The Impact of ESG-Linked Compensation on Sustainable Supply Chain Performance: An International Evidence

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ABSTRACT

Despite increasing global attention on sustainable supply chain performance (SSCP), few studies have examined the impact of ESG-linked compensation on SSCP in the international context. This study examines the relationship between ESG-linked compensation and focal firms' SSCP using 19,776 firm-year observations across 27 countries from 2003–2023. The results show that ESG-linked compensation is positively related to and focal firms' SSCP, suggesting that firms linking compensation to ESG metrics have stronger supply chain sustainability. Further analysis shows that ESG-linked compensation is positively associated with both the environmental and social dimensions of SSCP. We also find that the positive relationship between ESG-linked compensation and focal firms' SSCP is more pronounced for firms in countries with a higher level of governance and stakeholder-oriented business culture. The findings of our study have significant implications for stakeholders, policymakers, regulators, and practitioners globally, particularly in understanding the effects of ESG-linked compensation on firms' sustainability practices throughout the supply chain.

Keywords: ESG-linked compensation; sustainable supply chain performance; Country-level governance; Country's business culture; cross-country

Data: All data used in this paper are available from sources stated in the paper.

1. Introduction

This study examines the impact of linking executive compensation to environmental, social, and governance (ESG) metrics on focal firms' sustainable supply chain performance (SSCP). The integration of executive pay with ESG goals has become a growing trend in corporate governance, with companies worldwide increasingly adopting this practice. The proportion of firms incorporating ESG-linked executive compensation has risen from 3% in 2010 to over 30% in 2021 (Cohen et al., 2023).[2] This shift reflects a broader recognition that aligning executive incentives with sustainability goals can drive corporate responsibility and long-term value creation. However, despite its growing adoption, little is known about how ESG-linked compensation influences firms' sustainable performance, particularly within their supply chains.

At the same time, sustainable supply chain (SSC) management has gained prominence due to rising social, environmental, and economic concerns. SSC refers to firms' efforts to minimize the negative environmental and social impacts of their supply chains through responsible sourcing, ethical labour practices, and resource efficiency (Benjamin et al., 2020). Effective SSC management requires firms to coordinate closely with supply chain partners to align sustainability goals (Carter & Rogers, 2008). Firms are increasingly focusing on strengthening their SSC practices for several reasons. First, consumers are increasingly aware of unethical supply chain practices, such as forced labour and gender discrimination, leading them to favour companies that actively manage their supply chain sustainability (Hartmann & Moeller, 2014; Mollenkopf et al., 2022; Nichols et al., 2019; Sedex, 2023). Second, investors are incorporating sustainability considerations into their decisions, avoiding firms with high supply chain risks due to the financial and reputational consequences (Dai et al., 2021; Sedex, 2023; Swift et al., 2019). Additionally, disruptions caused by political conflicts, climate change, and natural disasters have highlighted the need for resilient supply chains, prompting firms to enhance supply chain visibility and risk management (Chen et al., 2019; Free & Hecimovic, 2021;

[2] Our sample shows significant increase in ESG-linked compensation, rising from 4.76% in 2003 to 46.96% in 2022.

Velayutham et al., 2021). A notable SSC initiative that gained traction during the COVID-19 pandemic is supplier diversity programs. These programs, which support businesses owned by minority groups, women, veterans, and Indigenous populations, not only promote social inclusion but also strengthen supply chain resilience (Ernst & Young, 2022).

Motivated by the growing interest in ESG-linked compensation and the importance of sustainable supply chains (SSC), this study examines how ESG-linked executive pay influences focal firms' SSCP. We define focal firms' SSCP as their effectiveness in collaborating with suppliers to mitigate social and environmental risks across the supply chain. It emphasizes prioritizing suppliers' environmental and social performance in selection processes and strategically disengaging from partners that do not align with the firm's sustainability objectives. Understanding SSCP and its determinants is crucial, as it enhances operational efficiency, strengthens brand value, and mitigates risk (Benjamin et al., 2020; Darendeli et al., 2022; Lam, 2018). Sustainable supply chain practices, such as optimizing transportation and sourcing materials from responsible suppliers, reduce costs while enhancing corporate reputation (Carter & Rogers, 2008; Dai et al., 2021). Improved SSCP yields both tangible benefits, such as higher profitability and market value (Ortas et al., 2014; Swift et al., 2019), and intangible benefits, including greater customer loyalty (Duan et al., 2021; Kraft et al., 2022) and lower employee turnover (Ernst & Young, 2022). Beyond corporate benefits, SSCP has broader societal implications. NGOs and environmental advocacy groups are increasingly pressuring firms to improve sustainability across their supply chains. Indirect carbon emissions, commonly known as supply chain emissions, often exceed direct emissions, making them a critical focus for sustainability efforts (Anquetin et al., 2022). Additionally, concerns about unethical supply chain practices, such as modern slavery and the use of conflict minerals, highlight the urgency for stronger regulatory oversight and corporate accountability (Islam, 2018; Islam & Van Staden, 2022).

To examine the impact of ESG-linked compensation on focal firms' SSCP, we analyse a sample of 19,776 firm-year observations across 27 countries from 2003 to 2023. We measure a focal firm's SSCP using the average ESG performance of its suppliers, following a three-step process. First, we

identify 33,130 unique suppliers linked to 33,156 unique focal firms. Second, we determine the ESG performance score for each supplier associated with a focal firm. Finally, we calculate the annual average ESG performance of all suppliers linked to a focal firm, resulting in 18,858 unique firms with 103,867 firm-year observations. Consistent with prior studies (Cohen et al., 2023; Flammer et al., 2019), ESG-linked compensation is measured as an indicator variable, capturing whether a company includes ESG criteria in the compensation contracts of any top executive in a given year.

Our findings show a positive relationship between ESG-linked compensation and focal firms' SSCP, indicating that firms incorporating ESG metrics into executive pay achieve stronger supply chain sustainability. The results remain robust after applying Heckman's (1979) two-stage analysis and entropy balancing tests. Further analysis shows that ESG-linked compensation is positively associated with both the environmental and social dimensions of SSCP. Additionally, we explore the influence of country-level institutional factors and find that the positive effect of ESG-linked compensation on focal firms' SSCP is more pronounced in countries with stronger governance frameworks and stakeholder-oriented business cultures.

Our study makes several key contributions to the literature. First, to the best of our knowledge, this is the first study to provide a longitudinal analysis of the impact of ESG-linked compensation on supply chain sustainability. While prior research has explored corporate governance factors in shaping SSCP (Benjamin et al., 2020; Gull et al., 2023; Islam et al., 2018), little is known about how executive compensation—an essential governance mechanism—affects SSCP. Although executive compensation is widely recognized as a governance tool for aligning managerial actions with stakeholders' interests (Amis et al., 2020; Arora & Alam, 2005), there remains a gap in understanding the role of ESG-linked compensation. Our findings contribute to this area by providing empirical evidence that ESG-linked compensation enhances firms' environmental and social performance across the supply chain. This study broadens our understanding of ESG-linked compensation as a stakeholder governance mechanism that guides executives to meet broader stakeholder expectations (Barney, 2018; McGahan, 2020).

Second, we extend the accounting literature on country-level governance and corporate sustainability. Prior studies suggest that strong governance frameworks at the country-level positively influence firms' sustainable performance (Choi & Luo, 2021; Pratama & Hermawan, 2023). Our findings build on this research by demonstrating that country-level governance strengthens the positive relationship between ESG-linked compensation and focal firms' SSCP. Finally, we contribute to the growing body of research on the role of business culture in non-financial accounting aspects, such as sustainability reporting and carbon emissions (Choi & Luo, 2021; Luo et al., 2018; Simnett et al., 2009). Specifically, we show that a country's stakeholder-oriented business culture strengthens the positive relationship between ESG-linked compensation and focal firms' SSCP.

The remainder of the paper is structured as follows: Section 2 lays out the literature review. Section 3 provides the theoretical framework and hypotheses development. Section 4 presents the study's research design. Section 5 presents the empirical results, followed by the conclusions in Section 6.

2. Literature review

2.1 Determinants of SSCP

The literature has documented various external and internal factors that drive firms' supply chain sustainability. External factors include NGOs' engagement, regulatory and governmental power, and buyers' pressure. On the other hand, internal factors include operational decisions, supply chain structure, and governance factors.

2.1.1 The external determinants of supply chain sustainability

Prior research has documented how NGO engagement changes firms' social and environmental behaviour across their supply chain and leads them to formulate an improved SSC. For example, Brennan and Merkl-Davies (2014) demonstrate how an NGO (Greenpeace) changed the environmental behaviour of six multinational corporations in their supply chain management.

Similarly, Huq et al. (2016) demonstrate the role of NGOs in enhancing the efficiency of approaches implemented by firms to scrutinize their suppliers' social and environmental behaviours. In addition, prior studies find that NGO pressures enhance firms' disclosures and performance of supply chain sustainability (Deegan & Islam, 2014; Islam & van Staden, 2018).

Furthermore, prior studies also examine the role of regulatory and governmental power as drivers of sustainable practices across supply chain and document two contrasting views. The first group of the literature demonstrates a positive impact of strengthened regulations on supply chain sustainability. For example, She (2022) finds that the California Supply Chains Transparency Act improves the US manufacturing and retail firms' supply chain sustainability. Similarly, Mai et al. (2023) document that the UK's Modern Slavery Act expands the extent and quality of disclosures related to modern slavery issues on supply chains. In contrast, the other strand of the literature shows insignificant impacts of regulatory forces on disclosures of supply chain sustainability. For instance, some studies document an insignificant impact of the Australian Modern Slavery Act on modern slavery disclosure quality (Bayne et al., 2022; Christ & Burritt, 2023; Christ et al., 2019). In addition to the regulatory power, the literature also documents the impact of government interventions on SSC. For instance, prior studies document that government intervention and incentives play a dominant role in guaranteeing firms' sustainability across their supply chains (Ding et al., 2016; Ding et al., 2018).

Attention to supply chain sustainability is proliferated because it is used to demonstrate how firms realigned their supply chain practices and cascaded sustainability to their lower tiers' suppliers in line with stakeholders' expectations (Porteous et al., 2015; Villena et al., 2021). This serves the purpose of restoring legitimacy, particularly after environmental and social supply chain disasters (Villena, 2019). It is worth noting that the literature on external determinants of supply chain sustainability often draws on the buyer's coercive power and the institutional perspective. For example, prior research documents the significant impact of focal firm power on cascading sustainability along the supply chain (Bayne, 2022; Porteous et al., 2015; Wilhelm & Villena, 2021;

Wilhelm et al., 2016). In addition, some studies demonstrate how firms' institutional context changes firms' SSCP to legitimize their activities (Akbar & Deegan, 2021; Li et al., 2023). Finally, Villena and Dhanorkar (2020) Examine the impact of buyers' institutional pressure and industry peers' pressure in the presence of climate change incentives on suppliers' carbon transparency. They find suppliers are likely to be coercive and mimetic without buyers' incentives and normative with these incentives.

2.1.2 The internal determinants of supply chain sustainability

Prior research documents several internal determinants of supply chain sustainability related to firm-level supply chain structure and operational decisions. For instance, Kim and Davis (2016) find that firms that characterized complex supply chains are less likely to release conflict mineral-free statements. Also, some studies reveal the significance of integration between suppliers and focal firms as a major driver for cascading sustainability along the supply chain (Foerstl et al., 2015; Villena, 2019). Moreover, prior research finds that improved sustainable performance of suppliers is associated with focal firms' implementation of lean manufacturing programs (Distelhorst et al., 2017) and mandatory sustainability policy only in the case of the existence of multiple suppliers (Agrawal & Lee, 2019). Interestingly, Jin et al. (2021) find a negative impact of management green optimism on sustainable supply chain management. In addition, studies also document the trade-off between cost and sustainability during the supplier selection process as the determinants of supply chain sustainability (Aral et al., 2021; Goebel et al., 2018).

