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# Shifting the balance: how ESG transformed corporate debt in emerging and developed markets post-COP21

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## Abstract

**Purpose** – We aimed to examine the influence of ESG performance pre- and post-COP21 on the capital structure of emerging and developed economies.

**Design/methodology/approach** – The analysis is based on 424,927 observations from companies listed in G20 stock exchanges between 2008 and 2023. Panel data regression models are employed to evaluate the impact of ESG performance on total, short-term and long-term debt, with interactions exploring differences between emerging and developed markets and the effects of COP21.

**Findings** – Our results reveal that ESG performance significantly influences corporate debt structures, particularly after COP21. Firms with strong ESG profiles experienced improved access to long-term financing, while short-term financing benefits were less pronounced. Companies adopting ESG practices in emerging markets mitigate structural financing challenges, gaining better access to long-term debt. Additionally, aligning ESG strategies with global sustainability goals post-COP21 enhanced debt access, emphasizing the growing role of ESG in corporate financing.

**Research limitations/implications** – The findings are based on G20 stock exchange data and may not generalize to non-G20 economies. Future research could expand the geographic scope and examine industry-specific ESG impacts.

**Practical implications** – The study highlights the importance of integrating ESG considerations into financial decision-making to enhance corporate debt access, particularly in the context of global sustainability goals.

**Originality/value** – This study contributes to the literature by analyzing ESG performance's impact on corporate capital structures across different economic contexts and regulatory environments. It underscores the importance of sustainability practices in financial strategy, particularly in emerging markets, where ESG adoption helps overcome structural barriers.

**Keywords** COP21, ESG performance, Emerging economies, Capital structure, Debt

**Paper type** Research paper

## Introduction

The Paris Agreement, signed during COP21, marked a turning point for global climate cooperation and emphasized the financial sector's role in managing carbon risks and promoting renewable energy investments, with significant implications for companies in emerging economies (McInerney and Johannsdottir, 2016). In these regions, where growth

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often brings environmental strain, we recognize that adopting ESG practices is essential for promoting transparency and sustainable development (Clement *et al*., 2021).

ESG rating scores evaluate firms' environmental, social, and governance efforts. While globally adopted, we find their relevance in emerging markets, particularly due to greater information asymmetry, regulatory gaps, and resource constraints (Yoon *et al*., 2018; Spandel *et al*., 2020). Although prior research links ESG performance to better capital access and lower costs, its effects in emerging economies remain underexplored (Ruan and Liu, 2021; Broadstock *et al*., 2021).

Globalization has increased environmental risks and allowed greater integration into global markets (Destek and Sarkodie, 2019). For emerging economies, the authors observe that ESG efforts can simultaneously address environmental concerns and enhance competitiveness. However, questions persist about how ESG influences financial outcomes such as capital structure.

In this study, we examine the role of ESG performance in shaping corporate capital structures across emerging and developed economies before and after COP21. We employ descriptive statistics, difference tests, Spearman correlation, and panel regressions on 424,927 firm-year observations from 2008 to 2023.

Our findings show that ESG performance became more relevant for long-term debt access post-COP21. While the Paris Agreement did not cause immediate changes, firms with stronger ESG profiles gradually gained financing advantages, especially in emerging markets, despite ongoing barriers to short-term credit.

This research offers practical implications. We encourage managers to improve ESG practices to enhance long-term financing conditions. Financial institutions can refine lending strategies to prioritize ESG-committed firms. Finally, policymakers in emerging markets should use these insights to support regulatory reforms that foster sustainable finance and global competitiveness.

## Literature review and hypotheses development

With growing awareness of climate change in recent years, companies and governments have adopted strategies beyond merely complying with environmental regulations and prioritizing sustainability performance to mitigate long-term environmental impacts. From the Kyoto Protocol in 2005 to the 2015 Paris Agreement (COP21), there has been a global movement toward reducing greenhouse gas emissions, with companies encouraged to address climate change proactively (Tuesta *et al*., 2021). Increased external pressures from regulators and investors have motivated companies to integrate ESG practices into their operations.

In this context, governments have employed environmental taxes to reduce pollution and incentivize using renewable energy sources. These taxes not only discourage the consumption of fossil fuels but also promote green growth, stimulating the transition to low-carbon economies. Furthermore, companies face climate risks classified as either physical, stemming from extreme natural events, or transitional, linked to regulatory and technological shifts aimed at decarbonization (Reboredo and Ugolini, 2022). While physical risks are more easily quantifiable, transitional risks are more complex, requiring a detailed analysis of market conditions and environmental policies.

Additionally, companies with higher ESG ratings can reduce information asymmetry, agency costs, and capital constraints, ultimately reducing idiosyncratic risk (Pelster *et al*., 2024) and reducing the risk of bankruptcy. Given their commitment to sustainability and corporate responsibility, investors and creditors perceive such companies as safer. Conversely, companies with a negative environmental profile tend to have higher capital costs, reflecting the greater perceived risk associated with unsustainable practices (Chava, 2014; Ng and Rezaee, 2015).

Furthermore, the investor protection environment also influences the relationship between ESG performance and the cost of capital. Companies located in countries with weaker investor protection and poor ESG performance may face higher capital costs (Breuer *et al*., 2018). Conversely, positive ESG performance not only reduces the risks perceived by creditors but

can also enhance a company's future performance, as they are seen as better positioned to manage resources efficiently and sustainably, particularly during crises such as the COVID-19 pandemic (Griffiths *et al*., 2021). Based on these arguments, we propose the first hypothesis:

*H1*. Companies with higher ESG scores have higher levels of debt.

The Paris Agreement, signed in 2015, was a fundamental milestone in the global fight against climate change. The agreement established clear targets for the decarbonization of economies, encouraging companies to adopt sustainable performance to reduce greenhouse gas emissions (Reboredo and Ugolini, 2022). As a result, companies across various sectors began aligning their business strategies with long-term sustainability goals, balancing financial performance with environmental commitments (Lee *et al*., 2023).

Adherence to the Paris Agreement has also significantly impacted companies' access to capital. Investors and creditors, increasingly aware of the importance of environmental, social, and governance issues, began favoring companies with clear environmental strategies and concrete commitments to sustainability (Bolton and Kacperczyk, 2023; McInerney and Johannsdottir, 2016). The implementation of stricter environmental regulations has also spurred the growth of the green bond market, encouraging investments in low-carbon assets and promoting the transition to more sustainable economies (McInerney and Johannsdottir, 2016). Therefore, the following hypothesis is proposed:

*H2*. The Paris Agreement positively affected companies' debt levels.

Following COP21, environmental, social, and governance issues became central to the relationship between companies and creditors, particularly concerning climate risk. Investors and market participants began closely monitoring companies' exposure to climate-related risks, especially transitioning to a greener economy (Pelster *et al*., 2024). With advancing environmental regulations and growing awareness of climate impacts, companies with high levels of carbon exposure face increasing pressure from creditors and investors (Trinh *et al*., 2024). Thus, the third hypothesis is presented:

*H3*. Companies with higher ESG scores post-COP21 have higher levels of debt.

Political, social, and economic globalization impacts environmental policies differently in developed and emerging countries. In developed countries, companies operate in more mature economic environments with stricter regulations and a more robust financial infrastructure. These factors create a framework where companies that adopt ESG practices are often rewarded with lower capital costs and greater access to credit (Pelster *et al*., 2024). In contrast, emerging economies often face challenges such as the lack of stringent environmental regulation and underdeveloped financial markets, making it difficult for companies to access external financing (Myers and Majluf, 1984; Santos *et al*., 2023).

Additionally, creditors often perceive companies as riskier in emerging economies due to political and economic instability and the lack of investor protection. In these markets, companies may resort to trade credit, which tends to have a higher cost, to compensate for the difficulty in accessing traditional credit (Yang *et al*., 2022). The lack of adequate financial infrastructure and the absence of robust environmental regulations make it more difficult for companies in emerging economies to implement effective ESG practices, resulting in a perception of higher risk by creditors.

