Green Image Management in Supply Chains: Strategic Disclosure of Corporate Suppliers*

Yilin Shi[†1], Jing Wu[‡1], Yu Zhang[§2], and Yuqing Zhou[¶1]

[1]CUHK Business School, The Chinese University of Hong Kong

[2]Guanghua School of Management, Peking University

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Abstract

This paper examines how firms manage their disclosure of customer-supplier relationships to create a favorable green image in their supply chain. Our study finds strong evidence that firms strategically disclose relationships with environmentally responsible ("good") suppliers while withholding relationships with "bad" suppliers, ceteris paribus. This strategic disclosure is particularly pronounced for firms with a worse ESG rating, a greater concern for their brand image, and a higher level of institutional ownership. Additionally, it tends to increase as public awareness of climate change grows and decreases as regulations on environmental information transparency strengthen. Furthermore, we find that firms engaging in strategic disclosure of "green" suppliers experience higher future stock returns and asset turnover, indicating that investors and consumers may not fully understand the implications of such disclosure.

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[†]E-mail address: ylshi@link.cuhk.edu.hk

[‡]E-mail address: jingwu@cuhk.edu.hk

[§]E-mail address: yuzhang@gsm.pku.edu.cn

[¶]E-mail address: yuqingzhou@cuhk.edu.hk

1 Introduction

In recent times, there has been a growing realization regarding the significance of disclosing information related to Environmental, Social, and Governance (ESG) factors. Nonetheless, one critical aspect that has received comparatively less attention is ESG performance within a firm's supply chain. The contributions of upstream suppliers in shaping a company's environmental impact are substantial, particularly in the production of intermediary components. For instance, in the case of Boeing's 787 Dreamliner, approximately 65% of its airframe parts are manufactured by upstream suppliers.[1] Similarly, Apple extensively relies on suppliers situated in Asia for the majority of its manufacturing processes.[2] Notably, the Carbon Disclosure Project has revealed that the cumulative level of carbon emissions attributed to a company's supply chain is more than eleven times the direct emissions of companies. With an elevated focus on ESG performance within supply chains, SEC has heightened their attention. Commencing in 2022, they have enforced obligatory disclosure mandates for climate-related risks, encompassing the reporting of greenhouse gas emissions stemming from both suppliers and consumers.[3] In this paper, we investigate whether and how firms manage the disclosure of customer-supplier relationships to cultivate an environmentally conscious image throughout their supply chains.

Firms might strategically choose to disclose their suppliers based on the ESG performance of these suppliers, aiming to align themselves with prevailing public preferences. The existing literature provides compelling evidence that firms exhibiting high levels of corporate social responsibility (CSR) garner value both among consumers and within the financial market. Notably, such firms receive increased recognition from consumers (Pigors and Rockenbach, 2016) and enjoy enhanced

[1] https://www.reuters.com/article/us-boeing-dreamliner/special-report-a-wing-and-a-prayer-outsourcing-at-boeing-idUSTRE70J2UX20110120

[2] https://www.annualreports.com/HostedData/AnnualReportArchive/a/NASDAQ_AAPL_2018.pdf

[3] https://www.wsj.com/articles/sec-to-float-mandatory-disclosure-of-climate-change-risks-emissions-11647874814

perceptions of their products (Servaes and Tamayo, 2013). These high CSR firms also tend to achieve superior financial performance (Flammer, 2015) and showcase greater resilience during periods of financial turmoil (Lins et al., 2017). Supply chain CSR is particularly pertinent to our study. As documented by Darendeli et al. (2022), firms display reluctance to engage in business transactions with counterparts possessing low ESG ratings. Similarly, Hainmueller et al. (2015) revealed that consumers exhibit willingness to pay a premium for products bearing a fair-trade label, while Gao and Souza (2022) demonstrated that environmentally conscious consumers attribute a higher value to products boasting a low-carbon footprint. Conversely, the detrimental impact of poor CSR performance by suppliers on the customer firm can be notably consequential. Jacobs and Singhal (2020) uncovered that customer firms affiliated with Volkswagen experienced substantial losses in market value due to the fallout from the diesel emission scandal.