From the preceding discussion, it is evident that the literature extensively examines internal determinants of supply chain sustainability associated with firm-level operational decisions. Nevertheless, relatively fewer research examines the impact of corporate governance on firms' supply chain sustainability. For instance, Benjamin et al. (2020) find that firms' supply chain sustainability is positively associated with board gender diversity and board independence. Also, Gull et al. (2023) find that firms characterized by higher board gender diversity incorporate more sustainability criteria in the selection and termination of suppliers. In addition, Islam et al. (2018) find an insignificant

impact of the social compliance audit programs carried out by multinational corporations in the garment industry on suppliers' labour working conditions in Bangladesh. While these studies started paying attention to corporate governance factors in determining supply chain sustainability, little is known about how executive compensation, as an important governance mechanism, impacts supply chain sustainability.

2.2 Executives' compensation structure and corporate social responsibility

There is a recent shift in the literature focusing on the relationship between executives' compensation structure attributes and corporate social responsibility (CSR) (Brooks & Oikonomou, 2018). For instance, Cohen et al. (2023) document a positive impact of ESG-linked executive compensation on carbon emissions reduction and ESG rating improvement. Similarly, other studies find that incorporating quantitative and strong ESG metrics into executives' compensation structures drives firms' social performance (Hong et al., 2016; Maas, 2018). Flammer et al. (2019) consistently document a positive relationship between ESG-linked executives' compensation and sustainability performance through increasing environmental initiatives, green innovation, and decreasing carbon emissions. Finally, recent studies document a positive impact of CSR contracting on ESG performance (Hou et al., 2024; Peng & Smith III, 2024). In contrast, Walker (2022) stated that ESG-linked compensation represents a small portion of total annual compensation and is a form of greenwashing. Similarly, Bebchuk and Tallarita (2022) argue that CEOs design subjective ESG metrics to manipulate them to their advantage over shareholders. Keddie and Magnan (2023) find that powered executives from environmentally sensitive industries used ESG-linked compensation to increase their remunerations.

Although extensive research investigates the link between ESG-linked compensation and sustainability performance of focal firms, limited research has explored its impact on sustainability across the supply chain. This research extends the existing literature by examining the relationship between ESG-linked compensation and focal firms' SSCP.

3. Hypotheses development

3.1 The impact of ESG-linked compensation on focal firms' SSCP

This study draws on both agency theory and stakeholder theory to examine the association between ESG-linked compensation and focal firms' SSCP. Agency theory posits that managers, acting as rational agents, prioritize their own interests over the owners' (Fama & Jensen, 1983). This may lead to supplier selections that favour personal interests, neglecting the sustainable performance of suppliers at the expense of benefits to firms. Given extensive evidence on the positive association between firms' sustainable performance and financial performance (Brammer et al., 2009; Chopra & Wu, 2016; Kassinis & Soteriou, 2003; Sharfman & Fernando, 2008; Thomas, 2001), we argue that it is to the benefit of firms to engage in sustainable practices.

The literature widely acknowledges that effective governance mechanisms significantly reduce agency conflicts and enhance firm performance by aligning executives' interests with shareholders and improving management monitoring (Banerjee & Homroy, 2018; Baysinger & Butler, 1985). Since SSCP significantly improves firms' performance, fostering a positive perception of seller quality and mitigating risks (Chen et al., 2021; Duan et al., 2021; Green et al., 2012; Kraft et al., 2022; Lam, 2018; Ortas et al., 2014; Pakdeechoho & Sukhotu, 2018; Zhu & Sarkis, 2004), firms have incentives to motivate management to improve SSCP. ESG-linked compensation has been used as a tool to incentivise managers to improve firm sustainable practices (Cohen et al., 2023; Flammer et al., 2019; Maas, 2018). Furthermore, incorporating nonfinancial performance measures in compensation structures is argued to improve long-term focus. Studies indicate that non-financial incentives can address the agency costs of short-term focused executives (Flammer et al., 2019; Karim et al., 2018). Better CSR performance, leading to economic benefits, often results from long-term efforts (Edmans, 2011; Henisz et al., 2014). Because SSCP takes time before displaying significant results, managers with short-term incentive orientations may neglect its long-term benefits (Flammer & Bansal, 2017; Graham et al., 2005). Therefore, it is expected that incorporating ESG-

linked compensation could also drive sustainable practices along the supply chain. Drawing on this reasoning, we argue that ESG-linked compensation drives executives to improve focal firms' SSCP.

Moreover, stakeholder theory advocates that the long-term success of any organisation depends on its ability to fulfil the diverse needs of its stakeholders (Freeman, 2010; Lerner & Fryxell, 1994; Parmar et al., 2010). According to stakeholder theory, executives are incentivised to improve their sustainability practices since sustainability practices can assist firms in building good relationships with different stakeholders that are essential to firms' success (Freeman, 2010; Jones, 1995). Consistently, empirical evidence shows that sustainability practices targeting various stakeholders positively impact firms' performance (Flammer et al., 2019; Godfrey et al., 2009; Jo & Harjoto, 2011). Since SSCP is a fundamental requirement of stakeholders (Islam et al., 2018), executives enhance SSCP to meet the various interests of stakeholders, improving firms' performance. Prior literature documents that ESG-linked compensation has been used to incentivise executives to improve firms' sustainable practices and meet the needs of various stakeholders (Cohen et al., 2023; Flammer et al., 2019; Maas, 2018). It is expected that incorporating ESG-linked compensation could highlight the importance of sustainable practices along the supply chain and motivate executives to improve SSCP.

In summary, based on agency and stakeholder theory, this study argues that ESG-linked compensation motivates executives to prioritize sustainability in the supplier selection process and launch more sustainability programs along the supply chain. Conversely, without ESG-linked compensation, executives might focus solely on short-term financial outcomes, overlooking environmental and social performance in supplier selection. Therefore, ESG-linked executive compensation is expected to improve focal firms' SSCP. This leads to the following hypothesis:

H1: ESG-linked executive compensation in a focal firm is positively related to its SSCP.

3.2 The moderating role of country-level governance

The firm's SSCP is not only affected by ESG-linked compensation but also by the law's tolerance to firms' environmental and social violations across the supply chain. The level of country governance

plays a critical role in determining the degree of tolerance for environmental and social violations, as well as the stringency of regulations addressing such violations (Choi & Luo, 2021). We therefore expect country-level governance also determines the degree of tolerance for firms' environmental and social violations across the supply chain.

Prior literature documents country-level governance has a positive impact on firms' sustainable performance. For instance, some studies document the significant impact of a country's governance factors, such as the rule of law, political system, and control of corruption, on ESG performance (Cai et al., 2016; Choi & Luo, 2021; Gani, 2012; Ioannou & Serafeim, 2012; Pratama & Hermawan, 2023). In addition, prior studies also demonstrate the considerable influence of a country's governance factors, including law enforcement, press freedom, investor protection, and regulatory quality, on CSR disclosures (Bhatia & Makkar, 2020; De Villiers & Marques, 2016; Kühn et al., 2018; Lattemann et al., 2009). The positive relationship between country-level governance and sustainability practices can be attributed to various factors. One significant reason is that firms operating within countries with strong governance frameworks are compelled to adhere to stringent regulations and standards aimed at promoting sustainability. Furthermore, countries with strong governance structures often showcase a commitment to sustainable development goals, which in turn exerts pressure on businesses to align their practices with these broader societal objectives. Moreover, effective governance at the national level can foster policy consistency and predictability, offering firms the necessary certainty and support to invest in long-term sustainable initiatives. Building on this reasoning, we expect that firms operating in countries with strong governance are subject to greater pressure to improve their sustainability practices across their supply chains. Furthermore, the market penalizes firms that have high SSC violations in countries with high governance scores. Accordingly, we posit that the relationship between ESG-linked executive compensation and focal firms' SSCP will be stronger in countries that exhibit strong governance. This leads to the following hypothesis:

H2: The positive relationship between ESG executives' compensation and focal firms' SSCP will be more pronounced in countries with stronger governance.

3.3 Moderating role of countries' business culture

A country's business culture pertains to its emphasis on either stakeholders' interests or shareholders' value (Ball et al., 2000; La Porta et al., 1997; Simnett et al., 2009). Stakeholder-oriented business cultures typically consider the interests of all parties, while shareholder-oriented business cultures focus primarily on maximizing shareholder value (Simnett et al., 2009). Stakeholder-oriented cultures have increased legal protections and public awareness of stakeholder issues, reflecting greater legitimacy of stakeholder concerns (Dhaliwal et al., 2012; Luo et al., 2021). Evidence shows that firms domiciled in stakeholder-orientated countries launch more sustainability initiatives to legitimate their activities (Husted & Sousa-Filho, 2017). Firms in these countries may enjoy greater public trust and goodwill, as they are perceived as contributing positively to society, which can enhance their long-term viability and success. For instance, Dhaliwal et al. (2012) find that ESG disclosures tend to be more valuable in countries that prioritize stakeholders. Overall, the emphasis on stakeholder interests in these countries encourages firms to consider the wider impact of their operations and fosters a culture of sustainability and responsible business practices. Consistently, prior research indicates that stakeholders' cultures positively influence firms' sustainability performance (Husted & Sousa-Filho, 2017; Koskinen et al., 2024). In line with prior research, we argue firms in stakeholder-oriented communities may prioritise sustainability practices across their supply chain over short-term financial benefits to satisfy diverse stakeholder needs given that SSCP is an essential demand of stakeholders (Islam et al., 2018). Accordingly, we expect that the positive relationship between ESG executives' compensation and focal firms' SSCP is stronger in stakeholder-oriented countries. This leads to the following hypothesis:

H3: The positive relationship between ESG executives' compensation and focal firms' SSCP will be more pronounced in stakeholder-oriented countries.

4. Research Method

4.1 Sample and Data

The sample consists of all firms covered by the FactSet Revere database from 2003 to 2023. FactSet Revere is the most comprehensive resource for firm-level supplier-customer relationships, offering detailed and extensive coverage of supply chain connections. Unlike other databases, it provides information on both direct and indirect relationships and specifies the inception and termination dates of each relationship, making it uniquely valuable for supply chain analysis. FactSet enhances this data by sourcing information from financial reports, company press releases, websites, investor presentations, supplier disclosures, and other publicly available sources (Gofman & Wu, 2022). In addition to supply chain data, we obtained firm-level ESG-linked compensation, governance and ESG scores data from the Refinitiv ESG database and financial data from World Scope database. Country-level governance indicators and GDP per capita data were sourced from the World Bank.

Our initial sample includes 33,156 focal firms from the FactSet Revere database. We then identified the suppliers linked to each firm annually between 2003 and 2023, resulting in 1,281,180 focal firm-supplier pairs. Next, we determined each supplier's ESG performance score using Refinitiv ESG data, yielding 496,372 firm-year observations. We then calculated the annual average ESG performance of all suppliers affiliated with each focal firm to measure focal firms' SSCP, producing 18,858 distinct firms with 103,867 firm-year observations. Table 1 outlines the process of measuring focal firms' SSCP and the sample construction. After excluding observations with missing values for other variables, our final sample consists of 19,776 firm-year observations from 3,610 distinct firms across 27 countries. Panel B, Table 1 details the sample selection procedure.

[INSERT TABLE 1 ABOUT HERE]

Table 2, Panels A, B, and C, show the distribution of firms in our sample by industry, year, and country. Following Dhaliwal et al. (2012), we include all sectors in our analysis, including utilities and finance. Among the industries represented, Miscellaneous accounts for the largest proportion at

12.74%, followed by finance (12.00%) and electronics (11.79%), while the textiles industry has the lowest representation at 0.02%. Notably, no single industry comprises more than 15% of the total observations. Firms in the tobacco, utilities, and oil, gas, and coal sectors show the highest tendency to link executive compensation to ESG metrics, with adoption rates of 45.24%, 42.62%, and 40.67%, respectively. This aligns with Ikram et al. (2023), which finds that firms in the oil, petroleum, and utility industries are more likely to implement ESG-related compensation structures. Conversely, the healthcare and printing and publishing sectors exhibit the lowest adoption rates, at 15.07% and 17.76%, respectively.

