# Are Developing Country Firms Facing a Downward Bias in ESG Scores?

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## Abstract

Policymakers in emerging economies are increasingly concerned that global ESG scoring firms based in developed countries are 'unfairly punishing' their companies by assigning lower scores compared to those in developed countries. This study investigates and provides empirical evidence supporting this concern. Using panel regression analysis on a comprehensive cross-country sample of 7,904 listed firms from 2002 to 2022 across 50 countries, we find that corporate ESG scores in developing economies are significantly lower than those in developed economies. Further analysis indicates that this disparity is linked to institutional bias and measurement issues within ESG scoring agencies, stemming from information asymmetry. Our empirical evidence also suggests that ESG scoring agencies can mitigate these information problems by incorporating analyst coverage and experience into their algorithms. This study, therefore, contributes to the ongoing debate on the subjectivity of the global rating industry by demonstrating that the biases affecting the credibility of corporate credit and corporate governance ratings also extend to corporate ESG scores.



***Keywords:*** Institutional Theory; Theory of Human Needs; Information Asymmetry; ESG; Financial Analyst; Developing Country

***JEL Codes:*** D82; G24; I31; O16; P48

## 1. Introduction

Since the introduction of the United Nations Sustainable Development Goals (SDGs) in 2015, sustainability has taken centre stage, particularly in the aftermath of the global financial crisis of 2007-08, climate concerns and the more recent COVID-19 pandemic.[1] This emphasis on sustainability has spurred the growth and demand of ESG score providers such as Refinitiv, Sustainalytics, MSCI, and Bloomberg. These providers quantify a company's environmental, social, and governance (ESG) performance and sell their ESG scores to various users. However, unlike credit rating agencies, the lack of transparency and a standardised framework has cast doubt on the accuracy of these scores, leading investors, businesses, and regulators to question their credibility (Larcker et al., 2022).[2] Adding to this controversy is a growing concern that ESG raters may be intentionally assigning lower scores to companies in developing countries.[3]

This development is concerning as it discourages the inflow of capital investments based on sustainability criteria, thus, preventing them from having the desired effect in the countries where it is most needed (UNCTAD, 2023).[4] One plausible explanation is that the ESG scoring agencies, headquartered in the United States (US) and Europe, rarely consider the cultural and contextual distinctions between developed and developing nations (UNEP Finance Initiative, 2010). For instance, employment generation, community development, and access to basic services that improve social equity could be more critical than environmental goals in developing countries. Thus, a failure to capture these nuances may introduce biases in ESG scores (GIS, 2024; SEBI, 2022, 2023).

[1] See, ESG awareness is an enduring legacy of the global financial crisis. Accessed on July 1, 2024.
[2] See, Sustainability Institute, ERM (2023). "Rate the Raters 2023: ESG Ratings at a Crossroads". Accessed on January 19, 2024.
[3] See, ESG scoring 'unfairly punishing' emerging economies. Accessed on January 19, 2024.
[4] See, Are ESG data demands hurting emerging markets? Accessed on July 1, 2024.

The failure to recognise the priorities of firms in developing countries has a long history, starting with sovereign credit ratings. After the 2008 financial crisis, credit ratings were criticised for favouring home countries and allied jurisdictions, disregarding economic fundamentals (Fuchs and Gehring, 2017; De Moor et al., 2018). Hence, the "sovereign ceiling" meant that firms in developing nations often receive unfairly lower credit ratings (Borensztein et al., 2013; Almeida et al., 2017). Similarly, corporate governance ratings for emerging markets, which often assign lower ratings to firms in these markets, are misleading as they are based on norms and practices of developed economies (Black et al., 2017, 2023; Duong et al., 2016; Khanna and Paleppu, 2010; Witt et al., 2022). Thus, global rating providers' lack of understanding of developing countries' institutional and business environments can lead to subconscious, deep-rooted, and systematic biases against firms in these regions. While these biases have been examined in the context of credit and corporate governance ratings, this study first aims to explain why firms in developing countries may receive lower ESG scores from two perspectives: institutional bias of ESG raters and measurement problems.

We integrate DiMaggio and Powell's (1991) institutional theory with human needs theories (Maslow, 1943, 1954; Deci and Ryan, 1985; Ryan and Deci, 2017) to explain why ESG scores are lower in developing countries. The institutional theory highlights how differences in political systems, labour and education systems, national cultures, and legal origins shape corporate social performance (Ioannou and Serafeim, 2012; Liang and Renneboog, 2017). However, this theory alone cannot fully explain the ESG score variations between developed and developing countries. Differences in SDG priorities lead to different ESG priorities in policymaking. Failure to recognize these distinctions may result in lower ESG scores for firms in developing countries. Standardising ESG scores, as done with sovereign ESG scores, might address institutional bias but won't resolve measurement issues in ESG rating systems.

As the availability and access to ESG-related information are crucial for reliable ESG scores (Larcker et al., 2022), ESG scores are strongly correlated with the quantity of ESG disclosures (Raghunandhan and Rajagopal, 2022). Thus, lower disclosures in developing countries (Black et al., 2023) could result in lower ESG scores for developing country firms. Furthermore, as most ESG raters are based primarily in the US or Europe (Widyawati, 2020), information asymmetry arising from the geographic distance between the firm and the rating agencies (Ayers et al., 2011) would hamper their ability to assess the reliability of the ESG related information, whatsoever, obtained from the developing country firms. Accordingly, if the poor disclosures and information asymmetry are the sources of the downward bias, ESG raters may overcome the bias by relying on financial analysts, who incorporate sustainability-related information into their forecasts and recommendations (Ioannou and Serafeim, 2015; Luo et al., 2015; Kopita and Petrou, 2024).[5] Since the bias is primarily caused by information asymmetry exacerbating the measurement problems, we conjecture that analyst characteristics like the extent of analyst coverage of a firm and analyst experience in covering the firm could provide credible signals to the ESG raters regarding the reliability of the ESG disclosures of the developing country firms. Analyst forecasts and recommendations would not serve the purpose because they are meant to assess the ability of the firm to maximise shareholder wealth and analysts are known to provide over-optimistic forecasts in developing countries due to the investment banking pressure (Lai and Teo, 2008) and "numbers game" (De Moura et al., 2023).

To test the above propositions, we employ a global sample of non-financial firms, classifying them based on the United Nations designation of the country in which their securities are primarily traded as either developing or developed.[6] Accordingly, the *DVPG*

[5] Rajgopal (2023) notes that "ESG can be viewed as a set of signals that a good analyst would have looked for anyway."

[6] Following the procedure laid down in De Moura et al., (2023), we find that our classification of countries into developed and developing successfully captures 84% of the institutional differences between these two groups of countries.

dummy takes a value one if the firm is from a developing country as per the aforementioned criteria, else zero. Next, we obtain their raw ESG scores (*RESG*) from the Refinitiv database,[7] along with additional financial and non-financial information from the WorldScope, BoardEx, and I/B/E/S databases. To address potential endogeneity caused by sample selection bias and omitted variables, we included firm-level controls in all our regression models and employ an entropy-balanced sample of firms from both developed and developing countries, following the procedure outlined by Shroff et al. (2017).[8]

Panel regression analysis reveals that the raw ESG score (*RESG*) of firms in developing countries is 11.6% lower than in developed countries. Hence, the systematic bias observed in credit ratings (Almeida et al., 2017) and governance ratings (Witt et al., 2022) towards firms in developing countries, persists even in the case of ESG scores. This finding is consistent with the predictions of the institutional theory. Notably, the Environment component (*RENV*) registers the highest difference at 15.8% followed by the Governance component (*RGOV*) at 12.2% and lastly the Social component (*RSOC*) at 6.3%. These differences in the component scores are reflective of the institutional priorities to promote social equity as more important than governance or environmental concerns in developing countries (GIS, 2024; SEBI, 2022, 2023). This is in line with the prediction of the theories of human needs. Overall, these findings confirm that ESG raters' institutional biases, stemming from the Western priorities in sustainability, result in a lower ESG score for firms domiciled in developing countries.

Next, to show that ESG raters' measurement issues contribute to the downward bias in ESG scores of firms in developing countries, we eliminate the effect of institutional bias by standardizing the *RESG* scores with respect to country-industry-year median *RESG* scores. We

[7] We consider the ESG scores from Refinitiv since it is has the largest global coverage of firms and is widely used (Basu et al., 2022; Drempetic et al., 2020; Dyck et al., 2019).
[8] The results of the balancing procedure are presented in Appendix D.

first subtract the country-industry-year median *RESG* scores from the firm's *RESG* scores and divide the resultant figure by the standard deviation of the county-industry-year *RESG* scores to arrive at the standardized ESG (*SESG*) scores. If institutional biases are the only source of difference in ESG scores between developed and developing country firms, then we would expect the difference in *SESG* scores between developed and developing countries to disappear. However, contrary to this expectation, our regression analysis with *SESG* scores indicates that the difference between developed and developing country firms has widened to 21.9% points. For the component scores, we observe that the *SENV, SSOC* and *SGOV* scores of firms in developing countries are lower than those in developed countries by 19.2%, 15.2% and 20.1% respectively. This finding suggests that the differences in ESG scores between developed and developing country firms are not only due to institutional biases but are also due to the measurement issues faced by ESG raters when constructing the ESG scores of firms in developing countries.

Next, to rule out the possibility that ESG raters could be assigning lower ESG scores because developing country firms are indeed performing poorly on ESG parameters and that our inferences are due to measurement error, we perform a Difference-in-Difference (DiD) analysis structured around the mandatory ESG disclosure norms with a two-year before and after time window. If developing country firms were indeed performing poorly on ESG metrics, we would expect the lower ESG scores for developing countries to persist even after mandatory disclosures. However, we find evidence to the contrary. The *RESG* scores increased in developing countries after mandatory disclosures which confirms the existence of institutional bias. If institutional bias was the only reason for lower ESG scores for developing country firms, then the *SESG* scores should also increase after mandatory adoption. However, we find that there is no such increase in the *SESG* scores. This confirms that institutional bias is not the only source of difference in ESG scores between developed and developing countries and

standardising ESG scores at the country-industry level has incremental information content. This suggests that measurement problems of the ESG raters are contributing to a downward bias in ESG scores for developing country firms.

We then test whether ESG raters can overcome this bias by considering the extent of analyst coverage and analyst experience as credibility signals for the reliability of ESG information from firms in developing countries. We conduct this analysis by following the procedure as in Fernandes et al. (2013) and find that the difference in standardized ESG (*SESG*) scores between developed and developing countries disappears when analyst coverage and experience are introduced in the regression models. We also observe a similar pattern for the *SESG* component scores – *SENV*, *SSOC* and *SGOV*.

Therefore, our empirical results suggest that ESG scoring agencies can mitigate their scoring biases by using financial analyst coverage and experience as positive indicators of the reliability of sustainability-related information for firms in developing economies, leading to more accurate ESG scores for these firms. We conducted additional tests to confirm the robustness of our findings. First, using the IMF classification for developed and developing countries, we found that our results remain consistent. Second, switching from median-adjusted to country-industry-mean-adjusted ESG scores did not alter our conclusions.

Overall, our study makes significant contributions to multiple strands of literature. First, we expand the existing literature exploring how the institutional environment shapes sustainable business practices. While previous studies (Ioannou and Serafeim, 2012; Cai et al., 2016; Liang and Renneboog, 2017) have predominantly used DiMaggio and Powell's institutional theory (1991) to explain variations in corporate ESG performance across countries, we enrich the literature by integrating insights from human needs theories (Maslow, 1943, 1954; Deci and Ryan, 1985; Ryan and Deci, 2017). Furthermore, we consider an integration of these institutional factors and adopt the developed and developing classification

which is more meaningful from a policy perspective. Therefore, our study emphasizes that differing priorities in policymaking between developed and developing countries are crucial in understanding disparities in corporate social performance.

Second, our research contributes to discussions on the subjective nature of the global rating industry. Previous studies have shown how institutional biases affect the credibility of corporate credit ratings (Borensztein et al., 2013; Almeida et al., 2017; Fuchs and Gehring, 2017; De Moor et al., 2018), and how measurement problems in rating agencies impact the reliability of corporate governance ratings (Daines et al., 2010; Duong et al., 2016; Black et al., 2017, 2023; Witt et al., 2022), resulting in lower ratings for firms in developing countries. Building on this, we demonstrate that corporate ESG scores are similarly affected by institutional biases and measurement issues, including challenges in quantifying qualitative information and the imposition of benchmarks from developed countries onto developing ones.

Lastly, we contribute to the literature on geographic distance and information asymmetry in finance. While previous studies have explored how information asymmetry due to geographic distance affects decision-making processes (Malloy, 2005; Butler, 2008; Ayers et al., 2011; Kim et al., 2016), our study is among the first to show that ESG raters also encounter such information challenges. Additional analysis reveals that ESG raters may mitigate these issues by relying on financial analyst coverage and experience as indicators of the reliability of sustainability information from firms in developing countries.

