, P. E. (2016). Relationship and transaction lending in a crisis. *The Review of Financial Studies*, *29*(10), 2643–2676. https://doi.org/10.1093/rfs/hhw041

Buti, M., & Messori, M. (2020). Next generation EU: An interpretative guide. *SEP Policy Brief*, *29*, 1–12.

Calza, F., Cannavale, C., & Tutore, I. (2016). The important effects of national culture on the environmental proactivity of firms. *Journal of Management Development*, *35*(8), 1011–1030. https://doi.org/10.1108/JMD-10-2015-0145

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, *97*(3), 470–487. https://doi.org/10.1016/j.jfineco.2010.02.009

Caprar, D. V., & Neville, B. A. (2012). "Norming" and "conforming": Integrating cultural and institutional explanations for sustainability adoption in business. *Journal of Business Ethics*, *110*(2), 231–245. https://doi.org/10.1007/s10551-012-1424-1

Castiglione, C., Infante, D., & Smirnova, J. (2015). Environment and economic growth: Is the rule of law the go-between? The case of high-income countries. *Energy, Sustainability and Society*, *5*(1), 1–7. https://doi.org/10.1186/s13705-015-0054-8

Castro, P., Keasey, K., Amor-Tapia, B., Tascón, M. T., & Vallascas, F. (2020). Does debt concentration depend on the risk-taking incentives in CEO compensation? *Journal of Corporate Finance*, *64*, 1–24. https://doi.org/10.1016/j.jcorpfin.2020.101684

Casu, B., & Girardone, C. (2009). Competition issues in European banking. *Journal of Financial Regulation and Compliance*, *17*(2), 119–133. https://doi.org/10.1108/13581980910952568

Chang, K., Wee, J. B., & Yi, H. C. (2012). Does national culture influence the firm's choice of debt maturity? *Asia-Pacific Journal of Financial Studies*, *41*(4), 424–457. https://doi.org/10.1111/j.2041-6156.2012.01078.x

Chen, M. J. (2017). Environmental governance: Disentangling the relationship between economic growth and rule of law on environmental policy stringency. *Letters in Spatial and Resource Sciences*, *10*(2), 253–275. https://doi.org/10.1007/s12076-017-0186-x

Choi, B., & Luo, L. (2021). Does the market value greenhouse gas emissions? Evidence from multi-country firm data. *The British Accounting Review*, *53*(1), 1–24. https://doi.org/10.1016/j.bar.2020.100909

Chui, A. C. W., Kwok, C. C. Y., & Zhou, G. (2016). National culture and the cost of debt. *Journal of Banking & Finance*, *69*, 1–19. https://doi.org/10.1016/j.jbankfin.2016.04.001

Coluccia, D., Fontana, S., & Solimene, S. (2018). Does institutional context affect CSR disclosure? A study on Eurostoxx 50. *Sustainability*, *10*(8), 1–20. https://doi.org/10.3390/su10082823

Culas, R. J. (2007). Deforestation and the environmental Kuznets curve: An institutional perspective. *Ecological Economics*, *61*(2–3), 429–437. https://doi.org/10.1016/j.ecolecon.2006.03.014

De Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm-and country-specific determinants. *Journal of Banking & Finance*, *32*(9), 1954–1969. https://doi.org/10.1016/j.jbankfin.2007.12.034

Dell'Ariccia, G., & Marquez, R. (2004). Information and bank credit allocation. *Journal of Financial Economics*, *72*(1), 185–214. https://doi.org/10.1016/S0304-405X(03)00210-1

Demirci, I., Huang, J., & Sialm, C. (2019). Government debt and corporate leverage: International evidence. *Journal of Financial Economics*, *133*(2), 337–356. https://doi.org/10.1016/j.jfineco.2019.03.009

Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, finance, and firm growth. *The Journal of Finance*, *53*(6), 2107–2137. https://doi.org/10.1111/0022-1082.00084

Di Vita, G. (2009). Legal families and environmental protection: Is there a causal relationship? *Journal of Policy Modeling*, *31*(5), 694–707. https://doi.org/10.1016/j.jpolmod.2009.01.003

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.2307/2095101

Disli, M., Ng, A., & Askari, H. (2016). Culture, income, and CO2 emission. *Renewable and Sustainable Energy Reviews*, *62*, 418–428. https://doi.org/10.1016/j.rser.2016.04.053

Dixon-Fowler, H. R., Slater, D. J., Johnson, J. L., Ellstrand, A. E., & Romi, A. M. (2013). Beyond "does it pay to be green?" a meta-analysis of moderators of the CEP-CFP relationship. *Journal of Business Ethics*, *112*(2), 353–366. https://doi.org/10.1007/s10551-012-1268-8