Given the advantageous implications of incorporating supply chain CSR, profit-maximizing firms are motivated to cultivate an environmentally conscious image throughout their supply chains. It's worth noting that existing regulatory frameworks pertaining to supply chain disclosure predominantly focus on downstream customer relationships.[4] There are no mandatory requirements to disclose the supplier list in financial reporting standards. Given that supplier disclosure is largely voluntary, firms hold the prerogative to choose which relationships to unveil to the public, weighing the associated pros and cons. This dynamic enables firms to strategically opt for the disclosure of environmentally responsible suppliers while withholding information about less favorable ones, thereby effectively projecting a green image to both investors and stakeholders. The distinction between firms that genuinely prioritize maintaining an environmentally responsible supply chain and those that merely project an outwardly "green" image is of paramount importance. Consequently, our study embarks on an exploration of whether and to what degree firms strategically disclose

[4]For instance, in the United States, accounting standards such as SFAS 14 and SFAS 131 mandate that publicly-listed firms disclose principal customers contributing over 10% of annual revenue in their 10-K filings.

their environmentally responsible suppliers, the mechanisms that underlie such actions, and the ensuing outcomes. To the best of our knowledge, this facet has yet to be thoroughly examined in prior research.

We leverage extensive global datasets of customer firms and their suppliers to present the first empirical analysis of customer firms' strategic disclosure of green suppliers and their withholding of relationships with less environmentally responsible ones. The cornerstone of our investigation rests upon the supply chain dataset FactSet Revere, which furnishes us with pivotal information – the identity of the disclosing party in the relationship. This indication informs us whether a customer firm voluntarily reveals a specific supplier or not. Our analysis reveals that a customer firm's decision to voluntarily disclose a supplier is significantly affected by the supplier's environmental rating, as measured by the environmental score in Thomson Reuters' ASSET4.[5]

Our main empirical specification is a linear probability model in which the dependent variable is a dummy variable that indicates a supplier is voluntarily disclosed by the customer. The key explanatory variable of interest is the environmental rating of the supplier. In spite of the absence of global mandatory regulations mandating customer firms to publicly unveil their supplier lists, the disclosing behavior of these firms may be influenced by industry practices, local policies, and firm preferences. To appropriately address this issue, we introduce a customer-by-year fixed effect into our model. This inclusion serves to account for any customer-specific elements that might influence the disclosure behavior of the customer firm. Thus, we ensure a comparison of suppliers voluntarily disclosed by the same customer firm within the same year. In our analysis, we also control for supplier attributes that reflect other potential factors that may affect customers' strategic disclosure such as the proprietary cost. Subsequent to a thorough consideration of these factors that might

[5]It's worth noting that for customer firms to determine which suppliers to disclose, they must first acquire insights into the environmental performance of said suppliers. Given that ASSET4's data is publicly available, we posit that customer firms possess knowledge of suppliers' environmental performance through this rating and subsequently make their disclosure decisions accordingly. This viewpoint aligns with recent research, indicating that customer firms alter their supply chain relationships when ASSET4 expands its CSR rating coverage (Darendeli et al., 2022).

influence the disclosure decision, our findings unveil that customer firms exercise strategic discretion in disclosing environmentally responsible suppliers while opting not to reveal associations with less environmentally conscientious suppliers. To address another possible concern that suppliers may also strategically report green customers, we exclusively incorporate customer firms with ESG ratings below the median. This is grounded on the presumption that suppliers are more inclined to disclose relationships with customer firms boasting high ESG ratings rather than those with lower ratings. Encouragingly, our outcomes remain statistically significant and, if anything, display slightly stronger effects. This suggests that our primary findings are not steered by suppliers' strategic reporting of green customers.

Moving forward, we investigate the heterogeneity of the effects. In doing so, we uncover various firm-specific factors that amplify the strategic disclosure of green suppliers. First, we find that customer firms that have lower environmental ratings are more strategic in disclosing suppliers with more favorable environmental ratings. This insight implies that customer firms with comparatively weaker environmental performance potentially possess fewer resources to invest in enhancing the ESG outcomes of their product life cycle. As a result, they may resort to strategically disclosing green suppliers as a means to bolster their comprehensive ESG image. Second, drawing parallels from prior research that establishes a link between higher advertising expenditures and more substantial increases in market value through CSR efforts (Servaes and Tamayo, 2013), we discern a similar pattern in our study. Specifically, firms that prioritize customer awareness and reputation, as indicated by elevated selling, general, and administrative expenses (SG&A), exhibit a greater propensity to strategically disclose their green suppliers. Third, our analysis reveals that firms boasting larger stakes held by institutional investors are notably more prone to engaging in strategic supplier disclosure. Given that institutional investors attach significant value to the CSR performance of their portfolio firms (Flammer, 2015; Hartzmark and Sussman, 2019; Kim et al.,

2019), our results suggest that firms strategically opt for the disclosure of green suppliers as a means to cater to the preferences of these institutional investors.