On the other hand, in developed economies, the development of financial markets facilitates access to external financing, which is crucial for corporate growth (Rajan and Zingales, 1998). Furthermore, adopting ESG practices in developed countries is often associated with financial incentives, such as access to green bonds and sustainable credit lines. This can further reduce capital costs for companies that commit to sustainability (Spandel *et al*., 2020). Therefore, companies in developed countries benefit more from adopting ESG performance than those in emerging economies, where financing barriers are greater. Based on these arguments, the following hypothesis can be proposed:

*H4*. Companies in emerging economies have lower debt levels than those in developed economies.

Even among companies in emerging economies that exhibit good ESG performance, these firms may not benefit from the same debt levels as those in developed countries. This is mainly due to the fragility of financial institutions and the limited access to sustainable financing instruments in emerging markets (Trinh *et al*., 2024). The business environment in these countries often lacks the maturity needed to fully support ESG initiatives, hindering companies from raising capital based on their sustainable performance.

Research also indicates that human capital, particularly education and training, is important in promoting effective environmental performance and improving energy efficiency, directly influencing companies' ability to raise funds (Zafar *et al*., 2020). In many emerging markets, the lack of investment in environmental education and clean technologies can hinder the implementation of ESG performance, reinforcing the perception of risk among creditors and investors. Thus, the following hypothesis can be formulated:

*H5*. Companies in emerging markets with higher ESG scores have lower debt levels than those in developed markets.

The Paris Agreement also had significant implications for emerging economies. Developed countries are committed to providing financial and technical support to help developing nations achieve their climate goals. However, this support has not always translated into a direct increase in corporate debt levels in these regions, as many companies still face substantial obstacles in accessing sustainable financing (Robbins, 2016). Moreover, companies operating in sectors heavily reliant on fossil fuels in emerging markets may face additional risks in securing financing for their transition to cleaner energy sources.

Trinh *et al*. (2024) considered the Paris Agreement in 2015 as an exogenous event related to firms' exposure to climate risks. They noted that COP21 is a key global event emphasizing the harmful effects of unsustainable corporate activities on the environment and society. According to the authors, COP21 has been used as an exogenous event in recent corporate finance research, particularly concerning ESG performance and climate issues. Following this event, they suggested that investors, market participants, shareholders, debtholders, and corporate managers worldwide have become more attentive to business models contributing to climate change and global warming. Consequently, firms with higher exposure to climate risks are likely to face increased concerns from debtholders after the shock of 2015.

In this regard, it is essential to explore the role of environmental regulation and support mechanisms, which could facilitate the process of accessing financing for companies committed to sustainability. Companies with a strong focus on ESG in emerging economies may have better chances of obtaining favorable financing conditions, particularly if they can demonstrate alignment with global environmental goals (Zafar *et al*., 2020). Thus, the following hypothesis can be formulated:

*H6*. Companies in emerging markets that align their strategies with global environmental goals after COP21 will have greater access to debt financing than those that do not.

## Research design

This study is descriptive and uses a quantitative approach. Data were collected from companies listed in G20 stock exchanges, totaling 424,927 observations (company/year) from 2008 to 2023. The companies' financial data and ESG scores were obtained from the LSEG database.

The dependent variables underwent a Box-Cox transformation to treat outliers and adjust the data's distribution. The continuous explanatory variables were winsorized between 1 and 99%. For the regression analysis, we used Ordinary Least Squares (OLS) models in panels with fixed effects in the sector, year, and country simultaneously.

To analyze our research hypotheses, we used the model described in Equation (1):

$$\mathbf{Debt_{it}} = \beta_0 + \beta_1 \mathbf{ESG_{it}} + \mathrm{D_1COP21_t} + \mathrm{D_2}\mathit{Emerg_j} + \beta_2 \mathbf{ESG_{it}} * \mathrm{COP21_t} + \beta_3 \mathbf{ESG_{it}} * \mathit{Emerg_j} + \mathrm{D_3COP21_t} * \mathit{Emerg_j} + \beta_4 \mathbf{ESG_{it}} * \mathit{Emerg_j} * \mathrm{COP21_t} + \sum_{i=1}^{11} \beta_k \mathrm{Controls} + \varepsilon_{it} \quad (1)$$

Where: $\mathrm{Debt_{it}}$: total ($\mathrm{DebtT_{it}}$) short-term ($\mathrm{DebtST_{it}}$) and long-term ($\mathrm{DebtLT_{it}}$) capital structure of company i in year t; $\mathrm{ESG_{it}}$: ESG variables for the company i in year t; $\mathrm{COP21_t}$: dummy variable that assumes value 1 in the years t after the Paris Agreement; $\mathrm{Emerg_j}$: dummy variable that assumes value one for companies i listed emerging countries that are part of the G20; Controls: Control variables adopted in this study based on previous empirical evidence.

The capital structure and ESG *proxies* were tested for each dependent variable ($Debt_{it}$): (1) total debt ($DebtT_{it}$), (2) short-term debt ($DebtST_{it}$), (3) and long-term debt ($DebtLT_{it}$). These were operationalized from the ratio of liabilities (total, current, and non-current, respectively) over total assets, according to Garfatta (2021) and Adeneye and Kammoun (2022).

The independent variables related to ESG performance ($ESG_{it}$) were delimited by the ESG scores available in the LSEG database. When the score was not disclosed, it was treated as absent, with zero in the sample. This variable presented in Equation (1) is broken down into three analyzed proxies. These are: $DESG_{it}$, $ESGscore_{it}$, and $CatESG_{it}$.

The variable $\mathrm{DESG_{it}}$ is a dummy equal to 1 for companies with an ESG score and zero otherwise. This proxy indicates whether the company is subject to ESG evaluation and disclosure scrutiny, regardless of its score. Through this proxy, it is possible to identify whether using third-party capital (short- or long-term) is associated with the company's ESG rating score. Thus, it can be determined whether companies with ESG ratings, by presenting more reliable information and focusing on sustainable practices, obtain more third-party capital than those without.

$\mathrm{CatESG_{it}}$ is a categorical variable that classifies ESG scores into four ranges, following the LSEG distribution: $ESG_{25it}$, for companies with scores between 0 and 25; $ESG_{50it}$, for those with scores between 25 and 50; $ESG_{75it}$, for companies with scores between 50 and 75; and $ESG_{100it}$, for those scoring between 75 and 100. Using this variable, it is possible to evaluate whether companies with higher scores face similar or different debt financing conditions in the short and long term compared to their peers with lower ratings.

$\mathrm{ESGscore_{it}}$ considers the ESG score (0–100) assigned to each company-year. It captures the intensity of ESG performance and disclosure, providing a more precise estimate of its influence on financing behavior. Therefore, each of the variables used captures different dimensions of ESG: (1) $\mathrm{DESG_{it}}$: the presence of ESG evaluation (extensive margin); (2) $\mathrm{CatESG_{it}}$: ordinal ESG performance (quality levels); and (3) $\mathrm{ESGscore_{it}}$: continuous ESG engagement (intensive margin).

To capture the occurrence of the Paris Agreement event, this study used the $\mathrm{COP21_t}$ variable, which was operationalized as a dummy and, in the period before the event (2008–2015), received the value 0, while in the period after (2016–2023), it received the value 1. This is because the Paris Agreement was signed during the G20 countries bloc meeting in late 2015 (He *et al.*, 2020). This variable was also operationalized as IV (instrumental variable) for ESG scores.

We included control variables identified in previous studies to reduce possible endogeneities resulting from the omission of significant variables. Table 1 presents the expected relationship between the capital structure and the explanatory variables.