From a policy perspective, our findings using a developed and developing classification of countries, underscore the systematic tendency for corporate ESG scores to be lower for developing country firms compared to their developed counterparts. Interestingly, this discrepancy is not caused only by varying prioritization of environmental and social issues but also by the information acquisition challenges faced by ESG raters. Hence, stakeholders should be aware of these factors when interpreting ESG scores in emerging economies.

Addressing these challenges may involve developing country regulators standardizing ESG scores in alignment with local needs and priorities, thereby enhancing credibility and relevance in global markets.[9]

## 2. Relevant Literature, Theoretical Background and Hypothesis Development

### 2.1. Evolution of ESG Scores

With the increasing importance of non-financial information in investors' decision-making process, ESG as a factor started capturing investor's attention in the 1990s. This gave rise to a new form of investing called socially responsible investing (SRI). Early ESG scores were rudimentary, often based on self-reported data from companies with limited standardization and transparency (Michelson et al., 2004). Therefore, SRI in the 1990s involved negative screening based on the ESG scores to avoid investing in companies deemed unethical, for example, companies engaged in the alcohol, tobacco or gambling business (Sparkes and Cowton, 2004). However, as negative screening did little to encourage non-ethical companies to adopt responsible business practices (Heinkel et al., 2001), there was a significant push in the 2000s towards standardization of ESG metrics. This was facilitated by the Global Reporting Initiative (GRI) and the United Nations Principles for Responsible Investment (UNPRI), which provided frameworks for companies to report ESG activities (Renneboog et al., 2008). This led to the development of positive screening or "best-in-class" practices and the integration of ESG factors into mainstream investment strategies of asset managers and institutional investors, recognizing the potential of ESG factors to impact financial performance (Kempf and Osthoff, 2007; Statman and Glushkov, 2009). More so, investor focus on sustainability to understand how firms address stakeholder concerns has increased in the aftermath of the global financial crisis (Galbreath, 2013). This growing demand for ESG-related information has encouraged the development of sophisticated ESG scoring methodologies using extensive data

[9] See SEBI | Consultation Paper on Environmental, Social and Governance (ESG) Rating Providers for Securities Markets

sets and analytics by major scoring agencies such as MSCI, Sustainalytics, and FTSE Russell (Berg et al., 2022).

### 2.2. Significance of ESG Scores in Decision Making

Today, ESG scoring agencies quantify voluminous data from various sources related to the performance of firms on environmental, sustainability and governance-related dimensions and make sustainability measurable. These scores are designed to assess a company's management of environmental issues such as pollution and climate change, social challenges like employee satisfaction and gender diversity, and governance issues including corruption and entrenchment. Further, by providing a benchmark to assess their business practices on sustainability issues comparable to their peers, ESG scores guide companies towards continuous improvement. This process aids companies in mitigating environmental issues, social challenges and governance issues, thereby reducing the likelihood of negative incidents (Eccles et al., 2015).

Therefore, the commercially available ESG scores are utilized by the growing number of institutional investors who are signatories to the Principles of Responsible Investment (PRI) initiative, helping them incorporate ESG and CSR issues into their investment analysis and decision-making processes. In fact, many of the sovereign wealth funds and pension funds focused on long-term wealth creation are increasingly incorporating sustainability as measured by the corporate ESG scores in their investment strategy (UNCTAD, 2020). Further, government agencies are increasingly relying on the ESG scores to guide policymaking in promoting responsible corporate business conduct (OECD, 2020). However, Larcker et al. (2022) argue that the notion of ESG scores measuring ESG performance is a myth due to issues with the construction of such metrics. Therefore, investors have questioned the reliance of Socially Responsible Investment (SRI) funds on ESG metrics as a proxy for sustainability performance (Avetisyan and Hockerts, 2017; Widyawati, 2020). Nevertheless, it remains a

dominant force in shaping the future of global trade and investments and is thus worthy of empirical investigation.

### 2.3. Criticism and Geopolitics of ESG Scores

The failure to recognize the priorities of developing country firms has a deep-rooted history, starting with sovereign credit ratings. After the 2008 financial crisis, sovereign credit ratings were criticized for being overly optimistic about their home countries and other regions with stronger economic, geopolitical, and cultural ties, disregarding economic fundamentals (Fuchs and Gehring, 2017; De Moor et al., 2018). Economists argue that major developing nations, despite their significant economic growth, often receive unfairly low credit ratings that do not reflect their economic fundamentals,[10] [11] affecting their firms via the sovereign ceiling channel (Borensztein et al., 2013; Almeida et al., 2017). Similarly, commercial corporate governance ratings based on developed economy norms, are ineffective for emerging markets (Aguilera and Cuervo-Cazurra., 2004; Bhagat et al., 2008; Duong et al., 2016). This bias introduces subjectivity, resulting in lower ratings for firms in developing economies (Khanna and Paleppu, 2010; Witt et al., 2022) and limiting their usefulness in assessing global corporate governance (Black et al., 2017; Black et al., 2023). Therefore, the lack of understanding of the institutional and business environment of developing countries by the global rating agencies leads to subjective biases against developing country firms.

As with commercial corporate governance ratings (Daines et al., 2010), one major issue with ESG scores is the lack of transparency in the methodologies used by ESG scoring agencies. While some agencies disclose more information about their methods, crucial details necessary for meaningful interpretation and accurate comparison are still not fully transparent (Busch et al., 2016). Additionally, the absence of a standardized framework for ESG metrics leads to differences in data collection methods, incompatible data formats, and varying levels

[10] See India's ratings don't reflect economy's fundamentals: CEA
[11] See Moody's politically biased credit outlook cut won't affect China's long-term upward growth trend: experts

of quality control. As a result, the aggregate measurement of ESG metrics does not converge, making it difficult to draw accurate conclusions (Berg et al., 2022; Chatterji et al., 2016; Christensen et al., 2022; Semenova and Hassel, 2015). Moreover, various measurement issues have been recognized, such as a tendency towards favouring larger companies (Drempetic et al., 2020), indicating that ESG metrics may not faithfully reflect a company's genuine sustainability performance. This could potentially mislead investors who depend on such information (Cheng et al., 2015).

These issues have led regulators in advanced economies to endorse the supervision of ESG raters.[12] [13] However, regulatory authorities in developing countries raise an overlooked yet important issue relevant to emerging markets. The consultation paper released by the Securities Exchange Board of India (SEBI) in February 2023 highlights that the existing ESG scoring providers fail to factor in the domestic context when assessing and grading the environmental and social issues because ESG issues plaguing emerging markets are completely different from developed countries (SEBI, 2023). A similar viewpoint has been put forth by the economies of the African Union (GIS, 2024). For example, concerns like generating employment in smaller towns, fostering gender diversity among employees, and promoting inclusive development hold greater priority than pollution and climate-related issues here. For instance, for climate issues, as developing countries are not the primary contributors to global greenhouse gas emissions, the resource constraints make it difficult for them to implement stringent climate policies and pollution norms at the cost of economic growth (Cai et al., 2016; UNCTAD, 2021). Thus, most of the metrics considered in assessing the environmental pillar are of less priority in developing countries than in developed countries. This leads to an overall lower ESG score for developing country firms by design (OECD, 2023).

[12] See Sustainable finance: Council agrees negotiating mandate on ESG ratings
[13] See UK set to unveil regulatory regime for ESG ratings industry

### 2.4. ESG Scores Through the Lens of Institutional Theory and Human Need Theory

The institutional theory by DiMaggio and Powell (1991) posits that organizations conform to societal norms and structures to gain legitimacy and support. As organizations mimic prevailing institutional patterns, leading to isomorphism, this theory emphasizes that external institutions are instrumental in shaping organizational behaviour and practices. Maignan (2001) find that consumers in stakeholder-oriented economies like France and Germany hold socially responsible businesses in high regard whereas consumers in shareholder-oriented economies like the US hold economically responsible businesses in higher regard. In a follow-up study, Maignan and Ralston (2002) find that this difference in stakeholder pressure drives the differences in managerial incentives to act in a socially responsible manner. Thus, whether firms conduct their businesses in a socially responsible manner is driven by nation-level institutions (Aguilera et al., 2007; Jackson and Apostolakou, 2010) and the institutionalized norms of corporate behaviour (Campbell, 2007).

Subsequent studies have provided empirical evidence in support of the institutional theory of corporate social responsibility. In a cross-country study spanning 2,787 firms across 42 countries from 2002 to 2008, Ioannou and Serafeim (2012) report that political systems, labour and education systems, and national cultures drive corporate social performance (CSP). They observe that CSP is negatively affected by laws promoting competition and higher levels of shareholder protection. CSP is also low in countries with high levels of national corruption, power distance and leftist ideology. On the other hand, strong labour unions promote higher CSP. Based on a larger sample consisting of 23,000 companies across 114 countries from 1999 to 2014, Liang and Renneboog (2017) provide evidence that legal origin has a stronger explanatory power in explaining institutional differences in CSP. They find that firms in civil law countries have higher ESG scores than firms in common law countries because civil law favours stakeholder protection in contrast to common law which favours shareholder protection. Notably, Cai et al. (2016) present evidence that country-level characteristics matter

more than firm-level characteristics in explaining sustainability as measured by commercial ESG scores. Using 2,632 unique firms across 36 countries from 2006 to 2011, they find that country-level characteristics such as economic development, culture, and institutions explain 13.4% of the variation in ESG scores while firm-level characteristics explain only 6.7% of the variation in ESG scores. While these studies highlight the importance of cross-country differences in shaping corporate ESG outcomes, they fail to address the question of whether ESG scores are different between developed and developing countries. This is important because the different set of challenges facing developing countries leads to differences in policymaking between developed and developing countries.

To investigate this question, we draw inspiration from the nexus between the theories of human needs (Maslow, 1943, 1954; Deci and Ryan, 1985; Ryan and Deci, 2017) and the institutional theory. The human needs theory has been highly influential in developmental economics and is the foundation of the basic needs movement which sets priorities for governments and organizations in framing development policies (United Nations, 2010). By prioritizing the eradication of poverty and hunger, the first two goals of the UN Sustainable Development Goals (SDGs) released in 2015 focus on lower-level needs which is still a problem in many developing countries. As the needs differ between developed and developing economies, so do the ESG priorities differ between developed and developing economies. For example, in India, the emphasis on employment generation, gender diversity and promoting inclusive development in the SEBI's consultation paper highlights the priority of addressing the fundamental socio-economic issues before moving focus to the more advanced sustainability issues related to climate, environment and bio-diversity relevant to developed markets (SEBI 2022, 2023). Similar concerns have been raised by countries of the African Union (GIS, 2024).

Integrating this perspective with the institutional theory suggests that corporate ESG priorities also differ between developed and developing countries. Failure to account for this distinction could lead to a systemic difference in corporate ESG scores between developed and developing countries. Moreover, addressing the institutional differences from a developing versus developed perspective eliminates the issue of co-dependence among country attributes that has been acknowledged in the accounting literature (Leuz et al., 2003). Furthermore, categorizing countries as either developed or developing is a more accurate depiction of reality compared to any other arbitrary classification. First, institutions (e.g., World Bank, IMF, UN) providing funding assistance to countries fix the covenants in the assistance programs according to the development status as to whether a country is developed, developing or in transition. Second, investors (i.e., foreign institutional investors, pension funds) managing global portfolios diversify their portfolios across geographical regions by following a similar classification of countries.

The sustainability framework underpinning international ESG scores is based on institutional norms established in developed economies. Thus, firms in developing countries, that are focused on addressing local priorities and challenges, may not prioritize adhering to these norms for better ESG scores. Consequently, firms in developing countries could receive lower rankings on ESG criteria compared to their counterparts in developed nations. We test this prediction using hypothesis, H1, stated below.

**H1:** *ESG Scores and it's respective component scores of firms in developing countries are lower than their developed counterparts.*

### 2.5. Refinitiv ESG Scoring Methodology and Standardized ESG Scores

As Liang and Renneboog (2017) reflect, the ESG rating providers rate companies relative to their industry peers across international markets making the scores independent of the local institutional environment. A similar approach is adopted by Refinitiv when calculating their environment (E) and social (S) scores, but not the governance (G) scores. The benchmarks for

environmental and social scores are industry averages, whereas the benchmarks for governance scores are national averages (Basu et al., 2022). While this benchmarking ranks companies on a global scale, the non-consideration of the institutional environment is the reason why ESG scores vary across countries as observed in prior studies (Ioannou and Serafaim, 2012; Cai et al., 2016; Liang and Renneboog, 2017).

It may be contended that the company's choice of sustainability practices from an institutional perspective can be controlled by employing econometric procedures. For instance, Gratcheva et al. (2021) show that adjusting for income levels removes the differences in the sovereign ESG scores between high-income and low-income countries. Therefore, if the difference in ESG scores between developed and developing countries is simply an aggregation problem, then applying a similar process of deriving country and industry-adjusted ESG scores would remove the differences. However, we contend that aggregation ranking is not the only cause of the difference in ESG scores between developed and developing countries. This is because the institutional theory explains only the incentives for a firm to adopt sustainable business practices. From a social planning perspective, Campbell (1979) states that "the more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor". In a similar vein, the extensive number of input variables required to quantify sustainability practices makes the ESG scores susceptible to distortion from measurement issues and other information problems faced by the ESG raters themselves.