Furthermore, we unveil compelling evidence that both public awareness surrounding climate change and government policies relating to CSR disclosures influence the practice of strategic supply chain disclosure. Firstly, we discern an increase in instances of strategic supply chain disclosure when customer firms find themselves situated in areas experiencing notably elevated temperatures and a heightened frequency of wildfires. These occurrences serve to amplify public awareness surrounding the pressing issue of climate change. Additionally, our study documents a reduction in strategic supply chain disclosure when there is a tightening of regulations pertaining to CSR disclosures, i.e., more mandatory CSR disclosure policies are implemented. This outcome is consistent with the theoretical findings in Wu et al. (2020), which posits that environments characterized by low levels of information transparency incentivize profit-oriented firms to engage primarily in CSR investments that are publicly observable. Simultaneously, such environments lead these firms to overlook CSR investments that remain publicly unobservable. Conversely, the presence of increased information transparency tends to curtail this tendency, minimizing the occurrence of such behavior.

Our findings so far suggest that firms make strategic decisions when it comes to supply chain disclosure, taking into account the costs and benefits involved. Our next investigative phase revolves around assessing the extent to which investors and analysts accurately understand a firm's strategic behaviors regarding supply chain disclosure. The customer-supplier relationships recorded within FactSet Revere are publicly accessible information. In an ideal scenario where investors and analysts exhibit rationality and meticulous attention to the information, whether a supplier is voluntarily disclosed by the customer firm should not significantly impact the customer firm's future performance. This expectation is rooted in the assumption that the market, being fully informed,

would incorporate such information into stock prices once it becomes publicly available. To test whether investors and analysts are fully rational, we segment suppliers into three distinct groups based on their environmental ratings: those exceeding the seventieth percentile, those falling between the seventieth and thirtieth percentiles, and those below the thirtieth percentile. Our analysis reveals that customer firms disclosing a green supplier tend to correlate with a heightened future abnormal stock return compared to instances where the firm has ties with a green supplier but refrains from voluntary disclosure. This outcome suggests that investors might not fully grasp the implications of a firm's strategic supply chain disclosure. On the other hand, analysts exhibit a more nuanced understanding, with their EPS forecasts remaining relatively unaffected by such strategic disclosure behaviors. To delve deeper into the ramifications of strategic supply chain disclosure on firm performance, we examine its impact on asset turnover (sales/asset) for the customer firm. Our findings show that the voluntary disclosure of environmentally responsible suppliers contributes to an increase in asset turnover for the customer firm. Taken collectively, our research postulates that investors and consumers might not fully understand a firm's strategic disclosure maneuvers. This, in turn, bestows potential advantages upon firms that engage in the selective disclosure of their environmentally friendly suppliers.

To enhance the robustness of our findings, we undertake supplementary analyses to bolster the validity of our conclusions. Firstly, we leverage comprehensive US import transaction-level data sourced from Panjiva. This alternative dataset offers a distinct sample of supply chain relationships exclusively involving US customer firms and their international suppliers. This dataset encompasses supply chain relationships that remain undisclosed by either the customer or the supplier, thereby mitigating the potential impact of selective disclosure issues. Our results remain robust across various specifications, effectively providing further support for our primary findings. In addition, to rigorously test the resilience of our main findings, we employ the Coarsened Exact Matching

(CEM) method based on supplier characteristics, in addition to controlling for observable supplier-side characteristics. This analysis confirms that a customer firm takes supplier environmental performance into account when deciding on supply chain disclosure, alongside other important supplier attributes.

Our study makes contributions to several areas of literature. Firstly, we contribute to the existing literature on ESG-related information disclosure. Prior research has shown that mandatory disclosure of ESG-related information can have tangible effects on areas such as labor safety (Christensen et al., 2017), firm profitability (Chen et al., 2018), corporate social responsibility activities (Fiechter et al., 2022), greenhouse gas emissions (Tomar, 2023), among others (Christensen et al., 2021). In terms of supply chain relationships, She (2022) found that mandating firms to disclose their due diligence processes for addressing human rights abuses among their suppliers can lead to improvements in their suppliers' human rights performance. Lu et al. (2023) show that mandatory ESG disclosure is associated with a greater number of new suppliers from countries with opaque ESG-related information environments. Similarly, Che et al. (2023) discovered that a firm's own ESG performance affects the number of customers they disclose. Our paper contributes to the literature by providing evidence of how firms manage their supply chain disclosure based on their suppliers' ESG performance. Specifically, we demonstrate that firms engage in strategic behavior by selectively disclosing suppliers with a green image while withholding information on trade relationships with suppliers that have lower ESG performance.