Donadelli, M., Fasan, M., & Magnanelli, B. S. (2014). The agency problem, financial performance and corruption: Country, industry and firm level perspectives. *European Management Review*, *11*(3–4), 259–272. https://doi.org/10.1111/emre.12038

Du, X., Weng, J., Zeng, Q., Chang, Y., & Pei, H. (2017). Do lenders applaud corporate environmental performance? Evidence from Chinese private-owned firms. *Journal of Business Ethics*, *143*(1), 179–207. https://doi.org/10.1007/s10551-015-2758-2

Duprey, T., Klaus, B., & Peltonen, T. (2017). Dating systemic financial stress episodes in the EU countries. *Journal of Financial Stability*, *32*, 30–56. https://doi.org/10.1016/j.jfs.2017.07.004

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, *43*(2), 153–193. https://doi.org/10.1016/S0304-405X(96)00896-3

Fan, J. P. H., Titman, S., & Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and Quantitative Analysis*, *47*(1), 23–56. https://doi.org/10.1017/S0022109011000597

Fernández-Cuesta, C., Castro, P., Tascón, M. T., & Castaño, F. J. (2019). The effect of environmental performance on financial debt. European

evidence. *Journal of Cleaner Production*, *207*, 379–390. https://doi.org/10.1016/j.jclepro.2018.09.239

Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management*, *38*(1), 1–37. https://doi.org/10.1111/j.1755-053X.2009.01026.x

Gao, W., & Zhu, F. (2015). Information asymmetry and capital structure around the world. *Pacific-Basin Finance Journal*, *32*, 131–159. https://doi.org/10.1016/j.pacfin.2015.01.005

González, V. M. (2015). The financial crisis and corporate debt maturity: The role of banking structure. *Journal of Corporate Finance*, *35*, 310–328. https://doi.org/10.1016/j.jcorpfin.2015.10.002

Greenwood, R., Hanson, S., & Stein, J. C. (2010). A gap-filling theory of corporate debt maturity choice. *The Journal of Finance*, *65*(3), 993–1028. https://doi.org/10.1111/j.1540-6261.2010.01559.x

Gungoraydinoglu, A., Çolak, G., & Öztekin, Ö. (2017). Political environment, financial intermediation costs, and financing patterns. *Journal of Corporate Finance*, *44*, 167–192. https://doi.org/10.1016/j.jcorpfin.2017.03.007

Gungoraydinoglu, A., & Öztekin, Ö. (2011). Firm-and country-level determinants of corporate leverage: Some new international evidence. *Journal of Corporate Finance*, *17*(5), 1457–1474. https://doi.org/10.1016/j.jcorpfin.2011.08.004

Gutiérrez-López, C., Castro, P., & Tascón, M. T. (2022). How can firms' transition to a low-carbon economy affect the distance to default? *Research in International Business and Finance*, *22*, 101722. https://doi.org/10.1016/j.ribaf.2022.101722

Halkos, G. E., & Tzeremes, N. G. (2013). National culture and eco-efficiency: An application of conditional partial nonparametric frontiers. *Environmental Economics and Policy Studies*, *15*(4), 423–441. https://doi.org/10.1007/s10018-013-0066-6

Haque, F., & Ntim, C. G. (2022). Do corporate sustainability initiatives improve corporate carbon performance? Evidence from European firms. *Business Strategy and the Environment*, *31*(7), 3318–3334. https://doi.org/10.1002/bse.3078

Hintermann, B., Peterson, S., & Rickels, W. (2016). Price and market behavior in phase II of the EU ETS: A review of the literature. *Review of Environmental Economics and Policy*, *10*(1), 108–128. https://doi.org/10.1093/reep/rev01

Hofstede, G. H. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. SAGE.

Husted, B. W. (2005). Culture and ecology: A cross-national study of the determinants of environmental sustainability. *Management International Review*, *45*(3), 349–371.

Jordà, Ò., Schularick, M., & Taylor, A. M. (2014). *Private credit and public debt in financial crises* (pp. 1–4). FRBSF Economic Letter.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: Methodology and analytical issues. *Hague Journal on the Rule of Law*, *3*(2), 220–246. https://doi.org/10.1017/S1876404511200046

Kieschnick, R., & Moussawi, R. (2018). Firm age, corporate governance, and capital structure choices. *Journal of Corporate Finance*, *48*, 597–614. https://doi.org/10.1016/j.jcorpfin.2017.12.011

Kim, Y. B., An, H. T., & Kim, J. D. (2015). The effect of carbon risk on the cost of equity capital. *Journal of Cleaner Production*, *93*, 279–287. https://doi.org/10.1016/j.jclepro.2015.01.006