Furthermore, as ESG scores exhibit a strong correlation with the volume of voluntary ESG-related disclosures (Raghunandan and Rajgopal, 2022), availability and access to information becomes a key factor in determining the reliability of ESG scores (Larcker et al., 2022). Given that disclosure levels vary according to the institutional environment and are typically poor in the weak institutional setting of developing countries (Black et al., 2023),

ESG information availability is lower in developing countries. Therefore, if poor disclosures are the source of the difference in ESG scores between developed and developing countries, then we would expect firms in developing countries to have lower scores than firms in developed countries even after standardization, thereby resulting in a downward bias in the ESG scores of firms in developing countries. We test this assertion using hypothesis, H2, stated below.

**H2:** *There exists a downward bias in ESG scores of firms in developing countries.*

### 2.6. The Role of Financial Analysts

Most of the commercial ESG scoring agencies are based out of Europe and USA, which increases the geographic distance between the ESG raters and firms in developing countries (Widyawati, 2020). Geographic distance is an important source of information asymmetry for market participants as it limits information access and analysis (Ayers et al, 2011). Applying the theory of information asymmetry caused by distance, Kim et al. (2016) find that domestic institutional investors are better than foreign institutional investors in constraining earnings management. In the context of ESG, the distance between the rater and the firm is higher when the firm is in a developing country. The lack of institutional familiarity adds an additional layer of opacity for the ESG raters. In such a scenario, ESG raters would face higher information problems when scoring firms in developing countries. This leads to an interesting question of how ESG raters could possibly overcome this information disadvantage.

To understand this, we consider the pivotal role played by financial analysts as information intermediaries. Like ESG raters who assess sustainability, financial analysts are important market participants who specialise in security valuations and recommendations (Bradshaw et al., 2017; Loh and Stulz, 2018). Of late, analysts have started collecting and incorporating sustainability-related information for making forecasts and recommendations (Ioannou and Serafeim, 2015; Luo et al., 2015; Kopita and Petrou, 2024). Accordingly, it has been found that financial analysts influence the sustainability disclosure practices of firms

which in turn influences their ESG performance (Benlemlih et al., 2023; Qian et al., 2019). Therefore, Rajgopal (2023) argues that "ESG can be viewed as a set of signals that a good analyst would have looked for anyway."

Given the high cost of information acquisition in developing countries (Ayers et al., 2011), and recognizing that analyst coverage and experience help reduce information asymmetry (Chen et al., 2015), we propose that extensive analyst following can mitigate the downward bias in ESG scores for firms in developing economies. By leveraging the depth of analyst coverage and experience, ESG raters in developed countries can gain more accurate insights, thus providing fairer and more precise sustainability scores for these firms. Analyst forecasts and recommendations would not serve the purpose for two reasons: First, analyst forecasts and recommendations serve a different purpose, namely, providing estimates of future earnings based on past performance and current expectations. Second, analysts are known to collude with the management in developing countries by providing over-optimistic forecasts due to the investment banking pressure (Lai and Teo, 2008) and weak institutional environment (De Moura et al., 2023). While we acknowledge that ESG raters could infer such cues from analyst coverage in developed countries as well, the higher information asymmetry in developing countries (Black et al., 2023) makes analyst coverage and experience a crucial signal in developing countries. Thus, ESG raters could overcome the downward bias in their ESG scoring methodology arising from information asymmetry by incorporating analyst characteristics like analyst coverage and analyst experience.

**H3:** *The downward bias in ESG Scores of firms in developing countries is mitigated by analyst coverage and analyst experience.*

## 3. Data, Covariates and Descriptive Analysis

### 3.1. Sample Selection

Our sample includes all publicly traded non-financial firms with annual data from 2002 to 2022. We source corporate ESG performance measures from the Refinitiv (Version 2)

database.[14] This database, formerly known as ASSET4 of Thomson Reuters, is widely used due to its extensive global coverage and accessibility for both investors and scholars (Basu et al., 2022; Drempetic et al., 2020; Dyck et al., 2019). The Refinitiv ESG score reflects a firm's commitment to environmental, social, and governance dimensions, evaluated through 178 metrics and the Refinitiv ESG controversy score.[15] Annual financial data is sourced from the Worldscope database and analysts' information from the I/B/E/S detail files. Firms are classified as 'developed' or 'developing' based on the United Nations' 2018 classification,[16] depending on the market where its primary security is traded.

To maintain sample homogeneity, we exclude firms from the financial, utility, transportation, public administration, and non-classifiable sectors based on their SIC codes, as well as firms with missing primary quote information. After merging Worldscope data with Refinitiv ESG, our dataset is reduced to 63,624 observations. Further filtering for country and industry-adjusted ESG scores, which requires at least six observations per country-industry-year group and eliminating observations with missing data for the computation of key variables, leaves us with 54,023 observations from 7,904 firms across 50 countries. Country-wise distribution of firms presented in Table 1 shows that our sample includes 2690 firms (34%) from developing countries and 5214 firms (66%) from developed countries, with significant representation from the United States (46% of developed countries), China (30% of developing countries), and India (18% of developing countries). To mitigate the impact of outliers, we winsorized all continuous variables at their 1st and 99th percentiles.

[14] See Thomson Reuters to sell Refinitiv to London Stock Exchange Group (accessed 17 January 2024).
[15] There are three subcategories within the environmental pillar: innovation, emissions, and resource utilisation – containing a total of 19, 22, and 20 indicators respectively. Workforce, human rights, community, and product responsibility are the four subcategories of the social pillar, each of which has 29, 8, 14, and 12 indicators, respectively. The three subcategories comprising the governance pillar—management, shareholders, and CSR strategy—are measured by 34, 12, and 8 indicators, respectively.
[16] Available at: World Economic Situation and Prospects 2018 | Department of Economic and Social Affairs (un.org) (accessed 17 January 2024)

### 3.2. Covariates

#### *3.2.1. Raw ESG Scores and Standardized ESG Scores*

The dependent variables of interest in our study are the raw ESG scores (*RESG*) and the standardized ESG scores (*SESG*). *RESG* represents the raw ESG scores from Refinitiv for a company *i* in year *t*. Likewise, *RENV*, *RSOC* and *RGOV* represent the raw component scores obtained from Refinitiv relating to the E (environmental), S (social) and G (governance) pillars respectively. The *RENV* reflects the company's performance on resource use, emissions and innovation related aspects. The *RSOC* reflects the company's performance in the workforce, human rights, community and product responsibility related aspects. The *RGOV* reflects the company's performance in management, shareholders and CSR strategy related issues. While these scores provide a comprehensive score based on data collected from statutory filings as well as other publicly available data and provide a comprehensive assessment of the overall and category-wise sustainability performance of the companies covered by Refinitiv, these are not the raw scores collected by Refinitiv. The pillar scores (*RENV, RSOC* and *RGOV*) are first normalised category-wise following a percentile ranking methodology to eliminate the effect of outliers. Regarding the peer group consideration for the percentile ranking technique, Refinitiv considers the industry group based on the TRBC codes (The Refinitiv Business Classification) for the *RENV* and *RSOC* scores, whereas the country of incorporation is considered as the benchmark for the *RGOV* scores. This percentile ranking technique scales the pillar scores to a range between 0 and 1. Once the percentile ranking is done for all categories, the final ESG score *(RESG)* is calculated as the weighted average of percentile-ranked pillar scores, with normalised category weights which vary according to the TRBC industry group. Thus, the final ESG score *(RESG)* also ranges between 0 and 1.[17] Hence, *RESG* represents the ESG scores of the companies as obtained from Refinitiv.

[17] Refer to the ESG scoring methodology booklet issued by LSEG in Dec 2023 for additional details. Environmental, social & governance scores guide (lseg.com)

While the percentile ranking technique eliminates the effect of outliers, this methodology makes the data points equidistant from each other thereby resulting in considerable information loss and making it impossible to appreciate the magnitude of differences in scores between each company. Second, since the peer group for *ENV* and *SOC* is the TRBC group, the *RENV* and *RSOC* scores ignore the country-specific priorities on the E and S pillars. Similarly, since the country of incorporation is the benchmark for the *GOV* component, the *RGOV* score ignores the industry-specific differences in governance practices. Therefore, these limitations are reflected in the overall ESG Score (*RESG*) as well.

To overcome this limitation, we standardise the overall ESG score and the respective pillar scores using the country-year-industry benchmark. Accordingly, the standardised ESG score (*SESG*) is measured as the difference between the firm-year *RESG* score and the median of the country-industry-year *RESG* score divided by the standard deviation of country-industry-year *RESG* score. Similarly, *SENV*, *SSOC* and *SGOV* represent the standardized component scores relating to the E, S and G pillars respectively.

Standardizing the ESG scores in this manner has two important advantages: First, it ensures that the scores account for the industry-specific and country-specific differences in sustainability performance. Thus, the institutional priorities regarding environmental and social aspects are taken care of. Second, it has been well-established that the ESG scores are influenced not only by institutional factors (Cai et al., 2016) but also by the measurement and information problems of ESG raters (Larcker et al., 2022). By taking care of the institutional differences, the standardised scores help us isolate the measurement and information problems faced by ESG raters in scoring firms across countries.[18]

[18] However, we acknowledge that the problem of equidistant data points in the normalised ESG scores provided by Refinitiv could persist in the standardised scores as well since we have applied the standardisation process to the normalised scores provided by Refinitiv. This may be overcome by applying the standardisation process over the raw data points used by Refinitiv as inputs to the percentile ranking methodology. Due to the lack of access to this data, we are unable to perform this procedure.

### *3.2.2. United Nations Classification of Developed and Developing Countries*

The United Nations (UN) categorizes nations based on their development status, which is determined by metrics such as per capita gross national income (GNI), human assets index, economic vulnerability index, and various other factors (United Nations, 2018, 2024). Our independent variable of interest is *DVPG*, an indicator variable which takes value 1 if a firm belongs to a developing country as per the United Nations 2018 classification, else zero.

Though the United Nations classify countries into developed and developing countries on a broad set of institutional factors, we check whether the *DVPG* dummy indeed reflects the major institutional differences. Isidro et al. (2020) identify 72 individual country-level variables widely used to capture differences in economic, institutional and societal characteristics between countries. However, they document that these variables are highly correlated and compress them into four latent country factors to measure country-level economic, social, regulatory, and political systems. Following De Moura et al. (2023), we regress the *DVPG* dummy on these four-factor variables. The regression analysis reveals that the *DVPG* dummy alone explains 84% of the variation in these factor variables. Next, we regress the *DVPG* dummy on 21 of the 72 country-level variables that change over time and are representative of time-varying macroeconomic attributes. We find that the *DVPG* dummy explains almost 95% of the variation in these time-varying country-specific attributes. As a further robustness check, we regress the *DVPG* on the entire set of 72 attributes and make similar observations.[19] Hence, the classification of countries as developed and developing captures all the important institutional differences.

### *3.2.2 Analyst Coverage and Experience*

In H3, we have hypothesised that the ESG raters may overcome the downward bias in ESG scores for developing country firms by relying on the number of financial analysts covering

[19] These results are available on request.

the firm and their experience. Following prior studies (Chen et al., 2015; Chourou et al., 2021), we measure analyst coverage (*COVR*) by the logarithm (1 + number of analysts following the firm) during the year and analyst experience (*EXP*) by the logarithm (1 + number of years that the firm has been followed by analysts).

Further, to show that analyst recommendations and forecasts do not matter for ESG raters when assessing sustainability performance, we consider commonly employed metrics for analyst forecasts and recommendations in our analysis. To represent earnings forecasts, we use analysts' forecast error *(FEEPS)*, forecast walkdown *(WLKDN)* and negative earnings surprises *(NSURP)* (Hui and Matsunaga., 2015; Lang, 2016). Following Wiersema and Zhang (2011), we use the mean of analysts' recommendation *(RAVG)* and change in analysts' mean recommendation *(RCHG)* to capture variations in the analysts' recommendations. These variables are described in detail in Appendix A.

### *3.2.3. Control Variables*

We include a number of firm-specific control variables from prior studies (Cai et al., 2016; Chen et al., 2020; Dyck et al., 2019). First, we control for *SIZE* (Ln(Total Assets)), profitability (*ROA*), financial slack (*CASH*) and working capital (*LIQ*) because larger companies that are more profitable, have higher cash holdings and better liquidity, exhibit better sustainability performance. Next, since firms with a greater degree of product differentiation exhibit better ESG performance, we use R&D intensity as an indicator of product differentiation. Further, we include leverage *(LEV)* and performance (*TQ*) to control for the effect of credit constraints and performance respectively. We include capital expenditure (*CAPEXP*) as an indicator of resource allocation since higher CAPEX would strain the company's resources thereby limiting the funds available for ESG initiatives. Next, we control for *GROWTH* (change in sales scaled by assets) since an aggressive growth strategy could be an indicator of compromise on ESG initiatives. Finally, we control for stability and risk through stock price volatility (*VOL*) and financial health through a dividend payment dummy (*DIV*). A detailed description of the

variables is presented in Appendix A. Our univariate regression analysis presented in Appendix B confirms that these variables are significant predictors of both *RESG* and *SESG* and their respective individual components.