Second, our study also contributes to the literature on firm voluntary disclosure. Theories of discretionary disclosure suggest that rational investors are aware that firms may strategically withhold negative information, and firms that do not disclose information may experience negative capital market reactions (e.g., Grossman, 1981; Milgrom, 1981). Consequently, managers may voluntarily disclose all information. When there are disclosure frictions such as proprietary cost

and probabilistic information endowment, rational investors still understand why information is withheld and respond rationally (e.g., Verrecchia, 1983; Dye, 1985; Jung and Kwon, 1988). However, investors may not always correctly understand the implications of firms' strategic disclosure. For instance, Zhou and Zhou (2020) found that investors do not fully incorporate the implications of management nonguidance into the stock price, and the mispricing is associated with less guidance issuance. Our study adds to this literature by demonstrating how firms engage in strategic disclosure of their supply chain relationships. Furthermore, we show that the financial market may not be fully aware of firms' strategic disclosure of suppliers. As a result, firms may benefit from portraying a green image.

Lastly, our study makes a valuable contribution to the existing literature on supply chain relationships. Previous research in the accounting field has primarily focused on exploring information asymmetry between suppliers and customers. For instance, Costello (2013) highlights that information asymmetry within the supply chain often results in shorter-term contracts. Zhou (2023) shows that improved financial reporting quality facilitates firms' exports and imports. Other studies have examined the impact of information spillovers along supply chains, such as the effects of major customers' earnings announcements (e.g., Pandit et al., 2011; Cho et al., 2020), customers' expanded derivative disclosures under SFAS 161 (Chen et al., 2021), customers' management forecast bias (Bushee et al., 2021), and the complementary nature of information between suppliers and customers (Luo and Nagarajan, 2015). More relatedly, Darendeli et al. (2022) discover that suppliers with low ESG ratings experience reductions in both their number of contracts and corporate customers. Our paper builds upon this literature by empirically investigating the decision-making process of customer firms with regard to supplier disclosure based on environmental performance. Our findings indicate that, instead of making adjustments to their supply chain relationships, firms may opt for a more cost-effective approach of cultivating a green image by strategically disclosing

their relationships with environmentally friendly firms.

The rest of this paper is organized as follows. Section 2 develops the hypotheses. Section 3 describes the data and sample. Section 4 presents the empirical results on supplier environmental ratings and customer disclosure. Section 5 discusses moderating factors. Section 6 presents the financial market reaction to strategic disclosure of green suppliers and the effects on firm performance. Section 7 conducts additional analyses. Section 8 concludes the study by discussing the implications of our findings.

2 Hypothesis Development

Despite the absence of mandatory regulations thus far mandating firms to disclose their lists of suppliers, a growing anticipation persists for companies to enhance the transparency of their supply chains. Yet, the decision to reveal the identities of supply chain partners necessitates a delicate balance between weighing costs and benefits. On one hand, disclosing supply chain information can yield advantages by mitigating information asymmetry between firms and investors, along with other stakeholders. Such a move can prove beneficial in various dimensions. For instance, Gong and Luo (2018) discovered that lenders reduce their demand for firms to exercise accounting conservatism when they gain access to information originating from the major customers of these firms. Furthermore, an increasing number of prominent enterprises have embarked on the path of publicly disclosing their comprehensive supplier lists. Opting not to do so can potentially lead to undesirable repercussions. For instance, Apple's initial reluctance to unveil the identities of its suppliers responsible for pollutants in China elicited criticism from NGOs, including The Institute of Public & Environmental Affairs. This unfavorable spotlight compelled Apple to eventually relent and disclose its full supplier list, even in cases where certain suppliers continued to grapple with

environmental and social issues.[6] Consequently, driven by the advantages and external pressures, companies possess compelling motivations to unveil their suppliers to relevant stakeholders.

On the other hand, firms might encounter proprietary costs when divulging information that could potentially benefit competitors (Verrecchia, 1983; Healy and Palepu, 2001; Berger and Hann, 2007). As a result, an incentive exists for companies to retain discretion in revealing their supply chain relationships. In the context of literature exploring segment disclosure, the works of both Ellis et al. (2012) and Li et al. (2018) have effectively underscored the substantial influence of proprietary costs on firms' determinations to disclose details about their principal customers.