Table 2, Panel B presents the yearly distribution of firms in our sample. The highest proportion of observations occurs in 2019 (11.41%), followed by 2021 (11.33%) and 2020 (11.30%), while 2006 has the lowest representation at 0.13%. Our data shows a fluctuating trend in ESG-linked compensation. The proportion of firms incorporating ESG metrics into executive pay rose sharply from 4.76% in 2003 to 43.06% in 2012. However, this upward trajectory was disrupted by a notable decline between 2013 and 2016, reaching a low of 11.42% in 2016. Following this decline, the trend rebounded, with ESG-linked compensation adoption surging to 46.96% by 2022 (see Figure 1).

[INSERT FIGURE 1]

Table 2, Panel C presents the distribution of observations by country. The United States accounts for the largest share, comprising 57.57% of the sample, followed by the United Kingdom (7.83%), Japan (4.09%), and France (4.01%). The remaining 26.5% of observations come from other countries, each with lower representation. Our findings indicate that firms in Norway (58.62%) and Australia (54.33%) have the highest propensity to link executive compensation to ESG metrics. In contrast, firms in China (2.38%) and India (6.61%) exhibit the lowest adoption rates for ESG-linked compensation.

[INSERT TABLE 2 ABOUT HERE]

4.2 Measurement of focal firms' SSCP

We measure focal firms' SSCP using the average ESG performance of their suppliers, following a three-step process. First, we identify suppliers associated with each focal firm using the FactSet Revere database. Second, we determine each supplier's ESG performance score from the Refinitiv ESG database. Finally, we calculate the annual average ESG performance of all suppliers linked to a focal firm to represent its SSCP. Appendix A provides further details and an illustration of the measurement process of focal firms' SSCP.

4.3 Measurement of ESG-linked compensation

Following prior studies (Cohen et al., 2023; Flammer et al., 2019), we measure ESG-linked compensation as a binary variable indicating whether a company incorporates ESG criteria into the compensation contracts of its top executives in a given year. The variable equals one if at least one ESG criterion is included and zero otherwise.

4.4 Empirical models

We estimate the following regression model to test the relationship between ESG-linked compensation and focal firms' sustainable supply chain performance (FSSCP), as proposed in our hypothesis H1. Model (1) is described as follows:

$$\begin{aligned} FSSCP_{i,j,t+1} = {} & \beta_0 + \beta_1 ESG\_PAY_{i,j,t} + \beta_2 SIZE_{i,j,t} + \beta_3 LEV_{i,j,t} + \beta_4 ROA_{i,j,t} + \beta_5 BSIZE_{i,j,t} + \beta_6 BIND_{i,j,t} \\ & + \beta_7 DUAL_{i,j,t} + \beta_8 SUSTCOM_{i,j,t} + \beta_9 FORSALE_{i,j,t} + \beta_{10} RD_{i,j,t} + \beta_{11} CAPEX_{i,j,t} \\ & + \beta_{12} ESG_{i,j,t} + \beta_{13} EXECPAY_{i,j,t} + \beta_{14} DURATION_{i,j,t} + \beta_{15} SUPP\_SIZE_{i,j,t} \\ & + \beta_{16} SUPP\_LEV_{i,j,t} + \beta_{17} SUPP\_ROA_{i,j,t} + \beta_{18} LNGDPC_{j,t} + \beta_{19} SD\_GDPC_{j,t} \\ & + \sum COUNTRY_j + \sum YEAR_t + \sum INDUSTRY_k + \varepsilon_{i,j,t} \end{aligned} \quad (1)$$

To test our second hypothesis H2, we add the interaction between ESG-linked compensation *(ESG_PAY)* and high country-level governance score *(HIGH_WGI)* to Equation (1). Model (2) is described as follows:

$$\begin{aligned} FSSCP_{i,j,t+1} = {} & \beta_0 + \beta_1 ESG\_PAY_{i,j,t} + \beta_2 ESG\_PAY_{i,j,t} \times HIGH\_WGI_{j,t} + \beta_3 HIGH\_WGI_{i,j,t} + \beta_4 SIZE_{i,j,t} \\ & + \beta_5 LEV_{i,j,t} + \beta_6 ROA_{i,j,t} + \beta_7 BSIZE_{i,j,t} + \beta_8 BIND_{i,j,t} + \beta_9 DUAL_{i,j,t} + \beta_{10} SUSTCOM_{i,j,t} \\ & + \beta_{11} FORSALE_{i,j,t} + \beta_{12} RD_{i,j,t} + \beta_{13} CAPEX_{i,j,t} + \beta_{14} ESG_{i,j,t} + \beta_{15} EXECPAY_{i,j,t} + \end{aligned}$$

$$\beta_{16}DURATION_{i,j,t} + \beta_{17}SUPP\_SIZE_{i,j,t} + \beta_{18}SUPP\_LEV_{i,j,t} + \beta_{19}SUPP\_ROA_{i,j,t} + \beta_{20}LNGDPC_{j,t} + \beta_{21}SD\_GDPC_{j,t} + \sum COUNTRY_j + \sum YEAR_t + \sum INDUSTRY_k + \varepsilon_{i,j,t} \quad (2)$$

To test our third hypothesis H3, we add an interaction between ESG-linked compensation *(ESG_PAY)* and stakeholder orientation *(STAKE)* to Equation (1). Model (3) is described as follows:

$$FSSCP_{i,j,t+1} = \beta_0 + \beta_1 ESG\_PAY_{i,j,t} + \beta_2 ESG\_PAYi,t \times STAKE + \beta_3 STAKE_{i,j,t} + \beta_4 SIZE_{i,j,t} + \beta_5 LEV_{i,j,t} + \beta_6 ROA_{i,j,t} + \beta_7 BSIZE_{i,j,t} + \beta_8 BIND_{i,j,t} + \beta_9 DUAL_{i,j,t} + \beta_{10} SUSTCOM_{i,j,t} + \beta_{11} FORSALE_{i,j,t} + \beta_{12} RD_{i,j,t} + \beta_{13} CAPEX_{i,j,t} + \beta_{14} ESG_{i,j,t} + \beta_{15} EXECPAY_{i,j,t} + \beta_{16} DURATION_{i,j,t} + \beta_{17} SUPP\_SIZE_{i,j,t} + \beta_{18} SUPP\_LEV_{i,j,t} + \beta_{19} SUPP\_ROA_{i,j,t} + \beta_{20} LNGDPC_{j,t} + \beta_{21} SD\_GDPC_{j,t} + \sum COUNTRY_j + \sum YEAR_t + \sum INDUSTRY_k + \varepsilon_{i,j,t} \quad (3)$$

In the above three regression models, the dependent variable is focal firms' sustainable supply chain performance (FSSCP), measured as the average ESG performance of a focal firm's suppliers. The key independent variable is ESG-linked compensation *(ESG_COMP)*, a binary variable that equals one if the company includes any ESG criterion in top executives' compensation contracts in a given year and zero otherwise. Country-level governance is proxied by the World Governance Index *(WGI)*, which is computed as the average of six governance indicators: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufmann et al., 2010). We define *HIGH_WGI* as a binary variable that equals one if a country's governance score is above the sample's yearly median and zero otherwise. *SATKE* is a dummy variable that equals one if the company is based in a code law country and zero if it operates in a common law country. We expect positive coefficients for *ESG_PAY* in Equation (1), *ESG_PAY* × *HIGH_WGI* in Equation (2), and *ESG_PAY*×*STAKE* in Equation (3), which would support our hypotheses.

We control for various firm- and country-level factors expected to influence FSSCP. At the firm level, we include firm size, as larger firms tend to face greater scrutiny regarding their sustainability practices (Balasubramanian et al., 2020; Brennan & Merkl-Davies, 2014). Firm size is measured as the natural logarithm of total assets, and we expect a positive relationship with FSSCP. Following Choi and Luo (2021), leverage and profitability (return on assets) are used as indicators of

a firm's available financial resources to enhance FSSCP. It is anticipated that a company with more financial resources is more inclined to undertake additional initiatives aimed at enhancing its SSCP (Benjamin et al., 2020), and therefore, we expect a positive relationship between these variables and FSSCP. Firm leverage is calculated by dividing total debt by total assets. Return on assets is calculated by dividing operating income by the book value of assets before depreciation. Consistent with prior studies (Benjamin et al., 2020; Karim et al., 2018), we control for different governance factors, including board size, CEO and Chair duality, sustainability committee and board independence. Companies that have high levels of governance tend to improve their SSCP, as SSCP significantly enhances company performance, creating positive seller perception and reducing risks (Chen et al., 2021; Duan et al., 2021; Kraft et al., 2022; Lam, 2018). Consequently, we expect a positive coefficient on these variables. Board size is measured by the natural logarithm of total number of directors. CEO duality is measured by a dummy variable that equals one if the chairperson is the CEO and zero otherwise. The sustainability committee is measured by a dummy variable that equals one if a company has a sustainability committee and zero otherwise. Board independence is measured by the ratio of independent directors.

We control for the focal firm's ESG score. We expect firms with high ESG performance to experience high SSCP. We also control executives' compensation. prior literature argues that executives' compensation affects firms' sustainability practices (Adu et al., 2023; Haque & Ntim, 2020; Zhu et al., 2024). Similarly, we expect executives' compensation could affect firms' SSCP. Consequently, we expect a positive coefficient on these variables. ESG score is measured by the natural logarithm of the firm's average ESG score. Executives' compensation is measured by the natural logarithm of the total executives' compensation.

Moreover, we control for foreign sales. Focal firms with more foreign sales tend to be under external pressure to improve their sustainability practices. In response to this external pressure, many firms are expected to prioritize sustainability practices across their supply chain to align with different stakeholders' desires. Therefore, we expect a positive coefficient on foreign sales. Foreign sales are

measured by a dummy variable equal to 1 if a firm has foreign sales and 0 otherwise. Furthermore, we control capital expenditure and research and development. Empirical evidence has shown that capital expenditure and research and development enhance firms' sustainable performance (Alam et al., 2019; Kim et al., 2012; Walls et al., 2012). Therefore, we argue that capital intensity (capital expenditure intensity) and greater innovation (research and development intensity) will be related to FSSCP. Capital expenditure intensity is measured by the total capital expenditures scaled by total assets. Research and development intensity is the ratio of research and development expenditures to total assets.

In addition, we control for characteristics of suppliers and supplier relationship, including the duration of the relationship as well as suppliers' size, leverage and return on assets. Relationship duration is measured by the natural logarithm of linkage years between the focal firm and the supplier. When a firm maintains a long-term relationship with its suppliers, it provides the opportunity for deep cooperation and collaboration aimed at improving sustainability practices (Wagner & Bode, 2014). This extended duration fosters a sense of trust and mutual understanding between the focal firm and the supplier (Alvarez et al., 2010), which are essential for implementing mutual sustainable initiatives. A longer relationship allows the focal firm to invest more time and resources into developing and implementing joint sustainability initiatives (Dyer & Singh, 1998; Rossetti & Choi, 2005). This extended collaboration period enables the development of comprehensive, long-term sustainability strategies that go beyond short-term fixes, leading to a more substantial and lasting impact on supplier sustainability practices (Naffin et al., 2023). Therefore, we anticipate a positive relationship between focal firm suppliers' duration and focal firm SSCP. Furthermore, we control the average size of focal firms' suppliers. The average size of focal firms' suppliers is measured by the natural algorithm of the focal firm's average suppliers' total assets. Larger suppliers are subjected to greater scrutiny to enhance their sustainability practices, consequently improving the focal firm's SSCP; thus, we anticipate positive coefficients on focal firm suppliers' size. Moreover, we control for the financial strength of focal firms' suppliers captured by the average suppliers' leverage and return on assets.

Leverage of the focal firms' suppliers is measured by dividing the average total debt by the average total assets of the focal firms' suppliers. Return on assets of the focal firms' suppliers is measured by dividing the average operating income before depreciation by the average total assets of the focal firms' suppliers. It is anticipated that suppliers with greater financial resources are more likely to enhance their sustainability practices, thus positively impacting the focal firm's SSCP.