Koch, N., Fuss, S., Grosjean, G., & Edenhofer, O. (2014). Causes of the EU ETS price drop: Recession, CDM, renewable policies or a bit of everything? —New evidence. *Energy Policy*, *73*, 676–685. https://doi.org/10.1016/j.enpol.2014.06.024

Kolk, A., & Pinkse, J. (2010). The integration of corporate governance in corporate social responsibility disclosures. *Corporate Social Responsibility and Environmental Management*, *17*(1), 15–26. https://doi.org/10.1002/csr.196

Lane, J. E., & Ersson, S. (2007). Party system instability in Europe: Persistent differences in volatility between west and east? *Democratisation*, *14*(1), 92–110. https://doi.org/10.1080/13510340601024322

Lavezzolo, S., Rodríguez-Lluesma, C., & Elvira, M. M. (2018). National culture and financial systems: The conditioning role of political context. *Journal of Business Research*, *85*, 60–72. https://doi.org/10.1016/j.jbusres.2017.12.021

Lee, C. C., & Wang, C. W. (2021). Firms' cash reserve, financial constraint, and geopolitical risk. *Pacific-Basin Finance Journal*, *65*, 1–12. https://doi.org/10.1016/j.pacfin.2020.101480

Li, Q., & Reuveny, R. (2006). Democracy and environmental degradation. *International Studies Quarterly*, *50*(4), 935–956. https://doi.org/10.1111/j.1468-2478.2006.00432.x

López-Iturriaga, F. J., & Rodriguez-Sanz, J. A. (2008). Capital structure and institutional setting: A decompositional and international analysis. *Applied Economics*, *40*(14), 1851–1864. https://doi.org/10.1080/00036840600905233

Luo, L. L., & Tang, Q. (2016). Does national culture influence corporate carbon disclosure propensity? *Journal of International Accounting Research*, *15*(1), 17–47. https://doi.org/10.2308/jiar-51131

Maaloul, A. (2018). The effect of greenhouse gas emissions on cost of debt: Evidence from Canadian firms. *Corporate Social Responsibility and Environmental Management*, *25*(6), 1407–1415. https://doi.org/10.1002/csr.1662

Martínez-Zarzoso, I., & Phillips, J. (2020). Freedom of the press, inequality and environmental policy. *Environment and Development Economics*, *25*(6), 537–560. https://doi.org/10.1017/S1355770X20000339

Muttakin, M. B., Rana, T., & Mihret, D. G. (2022). Democracy, national culture and greenhouse gas emissions: An international study. *Business Strategy and the Environment*, *31*(7), 2978–2991. https://doi.org/10.1002/bse.3059

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Nguyen, T., Locke, S., & Reddy, K. (2015). Ownership concentration and corporate performance from a dynamic perspective: Does national governance quality matter? *International Review of Financial Analysis*, *41*, 148–161. https://doi.org/10.1016/j.irfa.2015.06.005

Ntim, C. G., & Soobaroyen, T. (2013). Corporate governance and performance in socially responsible corporations: New empirical insights from a neo-institutional framework. *Corporate Governance: An International Review*, *21*(5), 468–494. https://doi.org/10.1111/corg.12026

Obydenkova, A. V., & Salahodjaev, R. (2017). Climate change policies: The role of democracy and social cognitive capital. *Environmental Research*, *157*, 182–189. https://doi.org/10.1016/j.envres.2017.05.009

Orazalin, N., & Mahmood, M. (2021). Toward sustainable development: Board characteristics, country governance quality, and environmental performance. *Business Strategy and the Environment*, *30*(8), 3569–3588. https://doi.org/10.1002/bse.2820

Öztekin, Ö. (2015). Capital structure decisions around the world: Which factors are reliably important? *Journal of Financial and Quantitative Analysis*, *50*(3), 301–323.

Parboteeah, K. P., Addae, H. M., & Cullen, J. B. (2012). Propensity to support sustainability initiatives: A cross-national model. *Journal of Business Ethics*, *105*(3), 403–413. https://doi.org/10.1007/s10551-011-0979-6

Parboteeah, K. P., Bronson, J. W., & Cullen, J. B. (2005). Does national culture affect willingness to justify ethically suspect behaviors? A focus on the GLOBE national culture scheme. *International Journal of Cross Cultural Management*, *5*(2), 123–138. https://doi.org/10.1177/1470595805054489

Park, J. (2012). Corruption, soundness of the banking sector, and economic growth: A cross-country study. *Journal of International Money and Finance*, *31*(5), 907–929. https://doi.org/10.1016/j.jimonfin.2011.07.007

Pastor, L., & Veronesi, P. (2013). Political uncertainty and risk premia. *Journal of Financial Economics*, *110*(3), 520–545. https://doi.org/10.1016/j.jfineco.2013.08.007