Upon meticulous consideration of the multifaceted advantages and costs associated with supply chain transparency, firms may choose to strategically disclose certain suppliers while retaining the discretion to withhold others. Previous research has shown that the ESG performance of suppliers can have a significant impact on the value of customer firms and their products (e.g., Jacobs and Singhal, 2020; Gao and Souza, 2022). Furthermore, consumers are often willing to pay a premium for products that have a fair-trade label and come from sustainable sources (Hainmueller et al., 2015). Voluntary disclosure papers, such as Zhou and Zhou (2020), have shown that investors may not fully understand the implications of management withholding information, making it possible for firms to strategically disclose suppliers with high ESG performance while hiding others. It is within this context that we posit the following hypothesis:

Hypothesis 1 *Customer firms strategically disclose suppliers with better environmental performances.*

Having established the premise of customer firms strategically unveiling their suppliers based on ESG ratings, our exploration advances to scrutinize whether investors and financial market analysts accurately understand these strategic disclosure practices and whether firms derive advan-

[6] https://www.forbes.com/sites/ericagies/2012/01/20/is-this-apples-nike-moment/?sh=76608eb46747

tageous outcomes from such strategies. As our earlier discussions underscore, rational investors are adept at grasping management's strategic information disclosures and responding rationally (e.g., Verrecchia, 1983; Dye, 1985; Jung and Kwon, 1988). Nevertheless, situations might arise wherein investors deviate from rationality or exhibit limited attention, potentially leading to an incomplete understanding of the implications emanating from firms' strategic disclosures (Zhou and Zhou, 2020). In instances where this comprehension falters, firms implementing the strategic supplier disclosure approach might potentially experience higher future abnormal stock returns since firms exhibiting high levels of ESG are valued by the financial market (Flammer, 2015). Moreover, the average consumer might not consistently exhibit full rationality and could be constrained by limited attention, which in turn could hamper their understanding of the implications underlying firms' strategic disclosures. Against this backdrop, when customer firms choose to disclose associations with suppliers boasting superior ESG ratings, a trajectory toward improved performance becomes plausible. Thus, in light of these considerations, we posit our second hypothesis:

Hypothesis 2 *Customer firms benefit from strategically disclosing suppliers with better environmental performances.*

3 Data and Summary Statistics

We study the strategic disclosure of green suppliers by listed companies and the associated outcomes. In this section, we describe the data that are used for analysis. These include data on supply chain relationships, whether they are voluntarily disclosed by the customer firm, the environmental ratings of suppliers, other characteristics of the supplier that may influence customer disclosure, customer characteristics that may moderate the strategic disclosure of green suppliers, and data on the financial outcomes.

3.1 Supply chain relationship and voluntary disclosure by customer

We use FactSet Revere, an established dataset used to study listed firms' supply chain relationships at a global scale. The dataset has been used in a series of recent studies to examine issues such as the effect of CSR information on supply-chain contracting (Darendeli et al., 2022), the effects of mandatory ESG disclosure on supply-chain relationships (Lu et al., 2023), the influence of customers on suppliers' CSR policies (Dai et al., 2021), trade credit and profitability (Gofman and Wu, 2021), and risk propagation (Wu et al., 2021; Agca et al., 2022). FactSet Revere collects firms' relationship information from various sources, such as annual reports (Securities and Exchange Commission forms 10-K), investor presentations, company websites, and company press releases. The dataset covers 33,335 public firms across 126 countries, and the sample period we use is 2004–2019. Compared with Compustat Segment data, FactSet Revere is better suited to studying the disclosure of suppliers by customers because Compustat Segment obtains supply chain relationships only from U.S.-listed firms' 10-K filings, which are primarily composed of supplier-disclosed relationships. FactSet Revere also enables us to study the strategic disclosure of green suppliers by customer firms across the world, distributed across regions with different levels of environmental awareness.

When FactSet Revere gathers information on a supply chain relationship, it records the disclosing party of each supply chain observation. Therefore, we know whether it is the customer firm reported it for each customer-supplier relationship. This information offers critical insights into the strategic supplier disclosure decisions made by customers. Although it is well known that the U.S. Statement of Financial Accounting Standards (SFAS) 14 and SFAS 131 require firms to disclose principal customers that account for more than 10% of their annual revenue in 10-K filings, on the customer side, there are no mandatory requirements for firms to disclose suppliers. Therefore, the supply chain relationships reported by customers are voluntarily disclosed.