Data was analyzed using descriptive statistics, mean difference tests between emerging and developed countries (Kruskal-Wallis, Mann-Whitney, Dunn's test), and regression analysis

**Table 1.** Description of control variables, operationalization, and expected results

| | Variables | Formula | E.S. | Justification | Based in |
|---|---|---|---|---|---|
| Book to Market | $BTM_{it}$ | Book value per share/ Market value per share | + | According to the trade-off theory, firms with a high BTM (Book-to-Market) ratio are perceived as less risky by creditors, as they have more tangible assets relative to their market value. This increases their ability to offer collateral, thereby facilitating debt financing | Barbosa and de Souza Costa (2020), Bastos and Nakamura (2009), Cardoso and Pinheiro (2020) |
| Return on Assets | $ROA_{it}$ | Operating profit/total assets | – | More profitable firms tend to rely less on external capital, as suggested by the Pecking Order theory, preferring internal financing | Barbosa and de Souza Costa (2020), Myers and Majluf (1984) |
| Company size | $SIZE_{it}$ | Natural logarithm of asset size | + | Larger firms tend to be perceived as less risky and have greater capacity to provide collateral, increasing their access to credit | Barbosa and de Souza Costa (2020), Bastos and Nakamura (2009) |
| Tangible assets | $TANG_{it}$ | (Fixed assets + inventories)/ total assets | + | Tangible assets can be offered as collateral, which reduces risk and facilitates obtaining external financing | Barbosa and de Souza Costa (2020), Cardoso and Pinheiro (2020) |
| Current liquidity | $CL_{it}$ | Current assets/current liabilities | – | According to the Pecking Order theory, a company that is more liquid tends to need less external capital | Cardoso and Pinheiro (2020), Nakamura *et al.* (2007) |
| Effective Tax Rate | $ETR_{it}$ | Income tax expenses/ EBT | + | Firms may use debt financing to reduce their taxable income, thereby increasing the incentive to use external capital | Barbosa and de Souza Costa (2020), Bastos and Nakamura (2009) |
| Auditor | $AUD_{it}$ | Categorical variable for financial information auditor. This assumes zero when it is not audited. Categories created for a NonBig4 auditor and each Big4 company | + | Audits conducted by Big Four firms reduce information asymmetry and increase the firm's credibility, facilitating access to credit | Atif and Ali (2021), Costa *et al.* (2017), Hansen *et al.* (2018) |

(*continued*)

**Table 1.** Continued

| | Variables | Formula | E.S. | Justification | Based in |
|---|---|---|---|---|---|
| ESG auditor | $AUD\_ESG_{it}$ | Categorical variable for ESG information auditor. This assumes zero when ESG information is not audited. Categories created for, a non-Big4 auditor, and for each Big4 company | + | ESG auditing enhances trust in sustainable practices, which may encourage creditors to provide more financing, even at lower capital costs | Atif and Ali (2021), Costa *et al.* (2017), Hansen *et al.* (2018) |
| Life cycle stage | $LCS_{it}$ | Categorical variable for life cycle stages according to Dickinson (2011) | +/− | The relationship depends on the firm's stage in the business life cycle. For instance, growing firms typically require more external capital, while more mature firms may reduce their debt levels | Atif and Ali (2021), Costa *et al.* (2017), Hansen *et al.* (2018) |
| Control of Corruption | $CoC_{jt}$ | 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 | +/− | On one hand, it may ease credit access in fragile environments; however, it can also increase perceived risk, prompting creditors to reduce lending | World Bank Databank® |
| GDP growth | $GDPGr_{jt}$ | Annual percentage growth rate of GDP at market prices based on constant local currency | + | During periods of economic growth, market confidence rises, facilitating access to external capital | World Bank Databank® |
| Regulatory Quality | $RegQ_{jt}$ | Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development | + | Firms in countries with strong regulations tend to have easier access to external capital, as systemic risk is lower, and creditor confidence is higher | World Bank Databank® |
| Private credit by deposit money banks and other financial institutions to GDP | $PCDBF_{jt}$ | The financial resources provided to the private sector by domestic money banks as a share of GDP. Domestic money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits | + | Firms in countries with greater availability of private credit are more likely to obtain external capital | World Bank Databank® |

(*continued*)

**Table 1.** Continued

| | Variables | Formula | E.S. | Justification | Based in |
|---|---|---|---|---|---|
| Stock price volatility | $SPVol_{jt}$ | The average of the 360-day volatility of the national stock market index | – | Higher volatility increases the risk perception, prompting creditors to restrict external financing to the firm | World Bank Databank® |
| Stock market total value traded to GDP | $SMVT_{jt}$ | The total value of all traded shares in a stock market exchange is a percentage of GDP | + | More active markets indicate greater liquidity and access to diverse sources of financing | World Bank Databank® |
| Stock market capitalization to GDP | $SMCap_{jt}$ | The total value of all listed shares in a stock market as a percentage of GDP | + | This ratio reflects a country's financial development, expanding corporate financing options | World Bank Databank® |
| Listed Companies per 1 m people | $LCpP_{jt}$ | Number of listed companies per one million people | + | A higher number of listed companies indicates a more developed and competitive financial environment | World Bank Databank® |
| Bank concentration | $BConc_{jt}$ | Assets of the three largest commercial banks as a share of total commercial banking assets | + | A higher number of banks increases the capacity to grant credit and reduces the cost of capital | World Bank Databank® |
| COVID-19 pandemic | $COV_t$ | Dummy variable with value 1 for the period affected by the COVID-19 pandemic, and zero in other cases | + | During the pandemic, governments adopted stimulus policies, including expanded corporate credit, to mitigate the crisis effects | Griffiths *et al.* (2021), Sinha and Vodwal (2023) |
| Subprime crisis | $Subprime_t$ | Dummy variable with value 1 for the period affected by the Subprime crisis, and zero in other cases | + | After the initial impact, many countries responded with expansionary policies that increased corporate credit | Atif and Ali (2021), Hansen *et al.* (2018), Sinha and Vodwal (2023) |

**Note(s):** Ln: natural logarithm; EBT: earnings before taxes. E.S.: Expected signal
**Source(s):** Created by authors

with panel data. We followed the analysis of the multicollinearity assumptions, heteroscedasticity, and serial correlation of residuals.

Additionally, the data were analyzed using Hierarchical Linear Models (HLM) with two levels (year and company) and three levels (year, company, and country). For both estimates of the null model, the Likelihood ratio test identified the OLS model as the most appropriate. No multicollinearity problems have been identified from the Variance Inflation Factor (VIF). The estimation was performed with robust clustered standard errors to mitigate problems related to heteroscedasticity and serial correlation of residues.

## Results and discussion

For descriptive statistics (Table 2), the groups considered were companies listed in developed countries (control) and those listed in emerging (treatment). Thus, 273,011 observations were observed for the control group and 151,916 for the treatment group.

Firms from emerging economies tend to exhibit lower total and short-term debt levels than those in developed markets. This aligns with the view that companies in emerging markets face greater external financing constraints due to underdeveloped financial systems and weaker regulatory environments (Myers and Majluf, 1984; Santos *et al.*, 2023). Additionally, ESG disclosure ($DESG_{it}$) is less prevalent in these economies, as evidenced by a lower incidence of ESG scoring, potentially reflecting reduced regulatory pressure for sustainability reporting (Tuesta *et al.*, 2021).

Table 3 presents regression results using $DESG_{it}$ — a binary variable equal to 1 if a firm receives an ESG score from LSEG and zero otherwise. The analysis focuses on the relationship between ESG scoring and firms' access to debt financing.

The variable $DESG_{it}$ is positively associated with both total debt ($DebtTit_{it}$) and long-term debt ($DebtTit_{it}$) but not with short-term debt ($DebtSTit_{it}$). Specifically, $DESG_{it}$ has a significant positive effect on total debt ($p < 0.05$) and a more substantial effect on long-term debt ($p < 0.001$), indicating that firms receiving ESG scores from LSEG have greater access to these forms of financing. This finding supports H1, which posits that ESG-recognized firms are perceived as lower-risk and more creditworthy (Chava, 2014; Pelster *et al.*, 2024). The positive association with long-term debt further supports the argument that ESG ratings reduce information asymmetry and enhance creditor confidence (Ruan and Liu, 2021). Conversely, the lack of significance for short-term debt suggests that ESG recognition is limited in influencing short-term financing, which may be more sensitive to immediate performance and liquidity concerns.