Payne, R. A. (1995). Freedom and the environment. *Journal of Democracy*, *6*(3), 41–55. https://doi.org/10.1353/jod.1995.0053

Pellegrini, L., & Gerlagh, R. (2006). Corruption, democracy, and environmental policy: An empirical contribution to the debate. *The Journal of Environment & Development*, *15*(3), 332–354. https://doi.org/10.1177/1070496506290960

Pohjolainen, P., Kukkonen, I., Jokinen, P., Poortinga, W., Adedayo Ogunbode, C., Böhm, G., Fisher, S., & Umit, R. (2021). The role of national affluence, carbon emissions, and democracy in Europeans' climate perceptions. *Innovation: The European Journal of Social Science Research*, 1–19. https://doi.org/10.1080/13511610.2021.1909465

Popov, A., & Udell, G. F. (2012). Cross-border banking, credit access, and the financial crisis. *Journal of International Economics*, *87*(1), 147–161. https://doi.org/10.1016/j.jinteco.2012.01.008

Povitkina, M. (2018). The limits of democracy in tackling climate change. *Environmental Politics*, *27*(3), 411–432. https://doi.org/10.1080/09644016.2018.1444723

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, *50*(5), 1421–1460. https://doi.org/10.1111/j.1540-6261.1995.tb05184.x

Rampini, A. A., & Viswanathan, S. (2013). Collateral and capital structure. *Journal of Financial Economics*, *109*(2), 466–492. https://doi.org/10.1016/j.jfineco.2013.03.002

Rothstein, B., & Eek, D. (2009). Political corruption and social trust: An experimental approach. *Rationality and Society*, *21*(1), 81–112. https://doi.org/10.1177/1043463108099349

Schopohl, L., Urquhart, A., & Zhang, H. (2021). Female CFOs, leverage and the moderating role of board diversity and CEO power. *Journal of Corporate Finance*, *71*, 1–26. https://doi.org/10.1016/j.jcorpfin.2020.101858

Scott, W. R. (2005). Institutional theory: Contributing to a theoretical research program. In K. G. Smith & M. A. Hitt (Eds.), *Great minds in management: The process of theory development* (pp. 460–484). Oxford University Press.

Seleim, A., & Bontis, N. (2009). The relationship between culture and corruption: A cross-national study. *Journal of Intellectual Capital*, *10*(1), 165–184. https://doi.org/10.1108/14691930910922978

Smith, J. D. (2016). US political corruption and firm financial policies. *Journal of Financial Economics*, *121*(2), 350–367. https://doi.org/10.1016/j.jfineco.2015.08.021

Tascón, M. T., Castro, P., Fernández-Cuesta, C., & Castaño, F. J. (2020). Environmental transaction costs and speed of adjustment to target debt in European carbon emitters. *Journal of Cleaner Production*, *256*, 1–10. https://doi.org/10.1016/j.jclepro.2020.120483

Tascón, M. T., Castro, P., & Ferreras, A. (2021). How does a firm's life cycle influence the relationship between carbon performance and financial debt? *Business Strategy and the Environment*, *30*(4), 1879–1897. https://doi.org/10.1002/bse.2722

Tata, J., & Prasad, S. (2015). National cultural values, sustainability beliefs, and organizational initiatives. *Cross Cultural Management: An International Journal*, *22*(2), 278–296. https://doi.org/10.1108/CCM-03-2014-0028

Tee, C. M., & Teoh, T. T. M. (2022). The cost of debt and political institutions: The influence of corruption. *Journal of Financial Crime*. https://doi.org/10.1108/JFC-08-2022-0192

Trumpp, C., & Guenther, T. (2017). Too little or too much? Exploring U-shaped relationships between corporate environmental performance and corporate financial performance. *Business Strategy and the Environment*, *26*(1), 49–68. https://doi.org/10.1002/bse.1900

Wang, L., Li, S., & Gao, S. (2014). Do greenhouse gas emissions affect financial performance? – An empirical examination of Australian public firms. *Business Strategy and the Environment*, *23*(8), 505–519. https://doi.org/10.1002/bse.1790

Zheng, X., El Ghoul, S., Guedhami, O., & Kwok, C. C. Y. (2012). National culture and corporate debt maturity. *Journal of Banking & Finance*, *36*(2), 468–488. https://doi.org/10.1016/j.jbankfin.2011.08.004

How to cite this article: Ferreras, A., Castro, P., & Tascón, M. T. (2024). Carbon performance and financial debt: Effect of formal and informal institutions. *Corporate Social Responsibility and Environmental Management*, 1–22. https://doi.org/10.1002/csr.2709