We define a supply chain as being voluntarily disclosed by customers if the reporting party is the customer. Accordingly, we define a dummy variable $Disclose^c$ that equals one if the supply chain relationship is voluntarily disclosed by the customer firm and zero otherwise.

3.2 Environmental rating of supplier

We use suppliers' environmental ratings as listed in Thomson Reuters' ASSET4, a dataset that covers listed companies globally and is widely used in CSR studies such as Darendeli et al. (2022), Lu et al. (2023), Ferrell et al. (2016), Dyck et al. (2019), Dai et al. (2021), and Flammer (2021). ASSET4 is available from the Thomson Reuters Datastream, one of the most commonly used data sources for investors. To construct the ASSET4 dataset, environmental, social, and governmental (ESG) analysts at Thomson Reuters collect information from firms' annual reports, CSR reports, press releases, and non-governmental organization (NGO) assessments in over 50 countries.

ASSET4 evaluates a firm's ESG performance in four major categories: environment, society, governance, and economy. Within each category, ESG performance is evaluated based on several subcategories. We focus on the supplier's environmental performance. ASSET4 evaluates a firm's environmental performance, i.e., environmental policies, initiatives, and commitments across three subcategories: emission reduction, resource reduction, and environmentally friendly product innovation. Within each subcategory, analysts evaluate a standardized list of aspects. Based on a firm's performance in each aspect, ASSET4 constructs an *Envscore* for the firm's overall environmental performance. In the following analysis, we normalize *Envscore* to a continuous range of 0 to 1.

Moreover, we obtain financial statement data on the supplier and customer firms from Thomson Reuters Worldscope and institutional ownership data on the supplier and customer firms from FactSet LionShares.

3.3 Summary Statistics

To link the several datasets at the global scale that we adopt for this study, we use the ISIN (International Securities Identification Number), the only common identifier across Factset Revere, ASSET4, Worldscope, and Factset LionShares, as primary IDs for firms in the supply chains collected by Factset Revere. The final sample for our baseline analysis consists of 203,057 customer-supplier–year observations covering a wide range of countries over the period 2004–2019.

[Insert Table 1]

Table 1 summarizes the variables used in this study. Of particular interest is that the average share of suppliers voluntarily disclosed by customers is 0.51, i.e., slightly more than half of the supplier-customer relationships in our final sample are disclosed by customers. The environment score of suppliers ($Envscore^s$) spans a wide range, with a mean of 0.66 and a standard deviation (SD) of 0.32.

For each supply chain relationship in the following empirical analysis, we control for supplier characteristics in addition to environmental ratings that can influence the likelihood of voluntary disclosure of the supplier by the customer. These variables are the supplier's size (natural logarithm of the asset), return on assets (ROA), institutional ownership, the ratio of research and development (R&D) expenses to total sales, Tobin's Q, and industry disclosure ratio (the share of supply chain relationships voluntarily disclosed by the customers in the same SIC 2-digit industry).

For the customer side, we employ the customer firm's environmental rating, selling, general, and administrative expenditures scaled by sales (SG&A), the proportion of institutional ownership, and country-level CSR reporting regulations for the customers as moderating variables. We also employ variables related to the customer's stakeholder environmental awareness as moderating variables, such as abnormal temperature, and the occurrence of wildfire incidents in the state or country in

which the customer is located. Finally, we examine the financial market reactions and firm performance outcome of strategic disclosure, i.e., whether investors and analysts correctly understand the behavior of strategically disclosing green suppliers and whether the strategic disclosure is beneficial to the customer. The outcome variables include abnormal stock return, analysts' forecast, and total sales scaled by assets (Asset Turnover)[7].

[Insert Table 2]

Table 2 shows the distribution of customers and suppliers by country or region in Factset Revere. Again, the supplier and customer firms span a wide range, covering 46 countries or regions across North and South America, Europe, Asia, and Oceania.

4 Strategic Disclosure of Green Suppliers

We use the previously described datasets to examine whether customer firms tend to strategically disclose more environmentally responsible suppliers than less environmentally responsible ones. This section presents the result of the relationship between the supplier's CSR rating and the customer's strategic disclosure decision. We start with model-free evidence by directly comparing the quantile difference of average supplier CSR rating for supply chains disclosed by the customers versus those not disclosed by the customers. We then provide a panel estimation of the main result by controlling for other considerations in the supply chain disclosure decision through various firm-level attributes in the supplier-customer relationships, as well as high-dimensional fixed effects. We also conduct additional tests to ensure the robustness of the baseline result.