The interaction between $DESG_{it}$ and $COP21_t$ is negative and significant across all debt categories—total ($p < 0.001$), short-term ($p < 0.05$), and long-term ($p < 0.01$). These results imply that, although ESG scores generally improve debt access, introducing the COP21 Agreement introduced stricter sustainability expectations that may have constrained financing, particularly short-term. This outcome partially challenges H2, which

**Table 2.** Descriptive statistics of the interest variables for the control and treatment groups

| Variables | *N* | Developed (control) $N = 273{,}011$[1] | Emerging (treatment) $N = 151{,}916$[1] | *p*-value[2] |
|---|---|---|---|---|
| $DebtT_{it}$ | 424,078 | 0.80 (1.45) | 0.57 (0.68) | *<0.001* |
| $DebtST_{it}$ | 391,497 | 0.60 (1.45) | 0.40 (0.58) | *<0.001* |
| $DebtLT_{it}$ | 390,513 | 0.19 (0.21) | 0.15 (0.18) | *<0.001* |
| $COP21_t$ | 424,927 | 155,453 (57%) | 91,590 (60%) | *<0.001* |
| $DESG_{it}$ | 424,927 | 43,692 (16%) | 9,803 (6.5%) | *<0.001* |
| $CatESG_{it}$ | 424,927 | | | *<0.001* |
| $NonESG_{it}$ | | 229,319 (84%) | 142,113 (94%) | |
| $ESG_{25it}$ | | 9,962 (3.6%) | 2,257 (1.5%) | |
| $ESG_{50it}$ | | 17,348 (6.4%) | 4,199 (2.8%) | |
| $ESG_{75it}$ | | 12,652 (4.6%) | 2,831 (1.9%) | |
| $ESG_{100it}$ | | 3,730 (1.4%) | 516 (0.3%) | |
| $ESGscore_{it}$ | 53,495 | 43.30 (20.76) | 41.53 (19.23) | *<0.001* |
| $Escore_{it}$ | 53,492 | 34.11 (29.68) | 34.53 (25.28) | 0.2 |
| $Sscore_{it}$ | 53,492 | 43.98 (22.97) | 40.84 (23.85) | *<0.001* |
| $Gscore_{it}$ | 53,495 | 49.69 (22.58) | 48.33 (21.61) | *<0.001* |

**Note(s):** [1]n (%); Mean (SD), [2]Kruskal-Wallis rank sum test; Welch Two Sample *t*-test
**Source(s):** Created by authors

**Table 3.** Regression for $DESG_{it}$

| Variable | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|
| Intercept | *0.222*** (0.042)* | *0.506*** (0.036)* | *−0.322*** (0.022)* |
| $DESG_{it}$ | *0.036* (0.014)* | −0.010 (0.012) | *0.043*** (0.007)* |
| $COP21_t$ | *0.045*** (0.012)* | −0.007 (0.010) | *0.052*** (0.006)* |
| $Emerg_i$ | *0.175*** (0.021)* | −0.004 (0.018) | *0.171*** (0.011)* |
| $DESG_{it}$*$COP21_t$ | *−0.077*** (0.022)* | *−0.048* (0.019)* | *−0.034** (0.011)* |
| $DESG_{it}$*$Emerg_i$ | *−0.113** (0.035)* | −0.004 (0.030) | *−0.105*** (0.018)* |
| $COP21_t$*$Emerg_i$ | *−0.126*** (0.015)* | −0.001 (0.012) | *−0.125*** (0.008)* |
| $DESG_{it}$*$COP21_t$*$Emerg_i$ | *0.162** (0.051)* | 0.053 (0.043) | *0.109*** (0.026)* |
| $BTM_{it}$ | 0.001 (0.001) | *0.002*** (0.000)* | −0.000 (0.000) |
| $ROA_{it}$ | *−0.834*** (0.013)* | *−0.819*** (0.011)* | *−0.071*** (0.007)* |
| $SIZE_{it}$ | *0.020*** (0.002)* | *−0.006*** (0.001)* | *0.027*** (0.001)* |
| $TANG_{it}$ | *0.075*** (0.010)* | *−0.060*** (0.008)* | *0.138*** (0.005)* |
| $CL_{it}$ | *−0.036*** (0.001)* | *−0.031*** (0.001)* | *−0.005*** (0.000)* |
| $ETR_{it}$ | *0.050*** (0.013)* | *0.088*** (0.011)* | *−0.025*** (0.007)* |
| $EY(AUD)_{it}$ | *0.027* (0.011)* | −0.004 (0.009) | *0.025*** (0.006)* |
| $KPMG(AUD)_{it}$ | −0.007 (0.008) | −0.003 (0.007) | 0.001 (0.004) |
| $DTT(AUD)_{it}$ | *0.023*** (0.007)* | 0.001 (0.006) | *0.020*** (0.003)* |
| $PWC(AUD)_{it}$ | −0.002 (0.007) | 0.003 (0.006) | −0.003 (0.003) |
| $NBIG4(AUD\_ESG)_{it}$ | 0.007 (0.029) | −0.001 (0.025) | 0.003 (0.015) |
| $EY(AUD\_ESG)_{it}$ | −0.016 (0.032) | −0.034 (0.027) | 0.022 (0.016) |
| $KPMG(AUD\_ESG)_{it}$ | −0.055 (0.034) | −0.026 (0.029) | −0.015 (0.018) |
| $DTT(AUD\_ESG)_{it}$ | −0.056 (0.035) | −0.015 (0.030) | −0.027 (0.018) |
| $PWC(AUD\_ESG)_{it}$ | −0.025 (0.037) | −0.019 (0.031) | 0.003 (0.019) |
| $Growth(LCS)_{it}$ | *−0.046*** (0.011)* | −0.014 (0.009) | *−0.029*** (0.006)* |
| $Developed(LCS)_{it}$ | *0.057*** (0.010)* | 0.013 (0.008) | *0.029*** (0.005)* |
| $Shake\text{-}out(LCS)_{it}$ | 0.012 (0.010) | *−0.016* (0.008)* | *0.029*** (0.005)* |
| $Decline(LCS)_{it}$ | −0.014 (0.008) | *0.024*** (0.007)* | *−0.040*** (0.004)* |
| $CoC_{it}$ | −0.016 (0.012) | *−0.025* (0.010)* | 0.007 (0.006) |
| $GDPGr_{it}$ | −0.002 (0.002) | 0.003 (0.002) | *−0.005*** (0.001)* |
| $RegQ_{it}$ | *0.138*** (0.017)* | 0.011 (0.015) | *0.123*** (0.009)* |
| $PCDBF_{it}$ | *−0.001*** (0.000)* | −0.000 (0.000) | *−0.001*** (0.000)* |
| $SPVol_{it}$ | *0.005*** (0.001)* | *0.006*** (0.001)* | −0.001 (0.001) |
| $SMVT_{it}$ | 0.000 (0.000) | −0.000 (0.000) | *0.000*** (0.000)* |
| $SMCap_{it}$ | *0.001*** (0.000)* | 0.000 (0.000) | *0.000*** (0.000)* |
| $LCpP_{it}$ | *−0.002*** (0.000)* | 0.000 (0.000) | *−0.002*** (0.000)* |
| $BConc_{it}$ | *−0.002*** (0.000)* | *−0.001*** (0.000)* | *−0.001*** (0.000)* |
| $COV_t$ | *−0.054** (0.018)* | −0.001 (0.015) | *−0.048*** (0.009)* |
| $Subprime_t$ | −0.003 (0.024) | *−0.122*** (0.020)* | *0.115*** (0.013)* |
| Companies | 16,097 | 16,097 | 16,097 |
| *N* | 121,553 | 121,553 | 121,553 |
| Panel | Fixed effects | Fixed effects | Fixed effects |
| Firm fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.410 | 0.404 | 0.366 |
| Adjusted $R^2$ | 0.408 | 0.403 | 0.365 |
| *p*-value | 0.000 | 0.000 | 0.000 |

**Note(s):** ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$
**Source(s):** Created by authors

hypothesized a universally positive post-COP21 effect. Instead, the findings suggest that COP21 intensified scrutiny and competition for sustainable financing, benefiting only firms that exceeded the new ESG benchmarks (Reboredo and Ugolini, 2022). COP21's ambitious decarbonization goals prompted structural changes, demanding long-term investments in clean technologies. Firms with stronger ESG profiles have been shown to benefit from lower

capital costs and better access to instruments like green bonds (Ramirez *et al.*, 2022; Guo *et al.*, 2023). Therefore, while long-term debt is more aligned with sustainability goals, short-term instruments remain less responsive to ESG signals, highlighting the selective impact of COP21.