We also control a country's GDP per capita. The level of a country's GDP per capita plays a crucial role in shaping people's awareness of environmental and social issues and the importance of ensuring sustainability within the supply chains. Therefore, companies operating in countries with high GDP per capita are expected to face more pressure to improve their SSCP. Therefore, we expect a positive coefficient on a country's GDP per capita and a negative coefficient on the standard deviation of GDP per capita. A country's GDP per capita is measured by the natural logarithm of GDP per capita. The standard deviation of GDP per capita is the deviation across three years. Finally, year, industry and country fixed effects are included. Appendix B provides a detailed explanation of the variables.

4.5 Estimation method

We estimate our models using ordinary least squares (OLS) regression techniques. We applied robust standard errors clustered by the firm to tackle issues related to heteroscedasticity and correlations over time. Our models also included year, industry, and country fixed effects. To minimise the impact of extreme values, we winsorise all continuous firm-level variables at the 1st and 99th percentiles.

5. Empirical Results

5.1 Descriptive statistics and correlation analysis

Table 3 presents descriptive statistics for variables used in Equations (1)-(3). The mean value of FSSCP is 0.525, which suggests that the focal firms are performing at an average level regarding their SSCP. The mean value of ESG_PAY is 0.26, meaning that around 26% of our sample incorporated ESG metrics into their compensation plans. This figure is higher than that of (Cohen et al., 2023),

who report that 17% of firms incorporate ESG metrics into their compensation plans. The mean of SIZE is 8.629, indicating that our sample, including both those who incorporate ESG-linked compensation and those who do not, is relatively large. The mean LEV and ROA values are 0.284 and 0.022, respectively. BSIZE, DUAL, SUSTCOM and BIND mean values are 0.023, 0.552, 0.556, and 0.696 respectively. The mean of ESG is 0.50, indicating that firms in our sample ESG scores are average. The mean of EXECPAY, FORSAL, CAPEX, and RD are 16.58, 0.746, 0.095, and 0.178, respectively. The mean duration is 1.27, indicating a medium linkage between focal firms and suppliers. The mean of SUPP_SIZE is 9.075, suggesting that our focal firms' suppliers are relatively large. The mean values of SUPP_LEV and SUPP_ROA of focal firms' suppliers are 0.28 and 0.345, respectively. The mean of LNGDPC is 10.76, which suggests that our sample countries' GDP per capita is relatively high. The mean of SD_GDPC is 0.054. The mean of HIGH_WGI is 0.458, indicating that almost half of our sample is in countries with high governance. Around 25.1% of the firms in our sample are located in stakeholder-oriented countries.

[INSERT TABLE 3 ABOUT HERE]

Table 4 presents the correlation coefficients for the variables in Equations (1) to (3). The results indicate a positive correlation between FSSCP and ESG-linked compensation (ESG_PAY). The strongest correlation among the explanatory variables is between the sustainability committee (SUSTCOM) and the ESG score (ESG), with a coefficient of 0.654. The mean variance inflation factor (VIF) of all variables is 1.44, with individual VIF values ranging from 1.02 to 2.53. None of the predictor variables exceed a VIF of 10, suggesting that collinearity is not a significant issue in our models.

[INSERT TABLE 4 ABOUT HERE]

5.2 Regression analysis

Our hypothesis H1 proposes that FSSCP is positively associated with ESG-linked compensation. The results reported in Table 5, Model (1) show a positive and significant coefficient

of ESG_PAY (β=0.008, p<0.01). This suggests that ESG-linked compensation is positively and significantly associated with FSSCP. Thus, H1 is supported.

[INSERT TABLE 5 ABOUT HERE]

Regarding the control variables, as shown in Table 6, we find focal firm size is negatively associated with FSSCP, which is inconsistent with our expectations. This negative association could be attributed to larger firms operating a complex and multitiered supply chain, making it difficult to monitor and manage the sustainability practices of lower-tier suppliers (Villena, 2019). Moreover, consistent with our expectations, we find that the coefficients of foreign sales (FORSALE) and research and development (RD) are significant and positive. These results indicate that firms with foreign sales prioritize supply chain sustainability to satisfy different stakeholders' desires. In addition, firms that had high research and development activities tended to improve SSCP. This result is aligned with prior studies supporting the view that high research and development expenditure improves sustainability (Alam et al., 2019; Kim et al., 2012; Walls et al., 2012). We also find that the coefficient for executives' compensation is negative, suggesting that high executive compensation leads to low FSSCP. This may be attributable to the notion that executives' compensation is often linked to short-term financial performance metrics. As supply chain sustainability requires time before displaying any significant financial results, if executive compensation is not tied to sustainable supply chain metrics, there is little motivation to prioritize them. Similarly, prior studies argue that executives with short-term financial incentives may neglect sustainability long-term benefits (Flammer & Bansal, 2017; Graham et al., 2005). The estimated coefficients of focal firm leverage (LEV), return on assets (ROA), board size (BSIZE), duality (DUAL), sustainability committee (SUSTCOM), board independence (BIND), ESG score (ESG) and capital expenditure (CAPEX) are found to be insignificant. Concerning control variables of relationship characteristics, it was observed that the duration of the relationship (DURATION), the size (SUPP_SIZE), and the return on assets (SUPP_ROA) of focal firm suppliers all exhibited positive coefficients. This finding aligns with our expectations, suggesting that longer-lasting partnerships with suppliers, along with larger

suppliers and with better financial performance, contribute positively to focal firms' SSCP. Finally, related to countries' control variables, we find the coefficient of GDP per capita (LNGDPC) is insignificant. The coefficient of the standard deviation of GDP per capita (SD_GDPC) is negative and significant, indicating that companies based in countries with high economic uncertainty may face challenges to improving supply chain sustainability. High volatility in GDP per capita could also diminish citizens' pressure on companies to prioritise supply chain sustainability. In economically challenging times, sustainability initiatives across supply chain could be viewed as luxury concerns.

Hypothesis H2 predicts that the positive relationship between ESG-linked compensation and focal firms' SSCP is more pronounced in firms located in countries with higher governance standards. To test the moderation effect of country-level governance, the variable of interest is the interaction term *(ESG_PAY×HIGH_WGI)*. The results reported in Table 6, Model (2), show the positive and significant coefficient of *ESG_PAY×HIGH_WGI* (β=0.007, p<0.10). This indicates that the positive relationship between ESG-linked compensation and focal firms' SSCP is more pronounced in countries with strong governance, supporting H2.

[INSERT TABLE 6 ABOUT HERE]

Hypothesis H3 indicates that the relationship between ESG-linked compensation and focal firms' SSCP is stronger in stakeholder-oriented countries. To test the moderation effect of the country's stakeholder orientation, the variable of interest is the interaction term (ESG_PAY×STAKE). This measures the difference in the impact of ESG-linked compensation on focal firms' SSCP between firms based in stakeholder-oriented countries and those in shareholder-oriented countries. As shown in Table 7, Model (3), the coefficient of ESGPAY×STAKE is positive and significant (β=0.010, p < 0.05). This indicates that the positive relationship between ESG-linked compensation and focal firms' SSCP is stronger in stakeholder-oriented countries, supporting H3.

5.3 Additional analysis

5.3.1 The impact of ESG-linked compensation on environmental and social dimensions of SSCP

We utilise two components of SSCP measures (environment and social) as an alternative proxy to measure focal firms' SSCP. We operationalize a focal firm's environmental supply chain performance (FENVSCP) and social supply chain performance (FSOCSCP) using its suppliers' environmental and social performance, respectively. Consistent with the measurement approach for focal firms' SSCP in the baseline regression, we measure FENVSCP following three steps: First, we identify suppliers linked to the focal firm using the FactSet Revere database. Second, the environmental performance score of each supplier associated with the focal firm is determined through the Refinitiv ESG database. Finally, the average environmental performance score of all suppliers is calculated to represent the FENVSCP. Similarly, measuring FSOCSCP involves three steps: First, suppliers associated with the focal firm are identified through the FactSet Revere database. Second, the social performance score of each supplier associated with the focal firm is determined through the Refinitiv ESG database. Finally, an average score of the social performance of all suppliers related to the focal firm is calculated to represent FSOCSCP.

Table 7 shows the impact of ESG_PAY on FENVSSCP and FSOCSCP. Consistent with our prediction, we find positive and significant coefficients of ESG_PAY for FENVSSCP (β= 0.011, $p <$ 0.01) and FSOCSCP (β= 0.006, $p < 0.10$), respectively. This indicates a positive impact of ESG-linked compensation on environmental and social dimension of SSCP.

[INSERT TABLE 7 ABOUT HERE]

5.3.2 Regression results of the impact of ESG compensation score on FSSCP

Furthermore, in addition to the dummy variable of ESG-linked compensation in the baseline model, we developed a continuous variable of ESG-linked compensation based on the ISS ECA database. ECA offers comprehensive data on incentive awards, including metrics, goals, and payout structures for over 9,000 companies across the US, Canada, UK, Europe, Australia, New Zealand, and South Africa (Cohen et al., 2023). ISS ECA database provides information on the number of executive members whose compensation is linked to ESG metrics. For each year, we aggregated the number of

executives with ESG-linked compensation to construct an annual ESG Compensation Score. Table 14 shows the impact of ESG Compensation Score (ESG_Pay_Score) on FSSCP. Consistent with our prediction, we find positive and significant coefficients of ESG_Pay_Score for FSSCP (β= 0.004, $p < 0.10$). This indicates a positive impact of ESG-linked compensation score on SSCP.

[INSERT TABLE 8 ABOUT HERE]

5.3.3 The moderation impact of Mandatory ESG Disclosure on the relationship between ESG-compensation score and FSSCP

We examined the moderation impact of mandating ESG disclosures by country on that relationship. We expect the relationship between ESG-linked compensation and focal firms' SSCP to be stronger in countries that mandate ESG disclosures. Countries that mandate ESG disclosures signal the importance of sustainability practices among firms. By enforcing these regulations, governments enhance transparency and encourage companies to invest in and improve their sustainability initiatives. In addition, mandating ESG disclosures will push firms to improve sustainability practices and report on them later. For instance, Wu et al. (2025) documented a positive impact of mandating ESG disclosures on ESG performance. Similarly, Clarkson et al. (2008) found a positive relationship between the level of disclosures and firms' environmental performance. In line with prior research, we argue that firms in countries mandating ESG disclosures may prioritise sustainability practices across their supply chain and report about them. Accordingly, we expect that the positive relationship between ESG executives' compensation and focal firms' SSCP is stronger in countries that mandate ESG disclosures. To test the moderation effect of Mandatory ESG Disclosure, the variable of interest is the interaction term (ESG_PAY×Mandatory ESG Disclosure). This measures the difference in the impact of ESG-linked compensation on focal firms' SSCP between firms based in countries that mandate ESG disclosures and those that do not mandate ESG disclosures. Following (KRUEGER et al., 2024) Mandatory ESG disclosure is measured by a dummy variable that equals one at the year country mandates ESG disclosures and zero otherwise. As shown in Table 9, the regression results revealed that the coefficient of ESG_PAY×Mandatory ESG Disclosure is insignificant. This indicates that

mandating ESG disclosures does not have a moderating impact on the relationship between ESG-linked compensation and focal firms' SSCP.

[INSERT TABLE 9 ABOUT HERE]

5.4 Endogeneity analysis

An essential concern in our regression models is the potential endogeneity between focal firms SSCP and ESG-linked compensation. This relationship could be affected by unobserved heterogeneity, observed heterogeneity, and omitted variable bias. To mitigate these endogeneity challenges, we implement several approaches, including (1) Heckman's (1979) two-stage analysis, (2) entropy balancing, and (3) incorporating firm-specific and country-specific fixed effects.