[7] A complete list of variable definitions and data sources is shown in Appendix Table A1. All continuous control and moderating variables are z-scored.

4.1 Model-free Evidence

We first use model-free analysis to explore whether the customer's disclosure of a supply chain link is orthogonal or related to the supplier's environmental score. We calculate and compare the quintile averages of the supplier's *Envscore* for a group of customer voluntarily disclosed supply chains and the comparison group of other supply chains and report them in Panel A of Table 3. We use this calculation to examine whether the environmental ratings differ between suppliers that are voluntarily disclosed (Column (1)) and suppliers that are not voluntarily disclosed by the customer (Column (2)). If a supplier's environmental rating is not related to their voluntary disclosure by the customer, then we should find no difference between the two columns.

[Insert Table 3]

Panel A of Table 3 shows that the environmental ratings are significantly different (Column (3)) between suppliers that are voluntarily disclosed and suppliers that are not voluntarily disclosed by the customer. The unconditional average difference in environment scores between the two supplier groups is 20.83% on a 0 to 1 environmental score scale, and it is significant at the 1% level. This difference is present across the spectrum of suppliers. In each within-group quintile, voluntarily disclosed suppliers have much higher environmental ratings than suppliers that are not voluntarily disclosed by customers.

To guard against the possibility of customers' preferring to voluntarily disclose large suppliers with high environmental scores, we double-sort the suppliers based on size and environmental score into 25 groups. In each group, we compare the average difference in the environmental scores between the voluntarily disclosed and not voluntarily disclosed suppliers. Panel B of Table 3 shows the double-sorting result, which suggests that the strategic disclosure of green suppliers cannot be explained by the voluntary disclosure of suppliers based on size.

4.2 Empirical Specification and Baseline Result

Our baseline regression analysis estimates a linear probability model in which the supplier is voluntarily disclosed by the customer. The linear probability model allows us to control for an array of fixed effects, which ensures that we compare the likelihood of being voluntarily disclosed for two suppliers with different environmental ratings with the customer, the year of the supply chain relationship, and other characteristics of the suppliers that can influence customer voluntary disclosure held constant. The model is as follows:

$$Disclose^{c}_{i,j,t} = \alpha + \beta \times Envscore^{s}_{j,t-1} + \phi_s \times Z^{s}_{j,t} + FE + \epsilon_t \tag{1}$$

where $Disclose^{c}_{i,j,t}$ is a dummy that equals one when the supply chain relationship with firm j is voluntarily disclosed by customer firm i in year t. The main explanatory variable we focus on is $Envscore^{s}_{j,t-1}$, which is the lagged value of the environment score in ASSET4 for supplier j in year $t-1$. A vector of control variables $Z^{s}_{j,t}$ includes supplier characteristics that capture other factors in addition to environmental ratings that previous studies on supply chain voluntary disclosure find to be important such as proprietary costs (Ellis et al., 2012; Sodhi and Tang, 2019). Specifically, $Z^{s}_{j,t}$ comprises size ($Size^s$), profitability (ROA^s), market valuation ($Tobin'sQ^s$), and proportion of institutional shareholding ($InstOwn^s$), and the supplier's R&D expenditures ($R\&D^s$) and the industry disclosure ratio ($DisRatio^s$), which serve as proxies for the proprietary cost channel. Although there is no mandatory regulation requiring the customer firm to disclose its supplier list, the customer's disclosing decision is influenced by industry practices and local policies, as well as the customer firm's preference. To ensure that the estimated influence of supplier environmental ratings on the customer's voluntary disclosure is not affected by unobserved customer firm-level characteristics that vary over time, we control for customer-by-year fixed effects.

[Insert Table 4]