The interaction between $DESG_{it}$ and $Emerg_i$ is negative and significant for total debt ($p < 0.01$) and long-term debt ($p < 0.001$), supporting H4, which posits that firms in emerging markets face greater challenges in accessing debt—even when ESG-rated. This result reflects persistent structural constraints such as underdeveloped financial markets and limited access to green finance (Myers and Majluf, 1984; Santos *et al.*, 2023). The pronounced adverse effect on long-term debt access suggests that, despite ESG recognition, firms in emerging economies continue to face skepticism from creditors due to heightened perceived risk and limited market depth (Ng and Rezaee, 2015).

In contrast, the three-way interaction among $DESG_{it}$, $COP21_t$, and $Emerg_i$ is positive and significant for total ($p < 0.01$) and long-term debt ($p < 0.001$). This supports H6, indicating that post-COP21, ESG-rated firms in emerging markets experienced improved access to debt—particularly long-term financing. These firms likely benefited from heightened international interest in sustainable investments after COP21, positioning themselves to attract green capital flows (Clement *et al.*, 2021).

Finally, Table 4 analyzes the continuous ESG variable $ESGScore_{it}$, revealing no significant effect on long-term debt and only weak significance on total and short-term debt ($p < 0.1$). This result challenges H1, which anticipates a positive relationship between ESG performance and debt access. The weak or insignificant findings suggest that an ESG score ($DESG_{it}$) may carry more weight than its magnitude or that ESG scoring methodologies may not adequately capture dimensions relevant to creditors (Ruan and Liu, 2021).

The variable $COP21_t$, representing the post-Paris Agreement period, shows no significant effect on total or short-term debt and a positive but insignificant association with long-term debt. This partially supports H2, indicating that COP21's intended influence on corporate debt levels may have been delayed due to slow regulatory and market adaptation (Clement *et al.*, 2021; Reboredo and Ugolini, 2022). Nonetheless, COP21 likely increased the visibility of ESG-aligned firms, even if financial benefits were unevenly distributed.

The variable $Emerg_i$, capturing firms from emerging markets, is positively and significantly associated with both total and long-term debt ($p < 0.05$), supporting H4. Despite institutional and financial constraints in emerging economies (Myers and Majluf, 1984; Santos *et al.*, 2023), ESG engagement mitigates these barriers by attracting global creditors focused on sustainability.

The interaction $ESGscore_{it}$*$COP21_t$ is negative and significant for total ($p < 0.01$) and long-term debt ($p < 0.05$). While ESG performance generally improves financing conditions, post-COP21 standards likely heightened creditor selectivity, favoring firms with stronger sustainability credentials. This partially supports H3, suggesting that stricter ESG expectations reduced access for firms less aligned with evolving norms (Pelster *et al.*, 2024).

The interaction $ESGscore_{it}$*$Emerg_i$ is negative and significant for short-term debt ($p < 0.01$), indicating that high-ESG firms in emerging markets face greater challenges accessing short-term debt than their developed-market counterparts. This supports H5, which attributes the difficulty to underdeveloped financial systems and elevated risk perceptions in these regions (Trinh *et al.*, 2024). While ESG improves access to long-term financing, it appears less effective in mitigating constraints on short-term credit.

The interaction $COP21_t$*$Emerg_i$ is also negative and significant for short-term debt ($p < 0.05$), suggesting that, post-COP21, firms in emerging markets faced tighter short-term credit conditions. This challenges H6, which expected improved financing conditions following the agreement. Instead, increasing ESG demands may have disadvantaged firms that are slower to adopt or implement sustainability measures.

In contrast, the three-way interaction $ESGscore_{it}$*$COP21_t$*$Emerg_i$ is positive and significant for total and short-term debt (both $p < 0.05$), though not for long-term debt. This

**Table 4.** Regression for ESG scores

| Variable | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|
| Intercept | *−0.432*** (0.098)* | *0.498*** (0.071)* | *−1.008*** (0.083)* |
| $ESGscore_{it}$ | 0.001 (0.000) | 0.001 (0.000) | −0.000 (0.000) |
| $COP21_t$ | 0.031 (0.028) | −0.004 (0.020) | 0.036 (0.024) |
| $Emerg_i$ | *0.134* (0.061)* | 0.024 (0.044) | *0.115* (0.052)* |
| $ESGscore_{it}$*$COP21_t$ | *−0.002** (0.001)* | −0.001 (0.000) | *−0.001* (0.000)* |
| $ESGscore_{it}$*$Emerg_i$ | −0.002 (0.001) | *−0.002** (0.001)* | 0.000 (0.001) |
| $COP21_t$*$Emerg_i$ | −0.042 (0.058) | *−0.089* (0.042)* | 0.046 (0.049) |
| $ESGscore_{it}$*$COP21_t$*$Emerg_i$ | *0.003* (0.001)* | *0.002* (0.001)* | 0.001 (0.001) |
| $BTM_{it}$ | 0.001 (0.001) | *0.003*** (0.001)* | −0.000 (0.001) |
| $ROA_{it}$ | *−0.154*** (0.046)* | *−0.111*** (0.034)* | *−0.084* (0.039)* |
| $SIZE_{it}$ | *0.042*** (0.003)* | −0.004 (0.002) | *0.048*** (0.003)* |
| $TANG_{it}$ | 0.004 (0.015) | *−0.059*** (0.011)* | *0.073*** (0.013)* |
| $CL_{it}$ | *−0.050*** (0.002)* | *−0.033*** (0.001)* | *−0.016*** (0.001)* |
| $ETR_{it}$ | *0.053* (0.023)* | *0.100*** (0.017)* | *−0.041* (0.019)* |
| $EY(AUD)_{it}$ | 0.006 (0.015) | −0.010 (0.011) | 0.009 (0.013) |
| $KPMG(AUD)_{it}$ | −0.013 (0.012) | −0.001 (0.009) | −0.006 (0.010) |
| $DTT(AUD)_{it}$ | *0.020* (0.010)* | −0.004 (0.007) | *0.018* (0.008)* |
| $PWC(AUD)_{it}$ | −0.014 (0.009) | 0.002 (0.006) | *−0.015* (0.007)* |
| $NBIG4(AUD\_ESG)_{it}$ | −0.023 (0.022) | −0.008 (0.016) | −0.025 (0.018) |
| $EY(AUD\_ESG)_{it}$ | 0.013 (0.022) | −0.016 (0.016) | 0.032 (0.019) |
| $KPMG(AUD\_ESG)_{it}$ | *−0.073** (0.024)* | *−0.036* (0.017)* | −0.026 (0.020) |
| $DTT(AUD\_ESG)_{it}$ | *−0.074** (0.024)* | −0.032 (0.018) | −0.029 (0.021) |
| $PWC(AUD\_ESG)_{it}$ | 0.011 (0.025) | −0.012 (0.018) | 0.031 (0.021) |
| $Growth(LCS)_{it}$ | *−0.064** (0.022)* | *0.041* (0.016)* | *−0.102*** (0.019)* |
| $Developed(LCS)_{it}$ | *0.097*** (0.019)* | *0.111*** (0.014)* | −0.017 (0.017) |
| $Shake\text{-}out(LCS)_{it}$ | −0.016 (0.016) | −0.002 (0.011) | −0.014 (0.013) |
| $Decline(LCS)_{it}$ | 0.001 (0.011) | *0.036*** (0.008)* | *−0.038*** (0.009)* |
| $CoC_{it}$ | *−0.072*** (0.021)* | *0.035* (0.015)* | *−0.109*** (0.018)* |
| $GDPGr_{it}$ | 0.004 (0.004) | 0.003 (0.003) | −0.000 (0.003) |
| $RegQ_{it}$ | *0.219*** (0.031)* | *−0.110*** (0.022)* | *0.332*** (0.026)* |
| $PCDBF_{it}$ | −0.000 (0.000) | *0.001*** (0.000)* | *−0.001*** (0.000)* |
| $SPVol_{it}$ | *0.004* (0.002)* | −0.001 (0.001) | *0.006*** (0.002)* |
| $SMVT_{it}$ | −0.000 (0.000) | *−0.000*** (0.000)* | 0.000 (0.000) |
| $SMCap_{it}$ | 0.000 (0.000) | *−0.000* (0.000)* | *0.001*** (0.000)* |
| $LCpP_{it}$ | *−0.002*** (0.000)* | *−0.000* (0.000)* | *−0.002*** (0.000)* |
| $BConc_{it}$ | −0.000 (0.000) | *0.001** (0.000)* | *−0.001*** (0.000)* |
| $COV_t$ | 0.021 (0.025) | *0.046* (0.018)* | −0.025 (0.021) |
| $Subprime_t$ | *−0.185** (0.062)* | −0.041 (0.045) | *−0.148** (0.052)* |
| Companies | 3,081 | 3,081 | 3,081 |
| *N* | 17,636 | 17,636 | 17,636 |
| Panel | Fixed effects | Fixed effects | Fixed effects |
| Firm fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.389 | 0.331 | 0.376 |
| Adjusted $R^2$ | 0.382 | 0.322 | 0.368 |
| *p*-value | 0.000 | 0.000 | 0.000 |