5.4.1 Heckman (1979) two-stage analysis

The baseline results reported earlier could reflect self-selection bias as our sample includes only those firms that voluntarily report ESG-linked compensation. To address this concern, we adopt Heckman's (1979) two-stage procedure to address potential self-selection bias. In the first-stage model of Heckman's (1979) two-stage analysis, we develop a model including the firm's decision to report ESG-linked compensation by augmenting our sample with firms that did not report ESG-linked compensation over our sample period. More specifically, we develop the following probit regression model:

$$\begin{aligned} ESGPay\_DISC_{i,t} = {} & \beta_0 + \beta 1 PROPDISCL + \beta 2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 BSIZE_{i,t} + \beta_6 BIND_{i,t} \\ & + \beta_7 DUAL_{i,t} + \beta_8 SUSTCOM_{i,t} + \beta_9 FORSALE_{i,t} + \beta_{10} RD_{i,t} + \beta_{11} CAPEX_{i,t} \\ & + \beta_{12} ESG_{i,t} + \beta_{13} EXECPAY_{i,t} + \beta_{14} LNGDPC + \beta_{15} SD\_GDPC \\ & + \sum COUNTRY + \sum YEAR + \sum Industry + \varepsilon_{i,t} \end{aligned} \quad (4)$$

In Equation (4), the dependent variable, ESGPay_DISC, is an indicator variable that is coded 1 if the firm reports ESG-linked compensation and 0 otherwise. In Equation (4), we include the proportion of firms in each country-industry-year group that have disclosed ESG-linked compensation (*PROPDISCL)* to meet the 'exclusion restrictions' criteria. The justification for

incorporating *(PROPDISCL)* arises from the reasoning that the proportion of firms in each country-industry-year group that have disclosed ESG-linked compensation may act as peer pressure or industry standards that could influence whether a firm discloses ESG-linked compensation or not. We expect that firms in high countries-industries disclosure groups to highly report ESG-linked compensation. This assumption justifies the relevance of *PROPDISCL* for the first-stage model. While the *PROPDISCL* might influence a firm's decision to report ESG-linked compensation to confirm industry standards or to avoid potential reputational risk, it does not directly affect focal firms' SSCP which reflects the focal firm suppliers' sustainable performance. Consequently, we contend that PROPDISCL can be reasonably omitted from the second-stage model. We expect a positive coefficient for *PROPDISCL* in Equation (4).

The regression results of the first stage are reported in Table 8, Panel A. Consistent with our expectation, we find that the coefficient of *PROPDISCL* is positive and statistically significant (β=4.115, $p< 0.01$). The model has a pseudo-R^2 value of 35.38%, and the areas under the ROC curve are 87.79%, suggesting that the *PROPDISCL* is a reasonable exogenous variable. Table 8, Panel B reports the second-stage regression results. These show that the coefficient of ESG_PAY is positive and statistically significant (β=–0.008, $p<0.01$). Additionally, the inverse Mills ratio (IMR) coefficient is not statistically significant, indicating that sample selection bias is not a major issue in our research.

[INSERT TABLE 10 ABOUT HERE]

5.4.2 Entropy balancing analysis

Our findings may also be affected by observable heterogeneity (Lennox et al., 2012) and functional misspecification bias (Shipman et al., 2017). To address this concern, we employ the entropy balancing technique. Entropy balancing addresses the problem of covariate imbalance in observational studies, where differences in firm characteristics between treatment groups and control groups (e.g., firms with different levels of ESG_PAY) can bias the estimation of causal relationships.

The treatment group comprised observations with ESG-linked compensation (ESG_PAY=1), while the control group comprised observations without ESG-linked compensation (ESG_PAY=0). Without balancing these covariates, it's difficult to isolate the actual effect of the ESG_PAY on FSSCP. Table 9 provides the entropy balancing results by reweighting the data to ensure that the distribution of covariates is similar across groups (mean, variance and skewness) (Hainmueller, 2012; Hainmueller & Xu, 2013). This creates a more comparable sample that mitigates the differences in covariates between treatment samples (ESG_PAY=1) and control samples (ESG_PAY=0), reducing bias from confounding variables.

Table 9, Panel A shows the descriptive statistics of the treatment groups (ESG_PAY=1) and control groups (ESG_PAY = 0) before balancing the covariates. Table 9, Panel B shows the entropy-balanced samples when balancing covariates for the treatment and control groups. Table 9, Panel C shows the regression analysis of the entropy-balanced sample. The coefficient of ESG_PAY is positive and statistically significant for FSSCP (β=0.007, $p < 0.05$). The outcomes indicate that our results are not influenced by observable selection bias or errors in functional specification.

[INSERT TABLE 11 ABOUT HERE]

5.4.3 Firm fixed effects

The presence of omitted variables correlated with ESG_PAY may introduce endogeneity issues within our research models. Despite the inclusion of various firm-level and country-level variables potentially influencing ESG_PAY, FSSCP, FENVSCP, and FSOCSCP, along with the incorporation of industry, country, and year-fixed effects in all regression models, there remains the potential for omitted variable bias in our research. To mitigate this concern, we employ firm fixed effects regressions. This approach eliminates omitted time-invariant firm characteristics that could engender spurious correlations between ESG_PAY, FSSCP, FENVSCP, and FSOCSCP. The results of the firm fixed effects regressions are presented in Table 10. The coefficient of ESG_PAY on FSSCP, FENVSCP, and FSOCSCP continues to exhibit a positive and statistically significant relationship,

aligning with the findings reported in Tables 6 and 8. Consequently, these results substantiate the assertion that our findings are not compromised by omitted variable bias.

[INSERT TABLE 12 ABOUT HERE]

5.5 Sensitivity analysis

5.5.1 Country-specific analysis

The composition of our sample is predominantly comprised of firms based in the United States (57.57%), followed by those from the United Kingdom (7.38%), Japan (4.09%), and France (4.01%). Given this distribution, we re-estimate our baseline regression models separately for firms in the United States, the United Kingdom, Japan, and France. Table 11 reports the regression results, with Panels A and C showing the regression results for USA and Japanese firms. We find that FSSCP is significantly positively associated with ESG_PAY, indicating that, in the context of USA and Japanese firms, ESG-linked compensation significantly impacts focal firms' SSCP. Furthermore, Panels B and D show the regression results for UK and French firms. We find no statistically significant relationship between FSSCP and ESG_PAY, indicating that, in the context of British and French firms, ESG-linked compensation does not significantly affect focal firms' SSCP.

[INSERT TABLE 13 ABOUT HERE]

To confirm that the US, which represents 57.57% of our sample, does not influence our study's findings, we re-ran our baseline regression models after excluding US firms. The regression results in Table 12 indicate that our findings remain unchanged, and the coefficient of ESG_PAY is still significantly positive.

[INSERT TABLE 14 ABOUT HERE]

5.5.2 Analysis for environmentally sensitive sectors

Furthermore, we test whether operating in environmentally sensitive sectors affects the relationship between ESG-linked compensation and focal firms' SSCP. Previous research indicates that firms

operating in environmentally sensitive sectors demonstrate stronger sustainable performance than those in less sensitive industries (Cai et al., 2012). Firms operating within sensitive industries face significant societal scrutiny due to their perceived negative impact on the environment and social welfare (Porter & Kramer, 2006). In response, these firms are more motivated to improve their sustainable performance to counteract this perception and rebuild trust with stakeholders, including consumers, investors, and regulators. Consistently, we predict firms in sensitive industries will be more motivated to improve their SSCP. Therefore, we predict that the relationship between ESG-linked compensation and focal firms SSCP will be more pronounced for firms operating in sensitive industries. Following prior studies (Cowen et al., 1987; Patten, 2002), industries sensitive to environmental issues include mining, oil and gas extraction, paper manufacturing, chemicals (except pharmaceuticals), and metal production.

To examine the moderating effect of environmentally sensitive industries, we split our sample into two sup-samples: firms operating in environmentally sensitive industries and those in non-environmentally sensitive industries. Table 13 provides the regression results for non-environmentally sensitive industries in Column 1 and environmentally sensitive industries in column 2. We find that the coefficient of ESG_PAY in a non-sensitive environment equals 0.015, while in sensitive environmental industries, it equals 0.019. A comparison of the two coefficients shows that the relationship between ESG_PAY and FSSCP is more pronounced for firms operating in environmentally sensitive sectors. It seems that in highly scrutinised industries, they are more motivated to be incentivised to improve SSCP.

[INSERT TABLE 15 ABOUT HERE]

6. Conclusions

In this study, we examine the relationship between ESG-linked compensation and focal firms' SSCP and the moderating effect of country-level governance and business cultures in this relationship. Based on 19,776 firm-year observations across 27 countries from 2003–2023, we find

that ESG-linked compensation is positively related to focal firms' SSCP. Our are robust when applying Heckman's (1979) two-stage analysis and entropy balancing methods. Our results also show that ESG-linked compensation is positively associated with both environmental and social dimensions of SSCP. We also find that the positive relationship between ESG-linked compensation and focal firms' SSCP is more pronounced for firms in countries with a higher level of governance and stakeholder-oriented business culture.

Our study contributes to the growing literature on ESG compensation and its impact on sustainability practices. We also contribute to the literature by demonstrating that oversight by a nation's governance frameworks and stakeholder-oriented business cultures amplifies the beneficial impacts of ESG-linked compensation on focal firms' SSCP. Our research integrates two theoretical perspectives: agency theory and stakeholder theory. This integration enriches the theoretical foundation, providing a broader perspective on the mechanisms through which ESG-linked executive compensation, as a corporate governance tool, improves focal firms' SSCP and meets different stakeholders' needs.

The findings of this study hold significant implications, particularly in light of the growing interest in FSSCP among diverse stakeholders, including global regulators and policymakers. This study contributes significantly to the ongoing discourse surrounding the advantages of ESG-linked compensation, highlighting its critical role in promoting sustainability practices throughout firms' supply chains. Our findings may encourage policymakers to incentivise firms that link compensation to ESG metrics to improve SSCP. Our research highlights the necessity for regulators to mandate ESG compensation, emphasizing the pivotal role this governance tool plays in promoting sustainable practices across the supply chain.

While our research offers significant insights into the relationship between ESG-linked compensation and focal firms' SSCP, it is essential to acknowledge certain limitations inherent in the study. First, our research is limited to suppliers of focal firms of which the information is publicly

accessible when measuring the focal firm SSCP. Second, the sample utilised in our study excludes firms that did not disclose information about ESG linked compensation. While we employ Heckman's (1979) two-stage methodology to mitigate self-selection bias, subsequent research could enhance the robustness of our findings by utilising data on ESG-linked compensation from alternative sources. Finally, while we use firm industry and country fixed effects to tackle endogeneity, it's possible that some omitted variable bias could still influence our results. Despite these limitations, the findings are robust to alternative model specifications and may offer valuable insights to the crucial role of compensation structure in enhancing sustainable practices across the supply chain.

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Table 1. Process of measuring FSSCP and sample selection

Panel A: Process of measuring FSSCP			
	Observations	**Years**	**Distinct Firms**
Step one: Focal firm-supplier pairs			
Focal firms	1,281,180	2003-2023	33,156
Suppliers	1,281,180	2003-2023	33,130
Step two: Focal firms' suppliers with ESG scores			
Focal firms with ESG scores	117,755	2003-2023	10,946
Suppliers with ESG scores	496,372	2003-2023	10,871
Step three: Compute focal firms' SSCP			
Focal firms with SSCP	103,867	2003-2023	18,858
Panel B: sample selection			
		Observations	**Distinct firms**
Initial sample: Focal firms available in the FactSet Revere database from 2003 to 2023.		103,867	18,858
Less: Firms with missing accounting and market data		82,558	15,086
Less: Firms in countries with fewer than 10 observations		1,533	162
Final test sample from 2003 to 2023		**19,776**	**3,610**

Table 2. Sample distribution

Panel A. Sample distribution by industry

Industry name	Observations	Percent	ESG_PAY
Miscellaneous	2,520	12.74%	23.29%
Financial	2,373	12.00%	24.61%
Electronics	2,332	11.79%	19.81%
Drugs, Cosmetics, Healthcare	1,811	9.16%	15.07%
Retailers	1,208	6.11%	21.11%
Utilities	1,185	5.99%	42.62%
Oil, Gas, Coal & Related Services	991	5.01%	40.67%
Recreation	948	4.79%	20.25%
Construction	909	4.60%	30.14%
Chemicals	886	4.48%	34.54%
Machinery & Equipment	650	3.29%	24.15%
Metal Producers	522	2.64%	31.15%
Automotive	521	2.63%	31.29%
Transportation	502	2.54%	29.48%
Food	462	2.34%	32.03%
Aerospace	444	2.25%	35.59%
Electrical	378	1.91%	23.28%
Apparel	280	1.42%	19.29%
Beverages	316	1.60%	23.10%
Paper	184	0.93%	36.41%
Printing & Publishing	152	0.77%	17.76%
Diversified	96	0.49%	20.83%
Metal producer manufacturer	61	0.31%	31.15%
Tobaccos	42	0.21%	45.24%
Textiles	3	0.02%	33.33%
Total	**19.776**	**100.00%**	**26.44%**

Panel B. Sample distribution by year

Year	Observations	Percent	ESG_PAY
2003	63	0.32%	4.76%
2004	73	0.37%	4.11%
2005	123	0.62%	6.50%
2006	26	0.13%	7.69%
2007	151	0.76%	6.62%
2008	230	1.16%	16.09%
2009	330	1.67%	28.48%
2010	467	2.36%	36.62%
2011	644	3.26%	39.44%
2012	757	3.83%	43.06%
2013	925	4.68%	38.38%
2014	955	4.83%	32.57%
2015	1,345	6.80%	17.32%
2016	1,699	8.59%	11.42%
2017	1,951	9.87%	13.48%
2018	2,156	10.90%	19.25%
2019	2,256	11.41%	23.54%
2020	2,235	11.30%	29.40%
2021	2,240	11.33%	36.70%
2022	1,150	5.82%	46.96%
Total	**19.776**	**100.00%**	**26.44%**

Table 2. Sample distribution (Cont.)