### 3.3. Descriptive Analysis

Table 2 provides summary statistics of all variables in the study. We present the overall descriptive statistics by developed and developing countries separately to highlight how key characteristics differ between the groups. First, the mean of the ESG score *(RESG)* in developing countries is similar to the mean of ESG scores (*RESG*) in developed countries. The *RENV* and *RSOC* scores are also apparently similar between developed and developing countries. Only the *RGOV* score differs significantly between developed and developing countries. Nevertheless, the mean differences presented in Table 3 suggest that these differences in the ESG scores between firms in developed and developing countries are statistically significant. This could be due to institutional differences and/or measurement problems of ESG raters. Next, we consider the *SESG* scores which represent the *RESG* scores standardised by country-industry-year median. By standardising *RESG* at the country level, *SESG* eliminates the institutional differences. However, the differences persist even in the standardized ESG (*SESG*) scores (see Table 2 and Table 3). The same trend can be observed in the standardized component scores – *RENV, RSOC* and *RGOV*. Thus, even when the institutional differences are incorporated in the scoring metric via standardization, the summary statistics provide initial evidence that the measurement problems of the ESG raters create a downward bias in the ESG scores of developing countries.

Next, with respect to analyst related metrics, we report systemic differences in analysts' forecasts and recommendations between developing and developed countries. While the forecast error (*FEEPS*) is higher in developed than in developing countries, the revision in forecasts (*WLKDN*) and negative surprises in earnings (*NSURP*) are higher in developing countries than in developed countries. The mean of analysts' recommendations (*RAVG*) is

slightly more optimistic leaning to a buy in developing countries than in developed countries. However, the change in recommendation (*RCHG*) is less favourable in developing countries than in developed countries suggesting that analysts are more likely to downgrade a recommendation in the future in developing countries than in developed countries. These differences in analyst forecasts and recommendations between developed and developing countries suggest that analysts give optimistic forecasts for developing country firms which are followed by downgrades in the subsequent period. This is consistent with the expectation that the weak institutional environment results in analysts colluding with the management and providing accurate forecasts initially which later leads to revisions and negative surprises (De Moura et al., 2023). Therefore, analyst recommendations and forecasts would not serve to eliminate the measurement problems of the ESG raters in developing countries.

Further, analysts' coverage (*COVR*) is higher in developed countries (6 analysts per firm) than in developing countries (4 analysts per firm). Also, the experience of analysts (*EXP*) is higher in developed (2.16 years) than in developing countries (1.43 years).[20] Looking at other control variables, we find that firms in developing countries have lower liquidity (*LIQ*) and poor product differentiation (*RDEXP*). Nevertheless, firms in developing countries are larger in size (*SIZE*) and more profitable (*ROA*), hold more cash (*CASH*), pay more dividends (*DIV*) and have more volatile returns (*VOL*). However, the leverage (*LEV*) levels and growth prospects (*GROWTH*) are not much different between firms in developed and developing countries. The correlation matrix presented in Appendix C confirms that the pairwise correlations amongst the control variables are within acceptable limits, thus eliminating concerns of multicollinearity.

[20] As the analyst coverage and analyst experience are computed by the natural logarithm(1+analysts following) and natural logarithm(1+experience), we calculate the exponential of the mean values and subtract by one to arrive at these figures.

## 4. Empirical Results and Discussion

### 4.1. Empirical Model

We start by considering the following baseline model.

$$ESG_{i,t} = \alpha_0 + \beta_1 DVPG_{i,t} + Controls_{i,t-1} + IndFE + YearFE + \varepsilon_{it} \quad (1)$$

In Eq. (1), *DVPG* represents the developing dummy. *Controls* represents the control variables as described in section 3.2.3 and are lagged by one year. It includes *SIZE* (Ln (Total Assets)), financial slack (*CASH*), product differentiation (*RDEXP*), profitability (*ROA*), leverage (*LEV*), performance (*TQ*), working capital (*LIQ*), capital expenditure (*CAPEXP*), stock price volatility (*VOL*), dividend payment dummy (*DIV*) and *GROWTH* (change in sales by assets). *IndFE* and *YearFE* represent industry and year fixed effects. *ESG* is the dependent variable and denotes *RESG* and its components (*RENV*, *RSOC* and *RGOV*) when testing H1. When doing so, if $\beta_1$ is negative, it confirms our first hypothesis that corporate ESG scores are lower in developing countries than in developed countries due to institutional differences or measurement problems of ESG raters or both.

As explained earlier, the institutional theory only describes why companies decide to be socially responsible from an institutional perspective. We contend that it is insufficient to explain the measurement errors and other data problems of the ESG raters which is the main reason for the failure of ESG scores to measure sustainability performance (Larcker et al., 2022). Therefore, we replace *ESG* in Eq. (1) with the standardised ESG score (*SESG*) and the standardised component scores (*SENV*, S*SOC* and *SGOV*). In doing so, if $\beta_1$ remains negative, it means that the lower corporate ESG scores for developing country firms are due to the measurement problems of the ESG raters.

Further, as presented in Table 2, firms in developing countries differ from firms in developed countries on several firm-specific attributes like liquidity, product differentiation, growth prospects, cash holdings, dividend payments, size, profitability, and performance. To ensure that the effect of *DVPG* on ESG scores is not driven by these firm-specific attributes

and sample selection issues, we consider an entropy-balanced sample of firms from developed and developing countries. First, we match firms on all the firm-specific attributes considered in our study (i.e., *Controls*) and arrive at an entropy-balanced sample, following the procedure as in Shroff et al. (2017). The results of the balancing procedure across three moments (mean, variance and skewness) are presented in Appendix D. The panel regression analysis is carried out with this entropy-balanced sample.

In line with prior studies studying the impact of institutional characteristics on ESG performance (Cai et al., 2016; Liang and Renneboog, 2017), we do not control for firm-fixed effects since the firm-fixed effect is highly collinear with the country-level variables under consideration. Further, as the *DVPG* dummy captures the institutional differences to the extent of 95%, we do not include country-fixed effects in our regression model to avoid multicollinearity issues that would eliminate the *DVPG* dummy from the regression.

Next, to show that ESG raters can overcome the downward bias in corporate ESG scores if they incorporate analyst characteristics in their measurement, we adopt the procedure as in Fernandes et al. (2013) and modify our model to include analyst coverage and experience as additional controls:

$$SESG_{i,t} = \alpha_0 + \beta_1 DVPG_{i,t} + \beta_2 COVR_{i,t-1} + \beta_3 EXP_{i,t-1} + IndFE + YearFE + \varepsilon_{it} \quad (2)$$

In Eq. (2), *COVR* represents analysts' coverage and *EXP* represents analysts' experience. Fernandes et al. (2013) find that the difference in equity pay between US and non-US CEOs is primarily due to institutional investor presence in the firm. To prove this, they first show that there is a difference in compensation between US and non-US CEOs. However, upon controlling for institutional ownership in their regression of US vs non-US CEOs on CEO total pay, they report that the compensation differences between US and non-US CEOs diminish. With respect to equity portion of the total compensation, the differences disappear. In a similar vein, when analyst coverage (*COVR*) and experience (*EXP*) are included in Eq. (2), we expect

$\beta_1$ to be insignificant and $\beta_2$ and $\beta_3$ to be significant. This would support our proposition that ESG raters can overcome the bias in ESG scores by relying on analyst coverage of a firm (*COVR*) and the analyst experience in covering a firm (*EXP)* as it helps them overcome measurement problems caused by information asymmetry. Since sustainability scores are based on qualitative information, we do not expect ESG raters to pay attention to the forecasts and recommendations for the firms covered by analysts. Thus, when analysts' earnings forecasts (*FEEPS, WLKDN, NSURP*) and analysts' recommendations (*RAVG, RCHG*) are included in the model, we expect the coefficient on *DVPG* ($\beta_1$) to remain significant suggesting that once the information environment is improved by analyst coverage in developing country firms, the earnings forecasts and recommendations are of little consequence to the ESG raters.

**4.2. Test of H1**

H1 predicts that corporate ESG scores (*RESG*) are lower in developing countries compared to developed countries. The panel regression results, shown in columns 2 to 5 of Table 4, support this hypothesis. In column 2, the *DVPG* variable has a significant negative coefficient, indicating that corporate ESG scores (*RESG*) are indeed lower in developing countries. Economically, this translates to an 11.6% reduction in corporate ESG scores for developing countries compared to developed ones. When we break down the ESG metrics into their principal components, we find that the *DVPG* variable remains negative and significant in regression models employing *RENV*, *RSOC*, and *RGOV* as dependent variables, respectively. This suggests that firms in developing countries score lower on environmental, social, and governance fronts. Specifically, *RENV* scores are 15.8% lower, *RSOC* scores are 6.3% lower, and *RGOV* scores are 12.2% lower in developing country firms compared to their counterparts in developed countries.

The lower *RENV* scores, followed by *RGOV* and *RSOC* scores, can be understood through the lens of the theory of human needs and the ESG scoring methodology. Most scoring

agencies evaluate a company's performance against global peers when calculating *RENV* and *RSOC* scores (Liang and Renneboog, 2017; Basu et al., 2022). This global benchmark reflects differences in priorities between developed and developing countries. For example, in developing countries, addressing basic needs like employment generation may take precedence over environmental concerns, especially in industries where there is a trade-off between pollution and job creation. Similarly, the necessity to sustain growth can justify higher fossil fuel usage, resulting in lower *RENV* scores compared to *RSOC* scores. As for *RGOV* scores, the difference remains significant at 12.2%. Firms are evaluated relative to their country's governance standards, independent of industry influences. Therefore, the overall industry profile of a country does not distort the corporate governance scores, maintaining a considerable difference between developing and developed countries. Overall, empirical tests provide strong support for hypothesis, H1.

**4.3. Test of H2**

Since the differences in corporate ESG scores between developed and developing countries are not solely due to institutional priorities but may also result from measurement issues by ESG raters, H2 posits that there is a downward bias in the ESG scores of firms in developing countries. To investigate this, we standardize the ESG score by subtracting it from the country-industry-year-median ESG score and dividing it by the country-industry-year standard deviation. Regressing this standardized ESG (*SESG*) score on *DVPG* and a set of firm-level controls reveals that the coefficient of *DVPG* remains negative and significant (see Column 6 of Table 4 ). In fact, after standardization, the magnitude of the difference increases to 21.9%.

Regarding the component scores, the *DVPG* dummy also remains negative and significant in regression estimates employing *SENV*, *SSOC*, and *SGOV* as dependent variables, respectively. Here, the differences increased to 19.2%, 15.2%, and 20.1%, respectively. These findings confirm that the challenges in measuring qualitative information are more pronounced

for ESG scores, resulting in a downward bias in the corporate ESG scores of firms in developing countries. Thus, confirming H2.

**4.4. Test of H3**

H3 proposes that incorporating analyst coverage and experience into the computation of ESG scores by scoring agencies could address the ESG bias problem. This suggestion is based on the idea that financial analysts gather sustainability-related information when making their forecasts (Ioannou and Serafeim, 2015). Therefore, ESG raters, particularly those based in developed economies who face higher information acquisition costs when evaluating firms in developing markets (Ayers et al., 2011), can use financial analyst coverage and experience as indicators of credibility and transparency. The empirical investigation of this proposition is presented in Table 5.

The results in Panel A represent the empirical investigation employing standardised ESG scores (*SESG*). Following the empirical design of Fernandes et al. (2013), if analyst coverage and experience mitigates the bias in ESG scores, then the coefficient on *DVPG* would either become insignificant or decrease in magnitude when *COVR* and *EXP* are introduced in the model. Accordingly, in column 5, when analyst coverage (*COVR*) and experience (*EXP*) are included in the model, the *DVPG* coefficient reduces in magnitude to 5.7% and becomes insignificant. This suggests that the incorporation of analyst coverage and analyst experience when constructing the ESG scores can help the ESG raters overcome the measurement problems and reduce the bias when assigning sustainability scores to firms in developing countries.

Next, in line with our prediction that analyst forecasts and recommendations do not affect the ESG scores in developing countries, we find that when earnings forecasts (*FEEPS, WLKDN, NSURP*) and analysts' recommendations (RCHG, RAVG) are incorporated into the model, the coefficient on *DVPG* remains negative and statistically significant (see Columns 3 and 4).