**Note(s):** ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$
**Source(s):** Created by authors

supports H6, indicating that post-COP21, ESG-aligned firms in emerging markets were able to overcome structural barriers partially, improving their access to financing—especially in the short term (Reboredo and Ugolini, 2022; Clement *et al.*, 2021).

Table 5 analyzes the categorical ESG variable $CatESG_{it}$, which segments firms into quartiles: $ESG25_{it}$, $ESG50_{it}$, $ESG75_{it}$, and $ESG100_{it}$. Firms in higher ESG categories

**Table 5.** Regression for ESG categories

| Variable | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|
| Intercept | *0.218*** (0.043)* | *0.507*** (0.036)* | *−0.327*** (0.022)* |
| $ESG_{25it}$ | −0.047 (0.030) | −0.039 (0.025) | −0.009 (0.015) |
| $ESG_{50it}$ | 0.038 (0.021) | 0.006 (0.018) | *0.026* (0.011)* |
| $ESG_{75it}$ | *0.085*** (0.023)* | −0.016 (0.020) | *0.099*** (0.012)* |
| $ESG_{100it}$ | 0.032 (0.042) | −0.027 (0.036) | *0.054* (0.022)* |
| $COP21_t$ | *0.043*** (0.012)* | −0.008 (0.010) | *0.052*** (0.006)* |
| $Emerg_i$ | *0.174*** (0.021)* | −0.004 (0.018) | *0.171*** (0.011)* |
| $ESG_{25it}$*$COP21_t$ | −0.005 (0.043) | −0.017 (0.036) | 0.005 (0.022) |
| $ESG_{50it}$*$COP21_t$ | −0.046 (0.033) | *−0.081** (0.028)* | 0.030 (0.017) |
| $ESG_{75it}$*$COP21_t$ | *−0.128** (0.039)* | −0.027 (0.033) | *−0.106*** (0.020)* |
| $ESG_{100it}$*$COP21_t$ | −0.049 (0.073) | 0.060 (0.062) | *−0.108** (0.038)* |
| $ESG_{25it}$*$Emerg_i$ | 0.024 (0.069) | 0.074 (0.059) | −0.050 (0.036) |
| $ESG_{50it}$*$Emerg_i$ | −0.098 (0.064) | 0.002 (0.054) | *−0.098** (0.033)* |
| $ESG_{75it}$*$Emerg_i$ | *−0.195** (0.071)* | −0.025 (0.060) | *−0.167*** (0.037)* |
| $ESG_{100it}$*$Emerg_i$ | −0.168 (0.163) | 0.091 (0.138) | *−0.253** (0.084)* |
| $COP21_t$*$Emerg_i$ | *−0.126*** (0.015)* | −0.000 (0.012) | *−0.125*** (0.008)* |
| $ESG_{25it}$*$COP21_t$*$Emerg_i$ | 0.033 (0.087) | −0.013 (0.074) | 0.047 (0.045) |
| $ESG_{50it}$*$COP21_t$*$Emerg_i$ | 0.117 (0.083) | 0.064 (0.070) | 0.056 (0.043) |
| $ESG_{75it}$*$COP21_t$*$Emerg_i$ | *0.260* (0.102)* | 0.047 (0.086) | *0.216*** (0.053)* |
| $ESG_{100it}$*$COP21_t$*$Emerg_i$ | 0.205 (0.286) | −0.297 (0.242) | *0.498*** (0.148)* |
| $BTM_{it}$ | 0.001 (0.001) | *0.002*** (0.000)* | −0.000 (0.000) |
| $ROA_{it}$ | *−0.834*** (0.013)* | *−0.819*** (0.011)* | *−0.071*** (0.007)* |
| $SIZE_{it}$ | *0.019*** (0.002)* | *−0.006*** (0.001)* | *0.027*** (0.001)* |
| $TANG_{it}$ | *0.076*** (0.010)* | *−0.060*** (0.008)* | *0.139*** (0.005)* |
| $CL_{it}$ | *−0.036*** (0.001)* | *−0.031*** (0.001)* | *−0.005*** (0.000)* |
| $ETR_{it}$ | *0.051*** (0.013)* | *0.088*** (0.011)* | *−0.024*** (0.007)* |
| $EY(AUD)_{it}$ | *0.027* (0.011)* | −0.004 (0.009) | *0.025*** (0.006)* |
| $KPMG(AUD)_{it}$ | −0.007 (0.008) | −0.003 (0.007) | 0.001 (0.004) |
| $DTT(AUD)_{it}$ | *0.023*** (0.007)* | 0.001 (0.006) | *0.020*** (0.003)* |
| $PWC(AUD)_{it}$ | −0.002 (0.007) | 0.002 (0.006) | −0.003 (0.003) |
| $NBIG4(AUD\_ESG)_{it}$ | 0.001 (0.030) | 0.001 (0.026) | −0.006 (0.016) |
| $EY(AUD\_ESG)_{it}$ | −0.005 (0.032) | −0.033 (0.027) | 0.033 (0.017) |
| $KPMG(AUD\_ESG)_{it}$ | −0.057 (0.034) | −0.030 (0.029) | −0.014 (0.018) |
| $DTT(AUD\_ESG)_{it}$ | −0.047 (0.036) | −0.008 (0.030) | −0.023 (0.018) |
| $PWC(AUD\_ESG)_{it}$ | −0.022 (0.037) | −0.019 (0.031) | 0.005 (0.019) |
| $Growth(LCS)_{it}$ | *−0.046*** (0.011)* | −0.015 (0.009) | *−0.029*** (0.006)* |
| $Developed(LCS)_{it}$ | *0.057*** (0.010)* | 0.013 (0.008) | *0.029*** (0.005)* |
| $Shake\text{-}out(LCS)_{it}$ | 0.012 (0.010) | *−0.016* (0.008)* | *0.029*** (0.005)* |
| $Decline(LCS)_{it}$ | −0.014 (0.008) | *0.023*** (0.007)* | *−0.039*** (0.004)* |
| $CoC_{it}$ | −0.014 (0.012) | *−0.027* (0.010)* | 0.011 (0.006) |
| $GDPGr_{it}$ | −0.003 (0.002) | 0.003 (0.002) | *−0.005*** (0.001)* |
| $RegQ_{it}$ | *0.133*** (0.017)* | 0.011 (0.015) | *0.118*** (0.009)* |
| $PCDBF_{it}$ | *−0.001*** (0.000)* | −0.000 (0.000) | *−0.001*** (0.000)* |
| $SPVol_{it}$ | *0.005*** (0.001)* | *0.006*** (0.001)* | *−0.001* (0.001)* |
| $SMVT_{it}$ | *0.000* (0.000)* | −0.000 (0.000) | *0.000*** (0.000)* |
| $SMCap_{it}$ | *0.000*** (0.000)* | 0.000 (0.000) | *0.000*** (0.000)* |
| $LCpP_{it}$ | *−0.002*** (0.000)* | 0.000 (0.000) | *−0.002*** (0.000)* |
| $BConc_{it}$ | *−0.002*** (0.000)* | *−0.001*** (0.000)* | *−0.001*** (0.000)* |
| $COV_t$ | *−0.056** (0.018)* | −0.003 (0.015) | *−0.048*** (0.009)* |
| $Subprime_t$ | −0.004 (0.024) | *−0.122*** (0.020)* | *0.114*** (0.012)* |
| Companies | 16,097 | 16,097 | 16,097 |
| *N* | 121,553 | 121,553 | 121,553 |
| Panel | Fixed effects | Fixed effects | Fixed effects |
| Firm fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |

(*continued*)

**Table 5.** Continued

| Variable | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|
| $R^2$ | 0.410 | 0.405 | 0.369 |
| Adjusted $R^2$ | 0.408 | 0.403 | 0.367 |
| *p*-value | 0.000 | 0.000 | 0.000 |

**Note(s):** ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$
**Source(s):** Created by authors

(particularly $ESG75_{it}$ and $ESG100_{it}$) tend to exhibit higher levels of long-term debt, reinforcing the view that superior ESG performance enhances creditworthiness (Chava, 2014). However, negative interactions between $CatESG_{it}$ and $COP21_t$ in some categories suggest that lower- and higher-scoring firms may have encountered increased scrutiny post-COP21, potentially constraining access to favorable financing.