Panel C. Sample distribution by country

Country	Observations	Percent	STAKE	ESG_PAY
United States	11,385	57.57%	0	21.36%
United Kingdom	1,548	7.83%	0	48.45%
Japan	809	4.09%	1	7.79%
France	793	4.01%	1	51.70%
Canda	733	3.71%	0	36.29%
China	713	3.61%	1	2.38%
Germany	700	3.54%	1	32.43%
Australia	554	2.80%	0	54.33%
South Africa	336	1.70%	0	39.58%
Switzerland	321	1.62%	1	32.40%
Sweden	318	1.61%	1	22.96%
Netherland	202	1.02%	1	41.09%
Spain	180	0.91%	1	33.89%
Denmark	175	0.88%	1	22.29%
Thailand	173	0.87%	1	18.50%
Finland	151	0.76%	1	29.14%
Italy	131	0.66%	1	38.17%
India	121	0.61%	1	6.61%
Singapore	94	0.48%	0	14.89%
Belgium	79	0.40%	1	41.77%
Norway	58	0.29%	1	58.62%
Russian Federation	50	0.25%	1	20%
Brazil	48	0.24%	1	14.58%
Austria	34	0.17%	1	41.18%
Ireland	46	0.23%	0	47.83%
Indonesia	12	0.06%	0	8.33%
Poland	12	0.06%	1	8.33%
Total	**19,776**	**100.00%**		**26.44%**

Table 3. Summary statistics

	Observations	Mean	Median	Std. Dev.	1st Quartile	3rd Quartile
FSSCP	19,776	0.525	0.528	0.156	0.426	0.633
ESG_PAY	19,776	0.264	0.000	0.441	0.000	1.000
SIZE	19,776	8.629	8.611	1.771	7.497	9.749
LEV	19,776	0.284	0.254	0.223	0.121	0.394
ROA	19,776	0.022	0.038	0.141	0.007	0.078
BSIZE	19,776	0.023	0.023	0.003	0.021	0.025
DUAL	19,776	0.552	1.000	0.497	0.000	1.000
SUSTCOM	19,776	0.556	1.000	0.497	0.000	1.000
BIND	19,776	0.696	0.750	0.212	0.571	0.875
ESG	19,776	0.500	0.501	0.207	0.326	0.670
EXECPAY	19,776	16.580	16.511	1.31	15.797	17.178
FORSALE	19,776	0.746	1.000	0.436	0.000	1.000
CAPEX	19,776	0.095	0.042	0.197	0.022	0.084
RD	19,776	0.178	0.000	1.063	0.000	0.038
DURATION	19,776	1.270	1.099	0.589	0.693	1.792
SUPP_SIZE	19,776	9.075	9.141	1.834	7.892	10.375
SUPP_LEV	19,776	0.280	0.271	0.153	0.184	0.361
SUPP_ROA	19,776	0.345	2.226	10.521	-1.918	5.281
LNGDPC	19,776	10.76	10.927	0.586	10.689	11.059
SD_GDPC	19,776	0.054	0.045	0.029	0.036	0.063
HIGH_WGI	19,776	0.458	0.000	0.498	0.000	1.000
STAKE	19,776	0.251	0.000	0.433	0.000	1.000

Table 4. Correlations matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) FSSCP	1.000										
(2) ESG_PAY	0.025***	1.000									
(3) SIZE	-0.125***	0.223***	1.000								
(4) LEV	-0.029***	0.028***	0.011	1.000							
(5) ROA	-0.103***	0.085***	0.281***	-0.079***	1.000						
(6) BODSIZE	-0.056***	0.148***	0.561***	0.016**	0.147***	1.000					
(7) DUAL	0.056***	0.042***	0.012*	-0.023***	-0.047***	-0.004	1.000				
(8) SUSTCOM	0.023***	0.279***	0.442***	0.016**	0.171***	0.310***	0.121***	1.000			
(9) BIND	-0.104***	0.086***	0.140***	0.060***	-0.035***	-0.208***	-0.116***	-0.112***	1.000		
(10) ESG	0.011	0.358***	0.557***	-0.008	0.221***	0.383***	0.142***	0.654***	-0.014*	1.000	
(11) FORSALE	0.028***	0.074***	0.176***	-0.043***	0.142***	0.114***	0.040***	0.233***	-0.081***	0.281***	1.000
(12) CAPEX	0.022***	0.014**	0.068***	0.056***	-0.247***	-0.069***	0.019***	-0.029***	0.017**	-0.106***	0.163***
(13) RD	0.090***	-0.079***	0.259***	-0.061***	-0.527***	-0.129***	0.046***	-0.146***	0.053***	-0.153***	0.162***
(14) EXECPAY	-0.061***	0.037***	0.399***	0.008	0.125***	0.259***	-0.043***	0.242***	-0.087***	0.285***	0.109***
(15) DURATION	0.045***	-0.020***	0.094***	-0.022***	-0.015**	-0.070***	-0.043***	-0.055***	0.055***	-0.053***	0.033***
(16) SUPP_SIZE	0.451***	0.008	-0.001	0.022***	-0.063***	0.014**	0.011	0.004	-0.063***	-0.017**	0.050***
(17) SUPP_LEV	-0.026***	0.010	-0.012*	0.107***	0.013*	0.009	-0.038***	0.008	0.034***	0.023***	0.026***
(18) SUPP_ROA	0.158***	-0.002	0.037***	-0.014**	0.034***	-0.019***	0.037***	0.002	-0.075***	-0.030***	0.026***
(19) LNGDPC	-0.069***	0.048***	0.213***	0.051***	-0.081***	-0.229***	-0.132***	-0.170***	0.400***	-0.118***	0.072***
(20) SD_GDPC	0.041***	0.003	0.141***	-0.022***	0.039***	0.103***	0.160***	0.140***	-0.265***	0.077***	0.054***
(21) HIGH_WGI	-0.034***	0.123***	0.143***	-0.123***	0.136***	0.022***	0.162***	0.199***	-0.123***	0.183***	0.165***
(22) STAKE	0.138***	-0.002	0.327***	-0.081***	0.061***	0.256***	0.156***	0.271***	-0.539***	0.340***	0.204***
	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(12) CAPEX	1.000										
(13) RD	0.413***	1.000									
(14) EXECPAY	0.051***	0.061***	1.000								
(15) DURATION	-0.010	0.027***	0.029***	1.000							
(16) SUPP_SIZE	0.024***	0.002	0.012*	0.028***	1.000						
(17) SUPP_LEV	0.018**	0.025***	0.038***	0.014**	0.027***	1.000					
(18) SUPP_ROA	0.023***	0.044***	0.049***	0.041***	0.234***	0.043***	1.000				
(19) LNGDPC	0.013*	0.078***	\0.154***	0.064***	0.036***	0.047***	0.070***	1.000			
(20) SD_GDPC	0.023***	0.036***	0.021***	0.059***	0.035***	0.046***	0.069***	0.460***	1.000		
(21) HIGH_WGI	-0.005	0.085***	0.082***	0.032***	0.107***	0.056***	0.032***	0.103***	0.033***	1.000	
(22) STAKE	0.035***	0.068***	0.135***	0.064***	0.070***	0.032***	0.051***	0.358***	0.250***	0.152***	1.000

**** p<0.01, ** p<0.05, * p<0.10*

Table 5. Regression Results: The impact of ESG-linked compensation on FSSCP

	DV=FSSCP	
	Model (1)	**Model (2)**
ESG_PAY	0.008***	0.010***
	(0.003)	(0.003)
SIZE	-0.012***	-0.012***
	(0.001)	(0.001)
LEV	-0.010	-0.009
	(0.007)	(0.007)
ROA	-0.003	-0.004
	(0.012)	(0.012)
BSIZE	0.023	0.264
	(0.723)	(0.729)
DUAL	-0.005	-0.005
	(0.003)	(0.003)
SUSTCOM	-0.002	-0.003
	(0.004)	(0.004)
BIND	-0.014	-0.016
	(0.010)	(0.010)
ESG	0.008	0.006
	(0.012)	(0.012)
EXECPAY	-0.006***	-0.006***
	(0.002)	(0.002)
FORSALE	0.014***	0.014***
	(0.004)	(0.004)
CAPEX	0.002	0.003
	(0.009)	(0.009)
RD	0.006***	0.006***
	(0.002)	(0.002)
DURATION	0.006***	0.006***
	(0.002)	(0.002)
SUPP_SIZE	0.035***	0.035***
	(0.001)	(0.001)
SUPP_LEV	-0.031***	-0.032***
	(0.010)	(0.010)
SUPP_ROA	0.001***	0.001***
	(0.000)	(0.000)
LNGDPC	0.011	——
	(0.019)	
SD_GDPC	-0.141**	——
	(0.061)	
Constant	0.231	0.413***
	(0.203)	(0.029)
Year Fixed Effects	Yes	No
Industry Fixed Effects	Yes	Yes
Country fixed effects	Yes	No
Country×Year fixed effects	No	Yes
Firm fixed effects	No	No
Observations	19,776	19,776
R-squared	0.302	0.313

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

Table 6. The moderating effects of country-level governance and stakeholder orientation

	DV=FSSCP	
	Model (1)	**Model (2)**
ESG_PAY	0.004	0.009***
	(0.003)	(0.003)
ESG_PAY×HIGH_WGI	0.007*	——
	(0.004)	
HIGH_WGI	0.015***	——
	(0.005)	
ESG_PAY×STAKE	——	0.010**
		(0.005)
STAKE	——	0.033***
		(0.003)
SIZE	-0.012***	-0.014***
	(0.001)	(0.001)
LEV	-0.010**	-0.014***
	(0.005)	(0.005)
ROA	-0.003	-0.003
	(0.008)	(0.008)
BSIZE	0.032	-0.379
	(0.451)	(0.420)
DUAL	-0.005**	-0.001
	(0.002)	(0.002)
SUSTCOM	-0.002	0.004
	(0.003)	(0.003)
BIND	-0.015**	-0.025***
	(0.006)	(0.006)
ESG	0.009	0.031***
	(0.008)	(0.007)
EXECPAY	-0.006***	-0.005***
	(0.001)	(0.001)
FORSALE	0.014***	0.017***
	(0.003)	(0.002)
CAPEX	0.002	0.004
	(0.006)	(0.006)
RD	0.006***	0.006***
	(0.001)	(0.001)
DURATION	0.006***	0.005***
	(0.002)	(0.002)
SUPP_SIZE	0.035***	0.035***
	(0.001)	(0.001)
SUPP_LEV	-0.031***	-0.032***
	(0.006)	(0.006)
SUPP_ROA	0.001***	0.001***
	(0.000)	(0.000)
LNGDPC	0.025*	-0.015***
	(0.013)	(0.002)
Constant	0.054	0.457***
	(0.144)	(0.032)
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	19,776	19,776
R-squared	0.303	0.295

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors.