These results are consistent with the notion that ESG raters can rely on analyst coverage and experience as a credible signal to overcome information asymmetry and transparency in developing country firms. The observation that the *DVPG* coefficient remains significant when analyst forecasts and recommendations are included in the model is consistent with our prediction that once a firm is covered by analysts, their forecasts and recommendations are of little consequence to ESG scores. This is because sustainability scores primarily involve quantifying qualitative information unlike analyst forecasts and recommendations which are largely based on the financial information related to the firm.

Further, we also investigate whether analyst coverage and experience are effective in addressing biases related to the individual components as well, i.e., *SENV, SSOC* or *SGOV*. This analysis is presented in Panels B, C and D of Table 5. The results in these panels are reflective of the main results in Panel A. Regardless of whether ESG scoring agencies assess environmental, social, or governance factors in developing market firms, the importance of analyst coverage and experience for ESG raters in overcoming information challenges associated with these firms remains crucial.

### 4.5. Mitigating Endogeneity Concern

#### *4.5.1 Endogeneity Concern Due to Omitted Variables*

The entropy balancing procedure corrects for differences in the firm-specific characteristics between developed and developing country firms, thereby effectively addressing the self-selection issues. However, the omitted variable bias remains a concern in our setting even after the inclusion of numerous firm-specific controls. Therefore, we address it by conducting an Impact Threshold of Confounding Variables (ITCV) analysis. This method evaluates the severity of the omitted variable issue necessary to invalidate our findings (Frank, 2000; Larcker and Rusticus, 2010). Omitted variable bias is significant when an unobserved variable, correlated with both the independent (x) and dependent (y) variables, undermines the results. According to Frank (2000), the ITCV is defined as the minimum product of the partial

correlations between the confounding variable and both the y- and x-variables needed to invalidate the conclusions. A high ITCV, coupled with the control variables showing a lower product of partial correlations than the ITCV, indicates that the omitted variable bias is insufficient to invalidate the OLS regression results.

When performing the ITCV analysis using the natural logarithm of total assets as a proxy for size, we find that size has an impact factor greater than the ITCV value for the developing country dummy. This suggests that size may be confounding the effect of the developing country dummy on *RESG* and *SESG* scores. Since ESG scores depend on data availability and larger firms can produce more ESG data, ESG scores are often highly correlated with firm size (Drempetic et al., 2020). To address this issue, we measure the size of a firm relative to its industry size within a given country and year for the ITCV analysis. Relative size (*RSIZE*) is calculated as the total assets of a firm in a given year divided by the sum of the total assets of all firms in the same industry and year. We use this measure of size in our regression analyses for the ITCV test.

The results of this analysis are presented for both the *RESG* and *SESG* regressions along with the component scores in Table 6. The ITCV values for the *DVPG* dummy in *RESG* and *SESG* regressions are 0.055 and .015 respectively (Columns 2 and 6). This indicates that the unobserved confounding variable must have a minimum correlation of 0.2345 with *RESG* and 0.1225 with *SESG* respectively to invalidate the regression inferences.[21] Next, following Larcker and Rusticus (2010), we calculate the impact score of each control variable as the product of the partial correlations of the control variable and *RESG* or *SESG*. In the *RESG* and *SESG* regressions, *DIV* and *VOL* have the highest impact scores of 0.031 and –0.015 respectively, which are lower than or equal to the reported ITCV values of the *DVPG* dummy in these regressions (Columns 2 and 6). Except for the *SENV* and *SSOC* regressions (Columns

[21] Correlation is square root of ITCV (Frank, 2000).

7 and 8), we observe that the impact scores of the control variables in the remaining regressions are lower than the respective ITCV values. This confirms that the omitted variable problem is not severe enough to invalidate our regression findings and hence our inferences are robust to omitted variable bias.

### *4.5.2 Endogeneity Concern Due to Measurement Error*

While the entropy balancing procedure mitigates the self-selection problem and the ITCV analysis addresses the omitted variable problem, these techniques do not address measurement error, if any, that could be driving the differences in ESG scores between developing and developed country firms. For example, developing country firms could indeed be performing poorly on ESG parameters and the ESG raters might be correctly capturing the differences, thereby invalidating our claim that institutional biases and measurement problems of the ESG raters are driving the differences in ESG scores.

To rule out this possibility, we construct a Difference-in-Difference (DID) model around the implementation of mandatory ESG disclosures in various countries. We identify mandatory ESG disclosures at the country level following Krueger et al. (2024). If ESG raters provided lower ESG scores to developing country firms because the developing country firms were indeed performing poorly, then we would expect developing country firms to perform poorly even after ESG disclosures became mandatory. On the other hand, if the developing country firms were receiving poorer ESG scores due to institutional biases and/or measurement problems of ESG raters, we would expect the difference in ESG scores between developed and developing country firms to become insignificant.

To test this proposition, we modify the baseline model in Eq. (1) as follows:

$$ESG_{i,t} = \alpha_0 + \beta_1 DVPG_{i,t} \times MAN + Controls_{i,t-1} + IndFE + YearFE + \varepsilon_{it} \quad (3)$$

Here, *MAN* takes the value 1 if a country has mandated ESG disclosures in year *t*, else 0. For the regressions with raw ESG scores as provided by Refinitiv (*RESG*), we replace *ESG*

with *RESG* and for regressions with standardised ESG scores (*SESG*), we replace *ESG* with *SESG*. The regression results are presented in Table 7. In the *RESG* regressions, we find *MAN* to be negative and significant suggesting that mandatory ESG disclosures led to a decline in ESG scores in the immediate aftermath of its implementation. Contrary to our expectation, the interaction term *DVPG* × *MAN* is positive and significant in the *RESG* regressions suggesting that after mandatory ESG disclosures in developing country firms, ESG scores for developing country firms increased at a higher rate compared to developed country firms (Column 2). A similar trend can be observed with respect to the component scores – *RENV, RSOC* and *RGOV* – in Columns 3 to 5. An increase in the *RESG* scores in response to mandatory disclosures within a time span of one year does not indicate any substantive changes in ESG behaviour of the firm and is only indicative of an underlying institutional bias that resulted in lower ESG scores in the pre-disclosure period.

If institutional bias is the only source of difference in ESG scores between developed and developing countries, then we would expect the positive and significant coefficient on the interaction term *DVPG* × *MAN* to exist in the *SESG* regressions as well. However, in the *SESG* regressions, we find that the interaction term *DVPG* × *MAN* becomes insignificant suggesting that the difference in ESG scores between developed and developing countries becomes insignificant in the post-disclosure period (Column 6). This finding is indicative of two pieces of information: first, since the *SESG* scores represent the raw ESG scores that have been standardized at the country level, a different impact of mandatory disclosure on *RESG* and *SESG* between developed and developing countries confirms that *SESG* has incremental information content over and above the raw ESG scores presented by Refinitiv. Therefore, this result validates the necessity to standardise the ESG scores at the country level before using them for decision-making. Second, the differential impact also highlights that institutional bias is not the only source of lower ESG scores in developing countries and confirms that the

measurement problems of the ESG raters due to information asymmetry is the real cause of lower ESG scores here, resulting in a downward bias.

Overall, these findings validate our claims and confirm that there is a downward bias in corporate ESG scores towards developing countries, i.e., developing country firms have lower ESG scores only because they are from developing countries and not because they are underperforming the developed country firms on ESG issues.

### 4.6 Robustness Checks

To further substantiate our findings, we conduct the following robustness checks.

#### *4.6.1 Alternate Classification of Developed and Developing Countries*

Since different international agencies have their own criteria for classifying nations as developed and developing, we first repeat our empirical tests with an alternate classification of firms into developed and developing as per the International Monetary Fund (IMF) criteria. The regression results confirm that irrespective of the classification criteria adopted, developing country firms have lower ESG scores than developed country firms due to differing institutional priorities in meeting sustainability goals and the measurement problems of the ESG raters.[22]

#### *4.6.2 Alternate Method of Standardisation*

Next, in our main analysis, we have considered standardised ESG scores with respect to country-industry-median. As coverage of firms varies widely across countries, it could be possible that the country-industry-median ESG scores are different from the country-industry-mean ESG scores. To address this concern, we repeat the standardization process using the country-industry-mean rather than the country-industry-median. Our regression results suggest that our main empirical predictions regarding the downward bias in ESG scores of developing

[22] Results of this analysis are available upon request.

country firms remain qualitatively unchanged even when we use country-industry-mean for standardisation.[23]

### *4.6.3 Issue of cross-listed firms*

Lastly, by excluding cross-listed firms from our sample, we recognize that firms from developing countries listed in developed markets might not face the same information challenges as their non-cross-listed peers. This could impact the influence of the *DVPG* dummy on ESG scores. To address this concern, we included cross-listed firms in our sample and repeated the analysis. Our regression results show that, even with cross-listed firms included, developing country firms still experience a downward bias in ESG scores.[24]

## 5. Conclusion

Using a global sample of firms from 50 developed and developing countries, we demonstrate that corporate ESG scores are systematically lower in developing countries relative to their developed counterparts. We find that the lower ESG scores for developing firms are not only due to the inherent institutional biases against developing countries but also due to the measurement problems of the ESG raters arising from information asymmetry.

Since the bias stems from measurement issues faced by ESG raters, we also propose a solution to this problem. As the ESG raters are predominantly based in the USA and Europe (Widyawati, 2020), the geographical distance limits their access to information about firms in developing countries thereby complicating the assessment of qualitative data (Ayers et al., 2011). Since financial analysts have a larger presence in developing economies than ESG analysts and readily incorporate sustainability-related information into their forecasts and recommendations (Ioannou and Serafeim, 2015; Luo et al., 2015; Kopita and Petrou, 2024), we provide empirical evidence which shows that ESG raters could rely on analyst coverage and experience to overcome their information asymmetry when providing assigning ESG

[23] Results of this analysis are available upon request.
[24] Results of this analysis are available upon request.

scores to developing country firms. This may mitigate the subjectivity in ESG scores and ensure that ESG raters are assigning ESG scores based on actual ESG behaviour and not disclosures.

We advise investors to be aware of the systematic lower ESG scores for developing country firms due to differing environmental and social priorities. Stakeholders should also recognize that ESG raters from developed economies lack access to reliable sustainability information in developing countries, further exacerbated by their unfamiliarity with local institutional contexts. This diminishes the credibility of ESG raters and questions the significant investments in this industry over the past decade.[25] To overcome this bias, we suggest that ESG raters incorporate analyst coverage and experience when assigning ESG scores to developing country firms. This would ensure that funds intended to promote sustainable business practices are effectively allocated to achieve global sustainability goals.