Firms were grouped into ESG performance categories — $\mathbf{ESG_{25it}}$, $\mathbf{ESG_{50it}}$, $\mathbf{ESG_{75it}}$, and $\mathbf{ESG_{100it}}$—based on their ESG scores. Results indicate that $\mathbf{ESG_{75it}}$ is positively and significantly associated with both total debt ($p < 0.001$) and long-term debt ($p < 0.001$), suggesting that firms in the top 25% of ESG performance benefit from greater access to financing, particularly for long-term obligations. This finding supports H1, which posits that higher ESG scores increase debt levels due to enhanced creditor confidence in governance and sustainability practices. Additionally, $\mathbf{ESG_{100it}}$ is positively associated with long-term debt ($p < 0.05$), reinforcing H3, which links post-COP21 ESG performance to improved credit access. ESG50it also shows a positive relationship with long-term debt ($p < 0.05$), indicating that even mid-level ESG performers gain financing advantages, though to a lesser extent. These results are consistent with prior studies (Pelster *et al*., 2024; Clement *et al*., 2021), which show that ESG performance mitigates perceived risk for creditors.

$COP21_t$ has a significant positive effect on total and long-term debt ($p < 0.001$ for both), indicating that the Paris Agreement improved access to financing for ESG-aligned firms, consistent with H2. The variable $\mathbf{Emerg_i}$, identifying firms in emerging markets, is likewise significant for total and long-term debt ($p < 0.001$), suggesting that ESG adoption helps these firms overcome structural financing constraints, as proposed in H4.

Interaction terms reveal more nuanced dynamics. $\mathbf{ESG_{75it}}$*$COP21_t$ and $\mathbf{ESG_{100it}}$*$COP21_t$ are negatively associated with long-term debt ($p < 0.001$ and $p < 0.01$, respectively), suggesting that high-ESG firms faced increased competition for sustainable financing in the post-COP21 period. $\mathbf{ESG_{50it}}$*$COP21_t$ negatively affects short-term debt ($p < 0.01$), indicating that firms with moderate ESG performance encountered difficulties meeting more stringent post-COP21 sustainability criteria.

Interactions with Emergi highlight financing challenges specific to emerging markets. $\mathbf{ESG_{75it}}$* $\mathbf{Emerg_i}$ and $\mathbf{ESG_{100it}}$* $\mathbf{Emerg_i}$ are negatively associated with long-term debt ($p < 0.001$ and $p < 0.05$, respectively), suggesting that even highly rated ESG firms in these regions face barriers due to market underdevelopment and limited availability of green finance, supporting H5.

In contrast, three-way interactions show more favorable outcomes. $\mathbf{ESG_{75it}}$*$COP21_t$* $\mathbf{Emerg_i}$ and $\mathbf{ESG_{100it}}$* $COP21_t$* $\mathbf{Emerg_i}$ are positively associated with long-term debt ($p < 0.05$ and $p < 0.001$, respectively), indicating that strong ESG engagement enabled firms in emerging markets to overcome institutional and market constraints after COP21. These findings support H6, which contends that alignment with international environmental frameworks enhance financing opportunities in developing economies.

Different ESG measurement approaches yield varying explanatory power. The dummy variable $\mathbf{DESG_{it}}$, which indicates whether a firm is ESG-rated, is positively and significantly related to total and long-term debt. This suggests that the mere presence of an ESG rating

signals stronger governance and sustainability, thereby improving credit access. Conversely, the continuous variable **ESGScore**$_{it}$, reflecting the intensity of ESG engagement, shows no significant association with debt, implying that minor variations in scores may carry limited weight for creditors. In contrast, the categorical variable **CatESG**$_{it}$, which classifies firms into performance tiers, reveals that firms in **ESG**$_{50it}$, **ESG**$_{75it}$, and **ESG**$_{100it}$ categories are more likely to hold higher levels of long-term debt, indicating that creditors differentiate and reward stronger ESG performance. Thus, categorical measures offer superior explanatory value compared to binary or continuous indicators.

Among control variables, ROA is consistently and negatively associated with all debt types, supporting the pecking order theory: more profitable firms prefer internal financing and rely less on external debt. Firm size (SIZE) is positively associated with total and long-term debt but negatively with short-term debt, reflecting the advantages of scale in accessing capital markets and securing favorable credit terms.

Tangibility (TANG) has a positive relationship with total and long-term debt and a negative one with short-term debt. This suggests that tangible assets serve as collateral, facilitating access to long-term credit, while firms with low asset tangibility may rely more on short-term borrowing with higher costs. Current liabilities (CL) are negatively associated with all forms of debt, reflecting substitution effects between operational liabilities and financial debt and potential constraints on additional borrowing under high short-term pressure.

The book-to-market ratio is negatively related to total and short-term debt, suggesting that firms with lower market valuations pursue conservative financing strategies or face borrowing constraints due to investor perceptions.

Macroeconomic and institutional controls include ***GDPGr***$_{it}$ (real GDP growth) and RegQ (regulatory quality). GDP growth positively influences credit access, while stronger regulatory environments enhance creditor protection and contract enforcement. Additional controls include organizational life cycle stages (growth, maturity, decline) as per Dickinson (2011) and audit characteristics, such as the presence of a Big4 auditor and ESG audit experience. Although audit variables show limited direct influence, they may play a complementary role in shaping financing strategies in transparent settings.

Table 6 presents regression results for environmental (**Escore**$_{it}$), social (**Sscore**$_{it}$), and governance (**Gscore**$_{it}$) scores, including their interactions with **COP21**$_t$ and **Emerg**$_i$. Significant coefficients, denoted by asterisks, support or refute the hypotheses, offering detailed insights into the impact of ESG dimensions on firms' capital structures.

The interaction between ***COP21***$_t$ and ***Emerg***$_i$ was generally insignificant, except for significant effects on short-term (**DebtST**$_{it}$, $p < 0.01$) and long-term debt (**DebtLT**$_{it}$), which increased post-COP21 for firms in emerging markets, supporting H5. This aligns with Myers and Majluf (1984) and Santos *et al*. (2023), who emphasize that underdeveloped financial markets constrain access to sustainable long-term financing even for firms with strong ESG performance.

The environmental score (**Escore**$_{it}$) exhibited notable interactions with ***COP21***$_t$ and ***Emerg***$_i$. The ***Escore***$_{it}$* ***COP21***$_t$ interaction was negative and significant for long-term debt ($p < 0.05$), suggesting that firms with higher environmental scores faced slightly reduced long-term debt access after COP21. This supports H3 and reflects increased creditor scrutiny of environmental risks (Reboredo and Ugolini, 2022). Moreover, ***Escore***$_{it}$* **Emerg**$_i$ was negatively significant for short-term debt ($p < 0.001$), indicating that even environmentally strong performers in emerging markets struggled to obtain short-term financing due to weak financial infrastructures (Trinh *et al*., 2024).