Table 7. The impact of ESG-linked compensation on environmental and social dimensions of SSCP

	DV=FENVSCP	DV=FSOCSCP
	Model (1)	Model (2)
ESG_PAY	0.011***	0.006*
	(0.004)	(0.003)
SIZE	-0.016***	-0.012***
	(0.002)	(0.002)
LEV	-0.001	-0.007
	(0.010)	(0.008)
ROA	-0.011	-0.008
	(0.016)	(0.013)
BSIZE	-0.002	0.309
	(1.062)	(0.782)
DUAL	-0.004	-0.005
	(0.005)	(0.004)
SUSTCOM	0.007	-0.004
	(0.006)	(0.004)
BIND	-0.036**	-0.016
	(0.014)	(0.011)
ESG	0.009	0.007
	(0.018)	(0.013)
EXECPAY	-0.010***	-0.005***
	(0.002)	(0.002)
FORSALE	0.021***	0.014***
	(0.006)	(0.005)
CAPEX	0.014	0.002
	(0.012)	(0.010)
RD	0.007***	0.007***
	(0.002)	(0.002)
DURATION	0.012***	0.005**
	(0.003)	(0.002)
SUPP_SIZE	0.052***	0.034***
	(0.001)	(0.001)
SUPP_LEV	-0.025*	-0.022**
	(0.014)	(0.011)
SUPP_ROA	0.001***	0.001***
	(0.000)	(0.000)
LNGDPC	0.063**	0.002
	(0.027)	(0.021)
SD_GDPC	-0.243***	-0.186***
	(0.089)	(0.070)
Constant	-0.529*	0.324
	(0.290)	(0.229)
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Country fixed effects	Yes	Yes
Observations	19,775	19,775
R-squared	0.318	0.284

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

Table 8. Regression Results: The impact of ESG-compensation score on FSSCP

	(1) **DV=FSSCP**
ESG_Pay_Score	0.004*
	(0.002)
SIZE	-0.015***
	(0.002)
LEV	-0.007
	(0.006)
ROA	0.001
	(0.011)
BSIZE	-0.474
	(0.695)
DUAL	-0.009***
	(0.003)
SUSTCOM	0.004
	(0.004)
BIND	-0.001
	(0.012)
ESG	-0.002
	(0.011)
FORSALE	0.021***
	(0.003)
CAPEX	-0.009
	(0.008)
RD	0.006***
	(0.001)
EXECPAY	-0.003
	(0.002)
DURATION	0.011***
	(0.002)
SUPP_SIZE	0.038***
	(0.001)
SUPP_LEV	-0.017**
	(0.009)
SUPP_ROA	0.001***
	(0.000)
LN_GDPC	-0.165***
	(0.049)
SD_GDPC	0.012
	(0.173)
Constant	2.103***
	(0.518)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Country fixed effects	Yes
Firm fixed effects	No
Observations	9,176
R-squared	0.357

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Table 9. Regression Results: The moderation impact of Mandatory ESG Disclosure on the relationship between ESG-compensation score and FSSCP

	DV=FSSCP
ESG_PAY	0.009**
	(0.004)
Mandatory ESG Disclosure	0.010
	(0.008)
ESG_PAY * Mandatory ESG Disclosure	-0.004
	(0.006)
SIZE	-0.012***
	(0.001)
LEV	-0.010
	(0.007)
ROA	-0.003
	(0.012)
BDSIZE	0.036
	(0.723)
DUAL	-0.005
	(0.003)
SUSTCOM	-0.002
	(0.004)
BIND	-0.015
	(0.010)
ESG	0.008
	(0.012)
FORSALE	0.014***
	(0.004)
CAPEX	0.002
	(0.009)
RD	0.006***
	(0.002)
EXECPAY	-0.006***
	(0.002)
DURATION	0.006***
	(0.002)
SUPP_SIZE	0.035***
	(0.001)
SUPP_LEV	-0.031***
	(0.010)
SUPP_ROA	0.001***
	(0.000)
LNGDPC	0.016
	(0.019)
SD_GDPC	-0.137**
	(0.061)
Constant	0.170
	(0.205)

Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Country fixed effects	Yes
Observations	19776
R-squared	0.302

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

Table 9. Heckman's (1979) two-stage model analysis

Panel A. The first-stage: probit regression results			
	DV=ESGPay_DISC		
	Coefficient	***z* stat**	***p* value**
PROPDISCL	4.115	31.56	0.000***
SIZE	0.017	1.02	0.306
LEV	0.087	1.12	0.261
ROA	0.167	1.28	0.200
BSIZE	15.809	2.05	0.040**
DUAL	-0.060	-1.62	0.106
SUSTCOM	0.038	0.85	0.398
BIND	0.243	2.15	0.032**
ESG	2.400	17.66	0.000***
EXECPAY	0.067	3.91	0.000***
FORGNSALE	-0.073	-1.61	0.107
CAPEX	0.066	0.86	0.391
RD	-0.047	-2.24	0.025**
LNGDPC	-0.997	-6.04	0.000***
SD_GDPC	-1.324	-2.47	0.013**
Constant	6.142	3.37	0.001***
Year fixed effects		Yes	
Industry fixed effects		Yes	
Country fixed effects		Yes	
Observations		29,010	
Pseudo R^2		0.3538	
Log likelihood		-10715.028	
ROC curve		0.8779	

Panel B. The second stage	
	DV=FSSCP
ESG_PAY	0.008***
	(0.003)
IMR	-0.017
	(0.019)
Constant	0.284
	(0.212)
Year fixed effects	Yes
Industry fixed effect	Yes
Country fixed effect	Yes
Observations	19,776
R-squared	0.302

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with

Table 10. Entropy balancing analysis

Panel A. Descriptive statistics of variables before entropy balancing

	Treatment ESGPAY = 1			Control ESGPAY=0		
	Mean	**Variance**	**Skewness**	**Mean**	**Variance**	**Skewness**
SIZE	9.185	2.574	0.1214	8.395	3.139	0.01521
LEV	0.2909	0.03889	1.766	0.2767	0.05118	1.556
ROA	0.04136	0.007806	-2.964	0.01546	0.02375	-3.988
BSIZE	0.02338	7.56E-06	0.05248	0.02253	8.31E-06	0.09904
DUAL	0.5968	0.2407	-0.3945	0.5541	0.2471	-0.2177
SUSTCOM	0.7832	0.1698	-1.374	0.4653	0.2488	0.1391
BIND	0.7207	0.0399	-1.055	0.6738	0.04963	-0.9015
ESG	0.6161	0.03229	-0.483	0.4515	0.03836	0.2302
EXECPAY	16.62	1.397	0.661	16.52	2.067	0.9614
FORSALE	0.7861	0.1682	-1.395	0.7165	0.2031	-0.9607
CAPEX	0.1042	0.03252	5.373	0.09683	0.044	6.09
RD	0.04719	0.2153	21.74	0.2146	1.429	8.126
DURATION	1.235	0.3298	0.3712	1.249	0.3474	0.3756
SUPP_SIZE	8.904	3.547	-0.4279	8.795	4.417	-0.4027
SUPP_LEV	0.2772	0.02287	0.816	0.2717	0.02779	0.8071
SUPP_ROA	0.358	109	-2.748	0.06685	140.3	-2.755
LNGDPC	10.79	0.2746	-2.983	10.69	0.4926	-2.364
SD_GDPC	0.05808	0.0009662	1.926	0.05894	0.001315	2.337

Panel B. Descriptive statistics of variables after entropy balancing

	Treat ESGPAY=1			Control ESGPAY=0		
	mean	**Variance**	**skewness**	**mean**	**variance**	**Skewness**
SIZE	9.185	2.574	0.1214	9.185	2.574	0.1217
LEV	0.2909	0.03889	1.766	0.2909	0.03889	1.767
ROA	0.04136	0.007806	-2.964	0.04136	0.007809	-2.97
BSIZE	0.02338	7.56E-06	0.05248	0.02338	7.56E-06	0.05302
DUAL	0.5968	0.2407	-0.3945	0.5967	0.2407	-0.3944
SUSTCOM	0.7832	0.1698	-1.374	0.7831	0.1698	-1.374
BIND	0.7207	0.0399	-1.055	0.7206	0.0399	-1.054
ESG	0.6161	0.03229	-0.483	0.6161	0.03229	-0.4828
EXECPAY	16.62	1.397	0.661	16.62	1.397	0.6619
FORSALE	0.7861	0.1682	-1.395	0.7861	0.1682	-1.395
CAPEX	0.1042	0.03252	5.373	0.1042	0.03252	5.373
RD	0.04719	0.2153	21.74	0.04719	0.2154	21.74
DURATION	1.235	0.3298	0.3712	1.235	0.3298	0.3713
SUPP_SIZE	8.904	3.547	-0.4279	8.904	3.547	-0.4276
SUPP_LEV	0.2772	0.02287	0.816	0.2772	0.02287	0.8161
SUPP_ROA	0.358	109	-2.748	0.358	109	-2.748
LNGDPC	10.79	0.2746	-2.983	10.79	0.2746	-2.982
SD_GDPC	0.05808	0.000966	1.926	0.05808	0.000966	1.926

Panel C. Entropy-balanced sample

	DV=FSSCP
ESG_PAY	0.007**
	(0.003)
SIZE	-0.010***
	(0.002)
LEV	-0.012
	(0.010)
ROA	-0.026
	(0.019)
BSIZE	-0.154
	(0.846)
DUAL	-0.010***
	(0.004)
SUSTCOM	0.001
	(0.005)
BIND	-0.028**
	(0.011)
ESG	0.006
	(0.015)
FOR_SALE	0.008
	(0.005)
CAPEX	0.007
	(0.012)
RD	0.006
	(0.004)
EXECPAY	-0.009***
	(0.002)
DURATION	0.003
	(0.002)
SUPP_SIZE	0.033***
	(0.001)
SUPP_LEV	-0.023*
	(0.013)
SUPP_ROA	0.001***
	(0.000)
LNGDPC	-0.008
	(0.021)
SD_GDPC	0.010
	(0.064)
Constant	0.522**
	(0.228)
Year fixed effects	Yes
Industry fixed effects	Yes
Country fixed effects	Yes
Observations	19776
R-squared	0.296

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

Table 11. Analysis including firm fixed effects

	DV=FSSCP	DV=FENVSCP	DV=FSOCSCP
	Model (1)	Model (2)	Model (3)
ESG_PAY	0.009***	0.021***	0.007**
	(0.003)	(0.005)	(0.003)
SIZE	-0.001	-0.005	0.005
	(0.004)	(0.007)	(0.004)
LEV	0.003	-0.014	0.014
	(0.009)	(0.014)	(0.009)
ROA	-0.009	-0.011	-0.007
	(0.017)	(0.022)	(0.018)
BSIZE	-0.273	-0.775	-0.689
	(1.000)	(1.524)	(1.067)
DUAL	-0.002	-0.005	-0.003
	(0.005)	(0.006)	(0.005)
SUSTCOM	0.007*	0.023***	0.005
	(0.004)	(0.006)	(0.004)
BIND	0.014	-0.003	0.034**
	(0.012)	(0.020)	(0.013)
ESG	0.018	-0.027	0.041**
	(0.019)	(0.034)	(0.019)
EXECPAY	0.000	0.002	-0.001
	(0.002)	(0.003)	(0.002)
FORSALE	-0.009	-0.003	-0.011
	(0.009)	(0.013)	(0.010)
CAPEX	0.001	-0.004	0.009
	(0.011)	(0.015)	(0.013)
RD	0.003	0.006*	0.002
	(0.003)	(0.003)	(0.003)
DURATION	0.004**	0.007***	0.005**
	(0.002)	(0.002)	(0.002)
SUPP_SIZE	0.018***	0.026***	0.018***
	(0.001)	(0.002)	(0.001)
SUPP_LEV	-0.005	-0.013	0.005
	(0.009)	(0.013)	(0.010)
SUPP_ROA	0.000	0.001**	0.000
	(0.000)	(0.000)	(0.000)
LNGDPC	0.084***	0.121***	0.089***
	(0.022)	(0.035)	(0.023)
SD_GDPC	-0.209***	-0.212*	-0.286***
	(0.068)	(0.110)	(0.076)
Constant	-0.544**	-1.048**	-0.621**
	(0.234)	(0.386)	(0.237)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	No	No	No
Country fixed effects	No	No	No
Firm fixed effects	Yes	Yes	Yes
Observations	19,485	19,511	19,511
R-squared	0.619	0.623	0.611

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level and year.