[25] See https://www.ft.com/content/fbe10867-fea1-4887-b404-9f9e301e102e

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**Table 1**

**Country-wise Distribution of *RESG* and *SESG***

| Country | No. of Firms | No. of Firm-year | *RESG* | | *SESG* | |
|---|---|---|---|---|---|---|
| | | | Mean | Standard Deviation | Mean | Standard Deviation |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| *Developing Countries* | | | | | | |
| Argentina | 33 | 169 | 0.347 | 0.193 | 0.009 | 0.812 |
| Bermuda | 8 | 32 | 0.418 | 0.227 | 0.004 | 0.800 |
| Brazil | 61 | 393 | 0.495 | 0.218 | –0.061 | 0.881 |
| Chile | 16 | 120 | 0.516 | 0.237 | –0.029 | 0.839 |
| China | 808 | 3348 | 0.342 | 0.169 | 0.093 | 0.966 |
| Colombia | 8 | 61 | 0.579 | 0.149 | 0.024 | 0.830 |
| Egypt | 8 | 42 | 0.281 | 0.100 | –0.189 | 0.800 |
| Hong Kong | 99 | 889 | 0.435 | 0.182 | 0.063 | 0.894 |
| India | 502 | 1764 | 0.476 | 0.183 | 0.066 | 0.952 |
| Indonesia | 45 | 360 | 0.459 | 0.202 | –0.025 | 0.882 |
| Israel | 14 | 111 | 0.380 | 0.239 | –0.224 | 0.845 |
| Korea (South) | 134 | 1225 | 0.464 | 0.251 | –0.111 | 0.944 |
| Kuwait | 4 | 14 | 0.366 | 0.238 | 0.000 | 0.734 |
| Malaysia | 297 | 933 | 0.420 | 0.173 | 0.029 | 0.919 |
| Mexico | 62 | 280 | 0.478 | 0.228 | –0.049 | 0.842 |
| Morocco | 18 | 25 | 0.348 | 0.124 | –0.109 | 0.799 |
| Peru | 11 | 67 | 0.408 | 0.218 | –0.053 | 0.845 |
| Philippines | 16 | 141 | 0.477 | 0.201 | –0.027 | 0.850 |
| Qatar | 8 | 32 | 0.275 | 0.146 | 0.000 | 0.718 |
| Russia | 28 | 307 | 0.443 | 0.159 | –0.030 | 0.901 |
| Saudi Arabia | 24 | 130 | 0.290 | 0.212 | 0.110 | 0.858 |
| Singapore | 46 | 428 | 0.427 | 0.186 | –0.031 | 0.827 |
| South Africa | 94 | 838 | 0.519 | 0.178 | –0.057 | 0.877 |
| Taiwan | 135 | 1317 | 0.463 | 0.230 | 0.019 | 0.941 |
| Thailand | 124 | 462 | 0.509 | 0.176 | –0.060 | 0.877 |
| Turkey | 58 | 291 | 0.557 | 0.215 | –0.067 | 0.839 |
| United Arab Emirates | 19 | 46 | 0.337 | 0.167 | 0.004 | 0.776 |
| Vietnam | 10 | 24 | 0.374 | 0.197 | 0.145 | 0.887 |
| **Total** | **2,690** | **13,849** | | | | |
| *Developed Countries* | | | | | | |
| Australia | 362 | 2755 | 0.372 | 0.192 | 0.073 | 0.938 |
| Austria | 10 | 47 | 0.522 | 0.192 | 0.039 | 0.782 |
| Belgium | 24 | 174 | 0.538 | 0.185 | –0.104 | 0.820 |
| Canada | 305 | 2011 | 0.402 | 0.197 | 0.073 | 0.935 |
| Denmark | 36 | 185 | 0.551 | 0.150 | –0.041 | 0.828 |
| Finland | 61 | 393 | 0.552 | 0.183 | –0.049 | 0.832 |
| France | 151 | 1217 | 0.567 | 0.204 | –0.076 | 0.902 |
| Germany | 218 | 1345 | 0.521 | 0.221 | –0.043 | 0.913 |
| Greece | 12 | 79 | 0.551 | 0.160 | –0.031 | 0.801 |
| Ireland | 16 | 120 | 0.531 | 0.181 | 0.071 | 0.864 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Italy | 94 | 469 | 0.581 | 0.178 | –0.008 | 0.888 |
| Japan | 447 | 6558 | 0.444 | 0.213 | –0.025 | 0.972 |
| Netherlands | 39 | 185 | 0.574 | 0.166 | 0.048 | 0.822 |
| New Zealand | 29 | 173 | 0.388 | 0.149 | 0.022 | 0.875 |
| Norway | 48 | 219 | 0.528 | 0.190 | –0.020 | 0.840 |
| Poland | 26 | 201 | 0.402 | 0.166 | 0.004 | 0.786 |
| Portugal | 11 | 77 | 0.638 | 0.151 | –0.010 | 0.750 |
| Spain | 54 | 425 | 0.640 | 0.185 | –0.017 | 0.877 |
| Sweden | 234 | 957 | 0.479 | 0.208 | 0.002 | 0.905 |
| Switzerland | 120 | 787 | 0.489 | 0.229 | 0.039 | 0.927 |
| United Kingdom | 520 | 3754 | 0.478 | 0.189 | 0.003 | 0.935 |
| United States | 2397 | 18043 | 0.415 | 0.196 | 0.099 | 0.988 |
| **Total** | **5,214** | **40,174** | | | | |
| **Sample Total** | **7,904** | **54,023** | | | | |

*Notes*: This table reports summary statistics of *RESG* and *SESG* scores by countries. The sample is based on the annual data of firms from 50 developed and developing countries from 2002 to 2022.

**Table 2**

**Summary Statistics**

| Variables | Country Classification | Mean | Standard Deviation | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | *ESG Scores* | | | |
| *RESG* | Developed | 0.442 | 0.205 | 0.428 | 0.004 | 0.956 |
| | Developing | 0.432 | 0.205 | 0.428 | 0.007 | 0.942 |
| *RENV* | Developed | 0.363 | 0.289 | 0.343 | 0.000 | 0.991 |
| | Developing | 0.387 | 0.260 | 0.376 | 0.000 | 0.988 |
| *RSOC* | Developed | 0.502 | 0.223 | 0.507 | 0.001 | 0.994 |
| | Developing | 0.490 | 0.221 | 0.490 | 0.003 | 0.980 |
| *RGOV* | Developed | 0.445 | 0.235 | 0.421 | 0.002 | 0.982 |
| | Developing | 0.422 | 0.251 | 0.411 | 0.001 | 0.984 |
| *SESG* | Developed | 0.045 | 0.959 | 0.000 | –3.739 | 3.735 |
| | Developing | 0.015 | 0.921 | 0.000 | –3.037 | 3.586 |
| *SENV* | Developed | 0.124 | 0.979 | 0.000 | –3.507 | 4.899 |
| | Developing | 0.038 | 0.928 | 0.000 | –2.971 | 3.528 |
| *SSOC* | Developed | –0.016 | 0.955 | 0.000 | –3.170 | 3.044 |
| | Developing | –0.001 | 0.921 | 0.000 | –2.843 | 2.754 |
| *SGOV* | Developed | 0.058 | 0.958 | 0.000 | –3.127 | 3.675 |
| | Developing | 0.032 | 0.926 | 0.000 | –3.041 | 3.789 |
| | | | *Analyst Forecasts, Recommendations and Characteristics* | | | |
| *FEEPS* | Developed | 0.105 | 0.368 | 0.010 | 0.000 | 2.562 |
| | Developing | 0.034 | 0.102 | 0.011 | 0.000 | 2.562 |
| *WLKDN* | Developed | 0.648 | 0.478 | 1.000 | 0.000 | 1.000 |
| | Developing | 0.807 | 0.395 | 1.000 | 0.000 | 1.000 |
| *NSURP* | Developed | 0.508 | 0.500 | 1.000 | 0.000 | 1.000 |
| | Developing | 0.633 | 0.482 | 1.000 | 0.000 | 1.000 |
| *RCHG* | Developed | –0.118 | 0.737 | 0.000 | –1.000 | 1.000 |
| | Developing | –0.178 | 0.713 | 0.000 | –1.000 | 1.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *RAVG* | Developed | 3.463 | 0.652 | 3.500 | 1.000 | 5.000 |
| | Developing | 3.620 | 0.691 | 3.667 | 1.000 | 5.000 |
| *COVR* | Developed | 1.982 | 0.795 | 2.079 | 0.000 | 3.932 |
| | Developing | 1.706 | 1.008 | 1.792 | 0.000 | 3.951 |
| *EXP* | Developed | 0.888 | 0.550 | 0.847 | 0.000 | 2.708 |
| | Developing | 0.376 | 0.339 | 0.405 | 0.000 | 2.079 |
| | | | *Control Variables* | | | |
| *LIQ* | Developed | 0.174 | 0.203 | 0.141 | –0.253 | 0.759 |
| | Developing | 0.148 | 0.191 | 0.130 | –0.253 | 0.759 |
| *RDEXP* | Developed | 0.027 | 0.055 | 0.001 | 0.000 | 0.297 |
| | Developing | 0.011 | 0.024 | 0.000 | 0.000 | 0.297 |
| *TQ* | Developed | 2.036 | 1.570 | 1.497 | 0.621 | 9.991 |
| | Developing | 1.964 | 1.705 | 1.333 | 0.621 | 9.991 |
| *LEV* | Developed | 0.249 | 0.185 | 0.235 | 0.000 | 0.803 |
| | Developing | 0.254 | 0.176 | 0.245 | 0.000 | 0.803 |
| *SIZE* | Developed | 22.666 | 2.691 | 22.155 | 17.990 | 30.946 |
| | Developing | 25.078 | 2.524 | 24.683 | 17.990 | 30.946 |
| *ROA* | Developed | 0.031 | 0.115 | 0.042 | –0.507 | 0.300 |
| | Developing | 0.055 | 0.080 | 0.047 | –0.507 | 0.300 |
| *GROWTH* | Developed | 0.090 | 0.287 | 0.052 | –0.595 | 1.613 |
| | Developing | 0.100 | 0.290 | 0.064 | –0.595 | 1.613 |
| *CASH* | Developed | 0.156 | 0.162 | 0.102 | 0.002 | 0.765 |
| | Developing | 0.163 | 0.128 | 0.130 | 0.002 | 0.765 |
| *CAPEXP* | Developed | 0.045 | 0.043 | 0.033 | 0.000 | 0.233 |
| | Developing | 0.049 | 0.044 | 0.037 | 0.000 | 0.233 |
| *DIV* | Developed | 0.114 | 0.317 | 0.000 | 0.000 | 1.000 |
| | Developing | 0.480 | 0.500 | 0.000 | 0.000 | 1.000 |
| *VOL* | Developed | 0.289 | 0.102 | 0.268 | 0.124 | 0.577 |
| | Developing | 0.298 | 0.087 | 0.293 | 0.124 | 0.577 |

*Notes*: This table reports summary statistics for all variables used in the multivariate analysis. All variables are winsorised at their 1st and 99th percentiles. The sample is based on the annual data of firms over 50 developed and developing countries from 2002 to 2022.

**Table 3**
**Difference of ESG Scores between Developed and Developing Countries**

| Variables | Mean | | Difference |
|---|---|---|---|
| | Developed | Developing | (2) – (3) |
| (1) | (2) | (3) | (4) |
| *Panel A: Raw ESG Scores* | | | |
| *RESG* | 0.443 | 0.432 | 0.010*** |
| *RENV* | 0.363 | 0.387 | –0.024*** |
| *RSOC* | 0.502 | 0.490 | 0.012*** |
| *RGOV* | 0.445 | 0.422 | 0.023*** |
| *Panel B: Standardized ESG Scores* | | | |
| *SESG* | 0.045 | 0.015 | 0.030*** |
| *SENV* | 0.123 | 0.037 | 0.086*** |
| *SSOC* | –0.016 | –0.001 | –0.015# |
| *SGOV* | 0.058 | 0.032 | 0.026*** |

*Notes*: This table presents the *t*-test results comparing ESG scores between developed and developing countries. All variables have been winsorized at the 1st and 99th percentiles. Panel A shows the differences in raw ESG scores, while Panel B displays the differences in standardized ESG scores. Column (4) provides the *t*-test results for the ESG score differences between developed and developing countries. The sample includes annual data from firms in over 50 developed and developing countries spanning from 2002 to 2022. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively, and # indicates 10% significance level of a one-tailed *t*-test. *t*-statistics are given in parentheses.

**Table 4**

**Multivariate Regressions of ESG Scores**

| Variables | Raw Scores | | | | Standardized Scores | | | |
|---|---|---|---|---|---|---|---|---|
| | *RESG* | *RENV* | *RSOC* | *RGOV* | *SESG* | *SENV* | *SSOC* | *SGOV* |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *DVPG* | –0.116*** | –0.158*** | –0.063*** | –0.122*** | –0.219*** | –0.192*** | –0.152*** | –0.201*** |
| | (–13.850) | (–16.445) | (–6.438) | (–11.653) | (–5.154) | (–4.737) | (–3.407) | (–5.087) |
| *LIQ* | –0.141*** | –0.188*** | –0.099*** | –0.139*** | –0.744*** | –0.725*** | –0.568*** | –0.688*** |
| | (–4.915) | (–5.652) | (–2.823) | (–4.122) | (–4.908) | (–5.286) | (–3.697) | (–4.561) |
| *RDEXP* | 0.868*** | 1.183*** | 0.559*** | 0.868*** | 4.212*** | 4.058*** | 2.368*** | 4.303*** |
| | (5.882) | (6.736) | (3.108) | (5.031) | (5.296) | (5.332) | (2.946) | (5.471) |
| *TQ* | 0.002 | –0.002 | 0.002 | 0.005* | 0.025** | 0.021 | 0.011 | 0.033*** |
| | (1.012) | (–0.567) | (0.624) | (1.799) | (2.151) | (1.584) | (0.911) | (2.850) |
| *LEV* | 0.048* | 0.062** | 0.025 | 0.051* | 0.274** | 0.286** | 0.196 | 0.156 |
| | (1.887) | (2.158) | (0.838) | (1.672) | (2.221) | (2.451) | (1.463) | (1.333) |
| *SIZE* | 0.014*** | 0.025*** | 0.007*** | 0.010*** | 0.036*** | 0.028*** | 0.034*** | 0.031*** |
| | (8.939) | (14.526) | (3.878) | (4.987) | (4.496) | (3.806) | (3.803) | (4.115) |
| *ROA* | 0.137*** | 0.083 | 0.077* | 0.197*** | 0.270 | 0.435* | 0.187 | 0.173 |
| | (3.368) | (1.608) | (1.664) | (3.813) | (1.346) | (1.835) | (0.977) | (0.776) |
| *GROWTH* | –0.037*** | –0.032*** | –0.013* | –0.055*** | –0.004 | 0.028 | –0.012 | 0.011 |
| | (–6.035) | (–4.070) | (–1.739) | (–5.600) | (–0.116) | (0.706) | (–0.298) | (0.297) |
| *CASH* | –0.069* | –0.056 | –0.036 | –0.126*** | 0.022 | –0.165 | 0.111 | –0.025 |
| | (–1.876) | (–1.301) | (–0.874) | (–2.892) | (0.114) | (–0.865) | (0.619) | (–0.127) |
| *CAPEXP* | –0.042 | –0.033 | –0.020 | 0.018 | 0.578 | 0.046 | 0.049 | 0.887** |
| | (–0.546) | (–0.366) | (–0.204) | (0.183) | (1.401) | (0.112) | (0.111) | (2.187) |
| *DIV* | 0.072*** | 0.077*** | 0.018** | 0.107*** | 0.095*** | 0.086** | 0.049 | 0.074** |
| | (10.427) | (9.167) | (2.327) | (12.079) | (2.710) | (2.379) | (1.415) | (2.111) |
| *VOL* | –0.547*** | –0.685*** | –0.336*** | –0.610*** | –1.948*** | –1.640*** | –1.177*** | –1.870*** |
| | (–12.870) | (–13.967) | (–7.056) | (–10.986) | (–8.186) | (–7.339) | (–5.027) | (–8.185) |
| Constant | 0.323*** | 0.089* | 0.468*** | 0.420*** | –0.195 | –0.026 | –0.406* | –0.096 |
| | (7.436) | (1.828) | (10.164) | (7.516) | (–0.966) | (–0.130) | (–1.825) | (–0.489) |
| Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 45,804 | 45,801 | 45,804 | 45,801 | 45,804 | 45,608 | 45,804 | 45,799 |
| Ad. R-squared | 0.322 | 0.371 | 0.107 | 0.297 | 0.111 | 0.107 | 0.057 | 0.104 |