The three-way interaction **Escore**$_{it}$* ***COP21***$_t$* **Emerg**$_i$ was positively significant for total debt ($p < 0.01$) and short-term debt ($p < 0.001$), implying that COP21 enhanced debt access for environmentally responsible firms in emerging markets, thus supporting H6. This underscores the role of global agreements like COP21 in facilitating sustainable financing in developing economies.

**Table 6.** Regressions for environmental, social and governance scores

| | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|---|---|---|---|---|---|
| $Intercept_{it}$ | *−0.438*** | *0.510*** | *−1.023*** | *−0.413*** | *0.493*** | *−0.984*** | *−0.400*** | *0.483*** | *−0.964*** |
| | *(0.098)* | *(0.072)* | *(0.084)* | *(0.098)* | *(0.071)* | *(0.084)* | *(0.097)* | *(0.071)* | *(0.082)* |
| $COP21_t$ | 0.001 | −0.015 | 0.016 | 0.034 | 0.004 | 0.027 | −0.027 | −0.029 | 0.011 |
| | (0.020) | (0.015) | (0.017) | (0.025) | (0.018) | (0.021) | (0.028) | (0.020) | (0.024) |
| $Emerg_i$ | *0.133** | 0.021 | *0.117*** | *0.144*** | 0.042 | *0.104** | 0.025 | *−0.097** | *0.134** |
| | *(0.052)* | (0.038) | *(0.044)* | *(0.056)* | (0.041) | *(0.047)* | (0.062) | *(0.045)* | *(0.053)* |
| $COP21_t$*$Emerg_i$ | −0.026 | *−0.084** | 0.058 | −0.045 | *−0.106*** | 0.064 | 0.082 | 0.031 | 0.040 |
| | (0.045) | *(0.033)* | (0.038) | (0.051) | *(0.037)* | (0.043) | (0.061) | (0.044) | (0.052) |
| $Escore_{it}$ | 0.000 | 0.000 | −0.000 | | | | | | |
| | (0.000) | (0.000) | (0.000) | | | | | | |
| $Escore_{it}$*$COP21_t$ | *−0.001*** | −0.000 | *−0.001** | | | | | | |
| | *(0.000)* | (0.000) | *(0.000)* | | | | | | |
| $Escore_{it}$*$Emerg_i$ | *−0.002** | *−0.002**** | 0.000 | | | | | | |
| | *(0.001)* | *(0.001)* | (0.001) | | | | | | |
| $Escore_{it}$*$COP21_t$*$Emerg_i$ | *0.003*** | *0.002**** | 0.000 | | | | | | |
| | *(0.001)* | *(0.001)* | (0.001) | | | | | | |
| $Sscore_{it}$ | | | | *0.001** | 0.000 | 0.000 | | | |
| | | | | *(0.000)* | (0.000) | (0.000) | | | |
| $Sscore_{it}$*$COP21_t$ | | | | *−0.002**** | *−0.001** | −0.001 | | | |
| | | | | *(0.000)* | *(0.000)* | (0.000) | | | |
| $Sscore_{it}$*$Emerg_i$ | | | | *−0.002** | *−0.002**** | 0.001 | | | |
| | | | | *(0.001)* | *(0.001)* | (0.001) | | | |
| $Sscore_{it}$*$COP21_t$*$Emerg_i$ | | | | *0.003** | *0.003**** | 0.000 | | | |
| | | | | *(0.001)* | *(0.001)* | (0.001) | | | |
| $Gscore_{it}$ | | | | | | | −0.000 | 0.000 | −0.000 |
| | | | | | | | (0.000) | (0.000) | (0.000) |
| $Gscore_{it}$*$COP21_t$ | | | | | | | −0.000 | −0.000 | −0.000 |
| | | | | | | | (0.001) | (0.000) | (0.000) |
| $Gscore_{it}$*$Emerg_i$ | | | | | | | 0.001 | 0.001 | −0.000 |
| | | | | | | | (0.001) | (0.001) | (0.001) |

(*continued*)

**Table 6.** Continued

| | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ | $DebtT_{it}$ | $DebtST_{it}$ | $DebtLT_{it}$ |
|---|---|---|---|---|---|---|---|---|---|
| $Gscore_{it}$*$COP21_t$*$Emerg_i$ | | | | | | | −0.000 | −0.001 | 0.001 |
| | | | | | | | (0.001) | (0.001) | (0.001) |
| Companies | 3,081 | 3,081 | 3,081 | 3,081 | 3,081 | 3,081 | 3,081 | 3,081 | 3,081 |
| *N* | 17,636 | 17,636 | 17,636 | 17,636 | 17,636 | 17,636 | 17,636 | 17,636 | 17,636 |
| Panel | Fixed effects | Fixed effects | Fixed effects | Fixed effects | Fixed effects | Fixed effects | Fixed effects | Fixed effects | Fixed effects |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.391 | 0.332 | 0.377 | 0.390 | 0.332 | 0.375 | 0.387 | 0.329 | 0.374 |
| Adjusted $R^2$ | 0.383 | 0.324 | 0.370 | 0.382 | 0.324 | 0.367 | 0.380 | 0.321 | 0.366 |
| *p*-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Note(s):** ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$
**Source(s):** Created by authors

The social score ($\mathbf{Sscore}_{it}$) revealed that $\mathbf{Sscore}_{it}$* $\boldsymbol{COP21}_{t}$ negatively affected total ($p < 0.001$) and short-term debt ($p < 0.05$), indicating financing challenges for firms with higher social scores post-COP21, consistent with H1 and the complexity of incorporating social factors into credit decisions (Cheng *et al*., 2014). However, the three-way interaction $\mathbf{Sscore}_{it}$* $\boldsymbol{COP21}_{t}$* $\mathbf{Emerg}_{i}$ was positively significant for total ($p < 0.05$) and short-term debt ($p < 0.001$), indicating improved financing conditions for socially responsible firms in emerging markets after COP21, supporting H6 and reflecting a growing emphasis on social criteria.

The governance score ($\boldsymbol{Gscore}_{it}$) showed no significant interactions with $\mathbf{COP21}_{t}$ or $\mathbf{Emerg}_{i}$. Although strong governance typically reduces financing risk (Cheng *et al*., 2014), these results suggest that governance alone does not significantly influence debt financing in the post-COP21 context, partially supporting H1 while highlighting the greater impact of environmental and social dimensions.

## Conclusions

Our study examines the influence of ESG performance pre- and post-COP21 on the capital structure of emerging and developed economies, analyzing 424,927 observations of listed companies in the G20 from 2008 to 2023. The findings highlight that ESG performance significantly affects corporate debt structures, particularly post-COP21.

H2, suggesting that COP21 positively impacts corporate debt, is partially supported. While the influence on short-term debt is still statistically small, the agreement shows a distinct effect throughout debt maturities, with a higher correlation in long-term debt. While short-term debt is less susceptible to sustainability-related constraints, corporations typically respond to climate obligations through structural, long-term finance plans.

H4, which posits that companies in emerging markets face greater challenges accessing debt but can mitigate these through ESG performance, is confirmed. Despite persistent barriers in short-term debt markets, ESG adoption notably improves access to long-term debt. H6 further confirms that firms in emerging markets aligning ESG performance with global goals experienced better debt access after COP21. These results emphasize ESG performance as a key tool for overcoming financing challenges and promoting sustainable corporate growth in emerging economies.

In this study, we contribute to multiple audiences. For managers, we show that ESG performance can enhance access to credit. Firms in emerging markets may improve financing conditions by strengthening ESG practices and transparency. In developed markets, ESG disclosures can serve as a tool for competitive differentiation.

For creditors, our results suggest that ESG ratings provide proper signals for assessing borrower risk, particularly after COP21, which marked a shift in institutional attention to sustainability. For policymakers, we support using incentives—such as tax benefits or preferential loans—to promote ESG adoption while stressing the need for stronger oversight to prevent greenwashing.

Academically, we use COP21 as a quasi-natural experiment to explore how global climate agreements affect corporate finance. Our treatment-control design enhances causal inference and encourages future research on institutional factors influencing the ESG–capital structure link. Despite using careful methods, we acknowledge potential endogeneity, such as reverse causality. We encourage further studies to examine regulatory impacts, greenwashing, and ESG's role in reducing earnings management.

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