Table 12. Country-specific analysis

Panel A. USA	
	DV=FSSCP
	Model (1)
ESG_PAY	0.011***
	(0.004)
Constant	-0.993***
	(0.225)
Control Variables	Yes
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	11,385
R-squared	0.311
Panel B. UK	
	DV=FSSCP
	Model (1)
ESG_PAY	0.011
	(0.008)
Constant	0.499
	(0.618)
Control Variables	Yes
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	1,548
R-squared	0.174
Panel C. Japan	
	DV=FSSCP
	Model (1)
ESG_PAY	0.031*
	(0.017)
Constant	3.655***
	(0.727)
Control Variables	Yes
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	809
R-squared	0.191
Panel D. France	
	DV=FSSCP
	Model (1)
ESG_PAY	0.014
	(0.010)
Constant	0.727
	(0.821)
Control Variables	Yes
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	793
R-squared	0.225

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level and year.

Table 13. Country-specific analysis without US observations

	DV=FSSCP	DV=FSSCP
	Model (1)	Model (2)
ESG_PAY	0.016***	0.011**
	(0.004)	(0.005)
SIZE	-0.013***	-0.008***
	(0.002)	(0.002)
LEV	-0.007	-0.009
	(0.014)	(0.015)
ROA	0.003	0.014
	(0.027)	(0.027)
BSIZE	-0.883	1.005
	(0.895)	(1.018)
DUAL	-0.008	-0.010*
	(0.005)	(0.005)
SUSTCOM	0.005	-0.000
	(0.007)	(0.007)
BIND	-0.006	-0.008
	(0.012)	(0.012)
ESG	0.042**	-0.021
	(0.018)	(0.020)
EXECPAY	-0.001	-0.006***
	(0.002)	(0.002)
FORSALE	-0.003	-0.004
	(0.008)	(0.008)
CAPEX	0.059***	0.041***
	(0.014)	(0.015)
RD	0.004	0.003
	(0.005)	(0.005)
DURATION	-0.001	-0.002
	(0.003)	(0.003)
SUPP_SIZE	0.032***	0.030***
	(0.001)	(0.001)
SUPP_LEV	-0.041***	-0.041***
	(0.016)	(0.015)
SUPP_ROA	0.000	0.000
	(0.000)	(0.000)
LN_GDPC	-0.007	——
	(0.005)	
SD_GDPC	-0.272***	——
	(0.060)	
Constant	0.496***	0.467***
	(0.071)	(0.040)
Year Fixed Effects	Yes	No
Industry Fixed Effects	Yes	Yes
Country fixed effects	Yes	No
Country * Year fixed effects	No	Yes
Firm fixed effects	No	No
Observations	8,391	8,391
R-squared	0.182	0.251

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

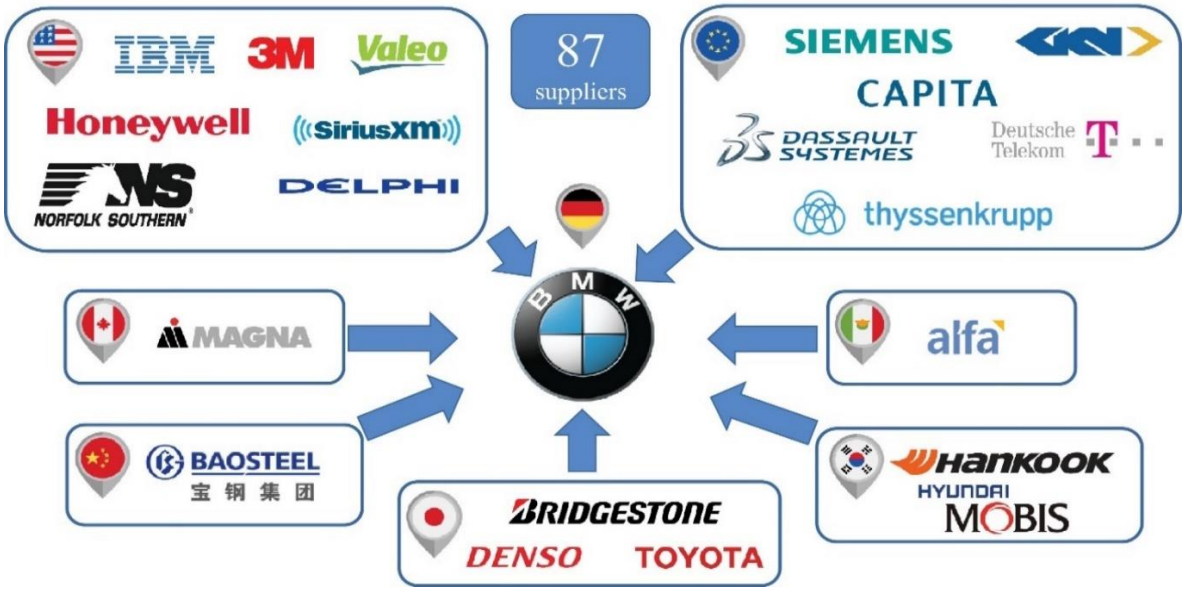
Table 14. Analysis for environmentally sensitive industries

	DV=FSSCP	DV=FSSCP
	Model (1)	**Model (2)**
ESG_PAY	0.015***	0.019**
	(0.003)	(0.007)
SIZE	-0.016***	-0.027***
	(0.001)	(0.004)
LEV	-0.014*	-0.012
	(0.008)	(0.028)
ROA	-0.035***	0.023
	(0.013)	(0.031)
BSIZE	-1.263*	-1.269
	(0.720)	(1.944)
DUAL	0.000	0.009
	(0.003)	(0.009)
SUSTCOM	0.007*	0.014
	(0.004)	(0.011)
BIND	-0.023**	-0.021
	(0.010)	(0.025)
ESG	0.041***	0.120***
	(0.012)	(0.033)
EXECPAY	-0.003***	-0.003
	(0.001)	(0.003)
FORSALE	0.013***	0.029**
	(0.004)	(0.012)
CAPEX	0.024**	-0.013
	(0.010)	(0.019)
RD	0.007***	0.009**
	(0.002)	(0.004)
DURATION	0.007***	0.008
	(0.002)	(0.006)
SUPP_SIZE	0.036***	0.041***
	(0.001)	(0.003)
SUPP_LEV	-0.031***	-0.004
	(0.011)	(0.030)
SUPP_ROA	0.001***	0.000
	(0.000)	(0.001)
LN_GDPC	-0.012***	-0.016**
	(0.003)	(0.008)
SD_GDPC	-0.097	-0.079
	(0.059)	(0.127)
Constant	0.519***	0.540***
	(0.048)	(0.126)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Country fixed effects	Yes	Yes
Firm fixed effects	No	No
Observations	17,041	2,735
R-squared	0.266	0.281

Notes: Superscript ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively; coefficient values (robust t-statistics) are shown with standard errors clustered at the firm level.

Appendix A. The measurement of FSSCP

To illustrate how focal firm SSCP is measured. Assume the focal firm is BMW in the following example. BMW suppliers will be extracted from the FactSet Revere database. Figure 1 shows a snapshot of BMW with some examples of its suppliers based on the FactSet revere database. Second, the ESG score of each of IBM, 3M, Valeo, Honeywell…, etc (BMW suppliers) will be extracted from the Refinitiv database. Finally, an average of BMW Suppliers' ESG score will be calculated to represent BMW SSCP.



A snapshot of FactSet Revere information on BMW and its worldwide suppliers (Dai et al., 2021)

Appendix B. Definitions of variables

NOTATION	Variable Name	Definition
FSSCP	Sustainable supply chain Performance of the focal firm	Measured by averaging the ESG score of focal firm suppliers.
ESG_PAY	ESG-linked compensation	Measured by a dummy variable that equals one if a company includes ESG criteria in executive compensation contracts and zero otherwise.
SIZE	Firm size	The natural logarithm of total assets.
LEV	Leverage	Calculated by dividing total debt by total assets.
ROA	Return on assets	Calculated by dividing operating income before depreciation by the book value of assets.
BSIZE	Board size	Measured by the natural logarithm of total number of directors.
DUAL	Duality	Measured by a dummy variable that equals one if the chairperson is the CEO and zero otherwise.
SUSTCOM	Sustainability Committee	Measured by a dummy variable that equals one if a company has a sustainability committee and zero otherwise.
BIND	Board independence	Measured by the ratio of independent directors.
ESG	ESG score	Measured by the natural logarithm of firm average ESG score.
EXECPAY	Executives' pay	The natural logarithm of total executives' compensation.
FORSALE	Foreign sales	Measured by a dummy variable equals 1 if a firm has foreign sales and 0 otherwise.
CAPEX	Capital expenditure intensity	Total capital expenditures scaled by total assets
RD	Research and design Intensity	The ratio of research and development expenditures to total assets.
DURATION	Duration	The natural logarithm of relationship years between the focal firm and the supplier.
SUPP_Size	Focal firm supplier size	The natural algorithm of the focal firm's average suppliers' total assets.
SUPP_LEV	Focal firm suppliers' leverage	Measured by dividing the focal firm's average suppliers' total debt by the focal firm's average suppliers' total assets.
SUPP_ROA	Focal firm suppliers' return on assets	Measured by dividing the focal firm's average suppliers' operating income before depreciation by the focal firm's average suppliers' total assets.
LNGDPPC	Gross domestic product per capita	The natural logarithm of gross domestic product per capita.
SD_GDPPC	Standard deviation of GDP	The standard deviation of gross domestic product per capita across three years.
High_WGI	Country's governance level	Measured by averaging six governance indicators. Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. An indicator variable equals 1 if the Country's governance score is higher than the yearly median and 0 otherwise.
STAKE	Country's business culture	Measured by a dummy variable that equals one if the company is from a code law country and zero if it is from a common law country.
ESG_Pay_Score	ESG compensation score	The natural algorithm of the aggregated number of executives with ESG-linked compensation each year
Mandatory ESG Disclosure	Country mandating ESG disclosures	Dummy variable equals one at the year country mandating ESG disclosures and zero otherwise

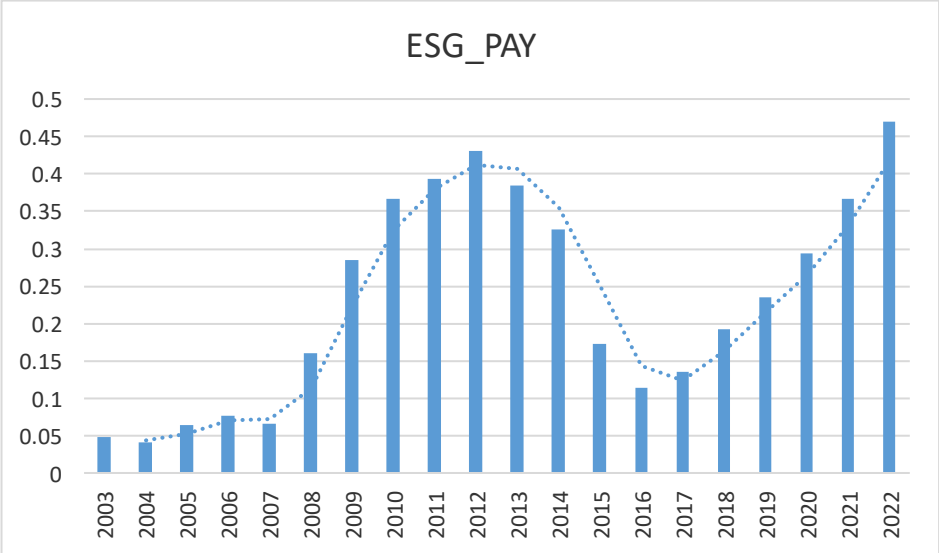


Figure 1. Trends of ESG-linked compensation