*Notes*: This table presents entropy-balanced multivariate regression estimates, with ESG scores as the dependent variable and the *DVPG* dummy variable as the independent variable of primary interest. All variables have been winsorized at the 1st and 99th percentiles. Columns (2) to (5) show models using raw ESG scores as the dependent variable, while columns (6) to (9) display models using standardized ESG scores. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

**Table 5**

**Multivariate Regressions of Standardized ESG with Analyst Variables**

*Panel A: SESG on Analyst Forecasts, Recommendations and Characteristics*

| Variables | *SESG* | | | |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| *DVPG* | –0.219*** | –0.127** | –0.195*** | 0.057 |
| | (–5.154) | (–2.473) | (–4.263) | (1.047) |
| *FEEPS* | | 0.141*** | | |
| | | (3.105) | | |
| *WLKDN* | | 0.015 | | |
| | | (0.598) | | |
| *NSURP* | | –0.041 | | |
| | | (–1.530) | | |
| *RCHG* | | | –0.082*** | |
| | | | (–6.017) | |
| *RAVG* | | | 0.035 | |
| | | | (1.631) | |
| *COVR* | | | | 0.234*** |
| | | | | (11.235) |
| *EXP* | | | | 0.146*** |
| | | | | (3.841) |
| Constant | –0.195 | –0.145 | –0.074 | –0.389 |
| | (–0.966) | (–0.611) | (–0.323) | (–1.613) |
| Controls | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 45,804 | 35,103 | 37,552 | 35,257 |
| Adjusted R-squared | 0.111 | 0.129 | 0.118 | 0.169 |

*Panel B: SENV on Analyst Forecasts, Recommendations and Characteristics*

| Variables | *SENV* | | | |
|---|---|---|---|---|
| *DVPG* | –0.192*** | –0.109** | –0.170*** | 0.086 |
| | (–4.737) | (–2.207) | (–3.937) | (1.368) |
| *FEEPS* | | 0.085 | | |
| | | (1.525) | | |
| *WLKDN* | | 0.034 | | |
| | | (1.223) | | |
| *NSURP* | | –0.051* | | |
| | | (–1.877) | | |
| *RCHG* | | | –0.070*** | |
| | | | (–4.527) | |
| *RAVG* | | | 0.037* | |
| | | | (1.653) | |
| *COVR* | | | | 0.216*** |
| | | | | (10.306) |
| *EXP* | | | | 0.190*** |
| | | | | (4.409) |

| | | | | |
|---|---|---|---|---|
| Constant | –0.026 | 0.089 | 0.043 | –0.185 |
| | (–0.130) | (0.366) | (0.184) | (–0.780) |
| Controls | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 45,608 | 34,955 | 37,371 | 35,108 |
| Adjusted R-squared | 0.107 | 0.121 | 0.113 | 0.159 |

*Panel C: SSOC on Analyst Forecasts, Recommendations and Characteristics*

| Variables | *SSOC* | | | |
|---|---|---|---|---|
| *DVPG* | –0.152*** | –0.093* | –0.129*** | –0.003 |
| | (–3.407) | (–1.744) | (–2.728) | (–0.054) |
| *FEEPS* | | 0.124*** | | |
| | | (2.843) | | |
| *WLKDN* | | –0.027 | | |
| | | (–1.000) | | |
| *NSURP* | | –0.009 | | |
| | | (–0.341) | | |
| *RCHG* | | | –0.047*** | |
| | | | (–3.014) | |
| *RAVG* | | | 0.014 | |
| | | | (0.678) | |
| *COVR* | | | | 0.141*** |
| | | | | (6.700) |
| *EXP* | | | | 0.045 |
| | | | | (1.061) |
| Constant | –0.406* | –0.443 | –0.270 | –0.556** |
| | (–1.825) | (–1.642) | (–1.175) | (–1.984) |
| Controls | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 45,804 | 35,103 | 37,552 | 35,257 |
| Adjusted R-squared | 0.057 | 0.071 | 0.061 | 0.082 |

*Panel D: SGOV on Analyst Forecasts, Recommendations and Characteristics*

| Variables | *SGOV* | | | |
|---|---|---|---|---|
| *DVPG* | –0.201*** | –0.124*** | –0.182*** | 0.032 |
| | (–5.087) | (–2.650) | (–4.255) | (0.631) |
| *FEEPS* | | 0.118** | | |
| | | (2.402) | | |
| *WLKDN* | | 0.027 | | |
| | | (1.010) | | |
| *NSURP* | | –0.051* | | |
| | | (–1.916) | | |
| *RCHG* | | | –0.075*** | |
| | | | (–5.326) | |

| | | | | |
|---|---|---|---|---|
| *RAVG* | | | 0.038* | |
| | | | (1.846) | |
| *COVR* | | | | 0.205*** |
| | | | | (9.979) |
| *EXP* | | | | 0.116*** |
| | | | | (3.108) |
| Constant | –0.096 | –0.074 | –0.055 | –0.280 |
| | (–0.489) | (–0.319) | (–0.241) | (–1.201) |
| Controls | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 45,799 | 35,100 | 37,547 | 35,254 |
| Adjusted R-squared | 0.104 | 0.123 | 0.109 | 0.153 |

*Notes*: This table presents multivariate regression estimates using an entropy-balanced sample with standardized ESG scores as the dependent variable and the *DVPG* dummy variable as the key independent variable. Additional control variables related to analysts' information are included: earnings forecast metrics (analysts forecast error of EPS (*FEEPS*), analysts walk down of EPS forecast (*WLKDN*), and negative surprise of EPS forecast (*NSURP*)), recommendation metrics (change of recommendation (*RCHG*) and average of recommendation (*RAVG*)), and analysts' characteristics (analyst coverage (*COVR*) and experience (*EXP*)). Columns (2) to (5) report the regression results, with Column (2) presenting the baseline model. Panel A shows the multivariate model with *SESG* as the dependent variable, Panel B shows the multivariate model with *SENV* as the dependent variable, Panel C shows the multivariate model with *SSOC* as the dependent variable and Panel D shows the multivariate model with *SGOV* as the dependent variable. All variables are winsorized at the 1st and 99th percentiles. The sample includes annual data of firms in from 50 developed and developing countries from 2002 to 2022. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

**Table 6**

**Impact of Unobservable Confounding Variables**

| Variables | Raw Scores | | | | Standardized Scores | | | |
|---|---|---|---|---|---|---|---|---|
| | *RESG* | *RENV* | *RSOC* | *RGOV* | *SESG* | *SENV* | *SSOC* | *SGOV* |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *ITCV (DVPG)* | 0.055 | 0.061 | 0.020 | 0.046 | 0.015 | 0.012 | 0.006 | 0.015 |
| | | | | *Impact Scores* | | | | |
| *RSIZE* | 0.012 | 0.011 | 0.006 | 0.012 | 0.012 | 0.010 | 0.007 | 0.011 |
| *LIQ* | 0.003 | 0.003 | 0.001 | 0.003 | 0.003 | 0.003 | 0.002 | 0.003 |
| *RDEXP* | –0.014 | –0.009 | –0.006 | –0.015 | –0.011 | –0.009 | –0.005 | –0.011 |
| *TQ* | 0.000 | –0.001 | –0.000 | 0.001 | 0.000 | 0.000 | –0.000 | 0.000 |
| *LEV* | 0.001 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 |
| *ROA* | 0.005 | 0.006 | 0.003 | 0.004 | 0.005 | 0.004 | 0.004 | 0.004 |
| *GROWTH* | –0.001 | –0.001 | –0.001 | –0.001 | –0.001 | –0.000 | –0.000 | –0.000 |
| *CASH* | –0.002 | –0.002 | –0.004 | –0.002 | –0.001 | –0.001 | –0.000 | –0.001 |
| *CAPEXP* | –0.001 | 0.000 | 0.000 | –0.001 | 0.000 | –0.000 | –0.000 | 0.000 |
| *DIV* | **0.031** | **0.040** | –0.008 | **0.040** | –0.014 | **–0.017** | –0.008 | –0.013 |
| *VOL* | –0.024 | –0.023 | **–0.013** | –0.022 | **–0.015** | –0.013 | **–0.009** | **–0.015** |

*Notes*: This table presents the Impact Threshold for Confounding Variable (ITCV) analysis for regression results presented in Table 4. The first row shows the ITCV values of the DVPG dummy for respective models. The following rows display the impact scores for the control variables. Columns (2) to (5) presents models using raw ESG scores as the dependent variable, while Columns (6) to (9) presents models with standardized ESG scores as the dependent variable.

**Table 7**

**Effect of Mandatory ESG Disclosures**

| Variables | Raw Scores | | | | Standardized Scores | | | |
|---|---|---|---|---|---|---|---|---|
| | *RESG* | *RENV* | *RSOC* | *RGOV* | *SESG* | *SENV* | *SSOC* | *SGOV* |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *DVPG* | –0.204*** | –0.245*** | –0.052*** | –0.292*** | –0.324*** | –0.334*** | 0.004 | –0.346*** |
| | (–9.345) | (–8.578) | (–2.800) | (–10.590) | (–2.950) | (–3.215) | (0.032) | (–3.064) |
| *MAN* | –0.069*** | –0.041 | –0.071*** | –0.101*** | –0.016 | –0.104 | 0.078 | –0.126 |
| | (–3.354) | (–1.528) | (–3.107) | (–3.419) | (–0.178) | (–1.092) | (0.657) | (–1.386) |
| ***DVPG × MAN*** | **0.050**** | **0.030** | **0.058**** | **0.070**** | **0.020** | **0.014** | **–0.077** | **0.016** |
| | (1.991) | (0.920) | (2.147) | (2.004) | (0.170) | (0.113) | (–0.520) | (0.139) |
| Constant | 0.161 | 0.170 | 0.477*** | –0.030 | –1.684*** | –1.438*** | –0.529 | –1.094** |
| | (1.321) | (1.090) | (3.800) | (–0.201) | (–3.280) | (–3.009) | (–1.036) | (–2.131) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,479 | 2,482 | 2,482 |
| Ad. R-squared | 0.379 | 0.371 | 0.181 | 0.357 | 0.162 | 0.148 | 0.068 | 0.141 |

*Notes*: This table presents the results of a difference-in-difference (DiD) analysis examining the effect of mandatory ESG disclosure. The multivariate regressions use raw and standardized ESG scores as dependent variables, with the *DVPG* dummy variable as the independent variable of interest. Columns (2) to (5) feature models with raw ESG scores as the dependent variable, while Columns (6) to (9) present models with standardized ESG scores as the dependent variable. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

**Appendix A**

**Variable Definition**

| Variables | Definitions |
|---|---|
| *RESG* | Firm's overall raw ESG score obtained from Refinitiv. |
| *RENV* | Firm's individual raw environmental score obtained from Refinitiv. |
| *RSOC* | Firm's individual raw social score obtained from Refinitiv. |
| *RGOV* | Firm's individual raw governance score obtained from Refinitiv. |
| *SESG* | Firm's standardized ESG score measured as the difference between firm-year ESG score and the median of country-industry-year ESG score divided by the standard deviation of country-industry-year ESG score. |
| *SENV* | Firm's standardized environment score measured as the difference between firm-year environment score and the median of country-industry-year environment score divided by the standard deviation of country-industry-year environment score. |
| *SSOC* | Firm's standardized social score measured as the difference between firm-year social score and the median of country-industry-year social score divided by the standard deviation of country-industry-year social score. |
| *SGOV* | Firm's standardized governance score measured as the difference between firm-year governance score and the median of country-industry-year governance score divided by the standard deviation of country-industry-year governance score. |
| *DVPG* | Indicator variable equals one if the country is classified as developing country by the United Nations' 2018 classification, and zero otherwise. https://www.un.org/development/desa/dpad/wp–content/uploads/sites/45/publication/WESP2018_Full_Web–1.pdf |
| *FEEPS* | Analysts' forecast error of EPS of the firm in the fiscal year end in consideration. |
| *WLKDN* | Indicator variable equals one if the calculated walkdown (analysts' first forecast minus last forecast, scaled by total assets and finally multiplied by 1000) of each firm-year is above the median of country-industry-year, and zero otherwise. |
| *SURP* | The difference between firm's actual EPS and the median of analysts' *EPS* forecast, scaled by the stock price at the beginning of the fiscal year. |
| *NSURP* | An indicator which equals one (and zero otherwise) if firm's *SURP* is negative. |
| *RECOM* | Categorical variable with the value if 1, 2, 3, 4, 5, which indicates the analyst issues "strong sell", "sell", "still", "buy", "strong buy" recommendations. |
| *RAVG* | Mean of analyst *RECOM* for all analysts who cover a firm over a year. |
| *RCHG* | The difference between the *RAVG* in the next year ($t + 1$) and the *RAVG* in the current period ($t$). |
| *COVR* | Logarithm of the number of analysts following the firm during the year. |
| *EXP* | Logarithm of analyst's firm-specific experience measured as the number of prior years he has issued annual earnings forecasts for a given firm. The variable is averaged across analysts following the firm. |
| *LIQ* | The ratio of the difference between current asset and current liabilities over total assets at the end of fiscal year. |
| *RDEXP* | The ratio of R&D expenditure over total assets at the end of fiscal year. |
| *TQ* | The ratio of the sum of total assets and market capitalization minus common equity over total assets at the end of fiscal year. |
| *LEV* | The ratio of total debt to total assets at the end of fiscal year. |
| *SIZE* | Firm size calculated as the natural log of the firm's assets at of the end of fiscal year. |
| *RSIZE* | The total assets of a firm in a given year divided by the sum of the total assets of all firms in the same industry and year. |

| | |
|---|---|
| *ROA* | Return on assets (income before extraordinary items divided by average total assets. |
| *GROWTH* | Change in sales scaled by lagged total sales. |
| *CASH* | The percentage of cash and short-term investments over total assets. |
| *CAPEXP* | The ratio of capital expenditure to total assets at the end of fiscal year. |
| *DIV* | An indicator which equals one (and zero otherwise) if the firm has dividend payout at the end of fiscal year. |
| *VOL* | Stock price volatility obtained from Worldscope. |

**Appendix B**

**Univariate Regressions of ESG Scores**

| Variables | Raw Scores | | | | Standardized Scores | | | |
|---|---|---|---|---|---|---|---|---|
| | *RESG* | *RENV* | *RSOC* | *RGOV* | *SESG* | *SENV* | *SSOC* | *SGOV* |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *LIQ* | –0.170*** | –0.286*** | –0.106*** | –0.150*** | –0.589*** | –0.603*** | –0.366*** | –0.523*** |
| | (–35.693) | (–43.750) | (–20.328) | (–26.689) | (–26.296) | (–26.194) | (–16.447) | (–23.281) |
| *RDEXP* | –0.142*** | –0.626*** | –0.175*** | 0.100*** | –0.250*** | –0.270*** | –0.607*** | –0.148*** |
| | (–7.046) | (–22.557) | (–8.004) | (4.237) | (–3.012) | (–4.935) | (–7.337) | (–2.761) |
| *TQ* | –0.007*** | –0.024*** | –0.006*** | 0.001 | –0.006** | 0.004* | –0.019*** | 0.003 |
| | (–11.444) | (–29.713) | (–9.085) | (1.043) | (–2.453) | (1.711) | (–7.343) | (1.216) |
| *LEV* | 0.113*** | 0.173*** | 0.066*** | 0.113*** | 0.443*** | 0.474*** | 0.254*** | 0.379*** |
| | (21.434) | (23.926) | (11.611) | (18.367) | (18.042) | (18.809) | (10.449) | (15.432) |
| *SIZE* | 0.021*** | 0.040*** | 0.009*** | 0.015*** | 0.064*** | 0.052*** | 0.041*** | 0.064*** |
| | (64.371) | (95.946) | (25.701) | (39.054) | (42.036) | (33.050) | (26.524) | (41.957) |
| *ROA* | 0.220*** | 0.304*** | 0.158*** | 0.195*** | 0.817*** | 0.712*** | 0.560*** | 0.752*** |
| | (23.509) | (23.598) | (15.509) | (17.804) | (18.691) | (15.863) | (12.916) | (17.165) |
| *GROWTH* | –0.073*** | –0.109*** | –0.045*** | –0.067*** | –0.138*** | –0.113*** | –0.142*** | –0.090*** |
| | (–21.208) | (–23.141) | (–12.026) | (–16.774) | (–8.602) | (–6.847) | (–8.966) | (–5.618) |
| *CASH* | –0.186*** | –0.350*** | –0.156*** | –0.138*** | –0.566*** | –0.545*** | –0.397*** | –0.480*** |
| | (–29.755) | (–40.971) | (–22.948) | (–18.741) | (–19.295) | (–18.052) | (–13.649) | (–16.308) |
| *CAPEXP* | –0.189*** | 0.008 | 0.053** | –0.302*** | 0.015 | –0.240** | –0.200** | 0.310*** |
| | (–8.625) | (0.274) | (2.412) | (–11.780) | (0.147) | (–2.502) | (–2.140) | (3.309) |
| *DIV* | 0.080*** | 0.132*** | 0.014*** | 0.097*** | 0.080*** | 0.037*** | 0.057*** | 0.062*** |
| | (34.359) | (41.375) | (5.494) | (35.577) | (7.286) | (3.295) | (5.253) | (5.621) |
| *VOL* | –0.630*** | –0.874*** | –0.405*** | –0.632*** | –1.936*** | –1.700*** | –1.313*** | –1.792*** |
| | (–75.314) | (–76.072) | (–43.220) | (–64.011) | (–48.637) | (–41.603) | (–32.704) | (–44.848) |

*Notes*: This table reports univariate regression estimates employing raw and standardized ESG scores as dependent. Significance levels are indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

**Appendix C**

**Correlation Matrix**

| Variables | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| *FEEPS* | (1) | 1.000 | | | | | | | | |
| *WLKDN* | (2) | 0.033 | 1.000 | | | | | | | |
| *NSURP* | (3) | 0.049 | 0.681 | 1.000 | | | | | | |
| *RCHG* | (4) | –0.012 | –0.058 | –0.045 | 1.000 | | | | | |
| *RAVG* | (5) | –0.029 | –0.051 | –0.042 | 0.372 | 1.000 | | | | |
| *COVR* | (6) | –0.079 | 0.019 | –0.038 | –0.204 | –0.055 | 1.000 | | | |
| *EXP* | (7) | –0.125 | –0.063 | –0.103 | 0.034 | –0.037 | 0.352 | 1.000 | | |
| *LIQ* | (8) | –0.058 | –0.049 | –0.054 | 0.039 | 0.041 | 0.001 | 0.070 | 1.000 | |
| *RDEXP* | (9) | –0.040 | –0.049 | –0.058 | 0.026 | 0.033 | 0.103 | 0.123 | 0.387 | 1.000 |
| *TQ* | (10) | –0.065 | –0.115 | –0.113 | 0.006 | 0.033 | 0.105 | 0.067 | 0.279 | 0.322 |
| *LEV* | (11) | 0.023 | 0.069 | 0.072 | –0.001 | –0.041 | –0.008 | 0.058 | –0.415 | –0.184 |
| *SIZE* | (12) | –0.153 | –0.001 | 0.025 | –0.087 | 0.001 | 0.150 | –0.139 | –0.153 | –0.147 |
| *ROA* | (13) | –0.086 | –0.189 | –0.200 | –0.019 | 0.035 | 0.089 | 0.032 | 0.075 | –0.210 |
| *GROWTH* | (14) | –0.052 | –0.167 | –0.172 | 0.035 | 0.102 | –0.017 | –0.017 | 0.070 | 0.106 |
| *CASH* | (15) | –0.050 | –0.063 | –0.058 | 0.014 | 0.035 | 0.030 | –0.006 | 0.674 | 0.517 |
| *CAPEXP* | (16) | –0.042 | 0.020 | 0.034 | –0.048 | 0.038 | 0.038 | –0.046 | –0.237 | –0.150 |
| *DIV* | (17) | 0.045 | 0.054 | 0.066 | –0.063 | –0.013 | –0.008 | –0.283 | –0.156 | –0.143 |
| *VOL* | (18) | 0.089 | 0.027 | 0.051 | 0.007 | 0.063 | –0.114 | –0.111 | 0.225 | 0.218 |
| | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| *TQ* | (10) | 1.000 | | | | | | | | |
| *LEV* | (11) | –0.193 | 1.000 | | | | | | | |
| *SIZE* | (12) | –0.261 | 0.076 | 1.000 | | | | | | |
| *ROA* | (13) | 0.316 | –0.217 | 0.048 | 1.000 | | | | | |
| *GROWTH* | (14) | 0.176 | –0.055 | –0.066 | 0.107 | 1.000 | | | | |
| *CASH* | (15) | 0.402 | –0.336 | –0.113 | –0.021 | 0.100 | 1.000 | | | |
| *CAPEXP* | (16) | –0.037 | 0.040 | 0.015 | 0.020 | 0.051 | –0.185 | 1.000 | | |
| *DIV* | (17) | –0.112 | 0.062 | 0.182 | 0.023 | –0.048 | –0.084 | –0.004 | 1.000 | |
| *VOL* | (18) | 0.040 | –0.073 | –0.209 | –0.288 | 0.143 | 0.273 | 0.101 | –0.089 | 1.000 |

*Notes*: This appendix table reports corelation metrics for all control variables used in the multivariate analysis. All variables are winsorised at their 1st and 99th percentiles. The sample is based on the annual data of firms over 50 developed and developing countries from 2002 to 2022.

**Appendix D**

**Descriptive Statistics of Entropy Balanced Sample**

| Variables | Treat Group | | | Control Group | | |
|---|---|---|---|---|---|---|
| | Mean | Variance | Skewness | Mean | Variance | Skewness |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| *Before Entropy Balancing* | | | | | | |
| *LIQ* | 0.148 | 0.036 | 0.389 | 0.174 | 0.041 | 0.756 |
| *RDEXP* | 0.011 | 0.001 | 4.382 | 0.027 | 0.003 | 3.087 |
| *TQ* | 1.964 | 2.907 | 2.724 | 2.036 | 2.464 | 2.756 |
| *LEV* | 0.254 | 0.031 | 0.501 | 0.249 | 0.034 | 0.639 |
| *SIZE* | 25.080 | 6.372 | 0.560 | 22.670 | 7.241 | 0.680 |
| *ROA* | 0.055 | 0.006 | –0.845 | 0.031 | 0.013 | –2.172 |
| *GROWTH* | 0.100 | 0.084 | 1.678 | 0.090 | 0.082 | 2.323 |
| *CASH* | 0.163 | 0.016 | 1.538 | 0.156 | 0.026 | 1.859 |
| *CAPEXP* | 0.049 | 0.002 | 1.529 | 0.045 | 0.002 | 2.099 |
| *DIV* | 0.480 | 0.250 | 0.078 | 0.114 | 0.101 | 2.436 |
| *VOL* | 0.298 | 0.008 | 0.377 | 0.289 | 0.011 | 0.944 |
| *After Entropy Balancing* | | | | | | |
| *LIQ* | 0.148 | 0.036 | 0.389 | 0.148 | 0.036 | 0.389 |
| *RDEXP* | 0.011 | 0.001 | 4.382 | 0.011 | 0.001 | 4.383 |
| *TQ* | 1.964 | 2.907 | 2.724 | 1.964 | 2.907 | 2.724 |
| *LEV* | 0.254 | 0.031 | 0.501 | 0.254 | 0.031 | 0.501 |
| *SIZE* | 25.080 | 6.372 | 0.560 | 25.080 | 6.372 | 0.560 |
| *ROA* | 0.055 | 0.006 | –0.845 | 0.055 | 0.006 | –0.845 |
| *GROWTH* | 0.100 | 0.084 | 1.678 | 0.100 | 0.084 | 1.678 |
| *CASH* | 0.163 | 0.016 | 1.538 | 0.163 | 0.016 | 1.538 |
| *CAPEXP* | 0.049 | 0.002 | 1.529 | 0.049 | 0.002 | 1.529 |
| *DIV* | 0.480 | 0.250 | 0.078 | 0.480 | 0.250 | 0.078 |
| *VOL* | 0.298 | 0.008 | 0.377 | 0.298 | 0.008 | 0.377 |

*Note*: This table reports the summary statistics before and after entropy-balanced matching. All variables have been winsorized at the 1st and 99th percentiles. The sample comprises annual data of firms over 50 developed and developing countries from 2002 to 2022.