Column (1) of Table 4 shows the estimates of Equation (1). We find that the supplier's environment score is significantly positively associated with the customer's probability of disclosing the supplier voluntarily. In other words, customers strategically disclose suppliers with higher ratings for environmental responsibility and do not disclose fewer green suppliers. To guard against the possibility that the industry, the country, or the customer itself experiences trends in the unconditional probability of voluntarily disclosing suppliers, we progressively add more fixed effects. In Columns (2)–(4), we consider the possibility that the time trends of customer disclosure behaviors differ in terms of country or industry or the interaction of country and industry. Thus, we add country-year fixed effects in Column (2), industry–year fixed effects in Column (3), and country–industry–year fixed effects in Column (4). In Column (5), we further consider the possibility that unobserved customer firm-level time-varying characteristics may affect the probability of reporting any supplier and, at the same time, may correlate with the supplier's environmental ratings. Thus, we add customer-by-year fixed effects. That is, we estimate the influence of the supplier's environmental ratings on the probability of the customer voluntarily disclosing the supplier, using only the comparison between suppliers that have trade relationships with the same customer, and the relationships are disclosed in the same year. The results in Columns (2)–(5) of Table 4 are consistently the same as in Column (1). The coefficients are almost the same in Columns (1)–(4) and are only slightly smaller in Column (5). The results in Column (5) indicate that the supplier's environmental rating on the customer's voluntary disclosure is economically significant: a one-standard-deviation increase in a supplier's environment score corresponds to a 1.2% higher probability of being disclosed by the customer.

Another potential concern is that our baseline results could be driven by suppliers selectively reporting green customers. In addition to customers that suppliers are required to disclose under

SFAS 14 and SFAS 131, suppliers may choose to voluntarily disclose additional supply chain relationships. It is possible that suppliers also have the incentive to disclose customers who are more environmentally responsible and thus bias our estimation. To address this concern, we conducted several tests. First, we added customer-year fixed effects in Column (5), Table 4 to control for any time-varying customer-level characteristics, including ESG ratings, that may affect the disclosure of supply chain relationships. If our main results are driven by suppliers selectively reporting green customers, then the coefficient of $Envscore^{s}_{j,t-1}$ in Column (5) should not be statistically significant. However, the results in Column (5) remain strong and statistically significant. We conduct an additional test to further address concerns. If suppliers tend to disclose customers with high ESG ratings and not those with low ratings, then customers with low ESG ratings are unlikely to be strategically disclosed by suppliers. In Table 5, we included only customer firms with below-median ESG ratings and found that our results remained robust and statistically significant across all specifications. Moreover, the coefficients in this table were larger compared to those in Table 4, providing additional evidence that our main findings are not influenced by suppliers' strategic disclosure of customers. It is important to note that even if suppliers engage in strategic disclosure of customers, our findings remain valid. Our goal is to establish the existence of customer firms' strategic disclosure of their supply chain relationships. It is not necessary to rule out the possibility that supplier firms have a similar strategy. We chose to focus on customers' strategic disclosure of their suppliers because there are no mandatory requirements for suppliers to be disclosed. This enables us to obtain a cleaner measure of voluntary disclosure of relationships. Therefore, the fact that suppliers may also engage in strategic disclosure does not contradict our primary purpose and findings.

[Insert Table 5]

5 Factors Driving the Strategic Disclosure of Green Suppliers

In this section, we further examine the channels that moderate strategic disclosure. We elaborate on the analysis and results below.

5.1 Customer Firm Characteristics as Moderating Channels

We first inspect the customer firm's internal aspects, i.e., firm-specific characteristics. We find that customers that have worse environmental ratings, care more about brand image and reputation, and are owned more by institutional investors are more likely to strategically disclose their suppliers according to the suppliers' environmental ratings.

We extend the same baseline model to include an interaction term between the supplier's *Envscore* and each customer firm attribute as a moderator, as below:

$$\begin{aligned} Disclose^{c}_{i,j,t} =& \alpha + \beta_1 \times Envscore^{s}_{j,t-1} + \beta_2 \times Envscore^{s}_{j,t-1} \times Moderator^{c}_{i,t} \\ &+ \beta_3 \times Moderator^{c}_{i,t} + \phi_s \times Z^{s}_{j,t} + FE + \epsilon_t \end{aligned} \tag{2}$$

We consider the following moderating customer firm attributes: the customer's environmental rating, SG&A, and share of institutional ownership. The results for the marginal effects of the moderators are shown in Table 6.

[Insert Table 6]

Column (1) shows that customer firms with low environment scores are more likely to strategically disclose suppliers based on their environmental ratings. This is because firms already lagging in environmental performance may have fewer resources to invest in CSR improvements to their product life cycles other than strategically disclosing green suppliers. Therefore, they prefer to "talk the walk" instead of pushing changes to become more environmentally friendly.

Servaes and Tamayo (2013) find that CSR affects firm value only through its interaction with advertising intensity. Harjoto and Jo (2011) find that high-CSR firms on average spend more on advertising and have a larger share of institutional holding. In Column (2), we examine a firm's spending on advertising, as proxied by SG&A. We find that firms with more advertising spending conduct more supply chain strategic disclosure. These firms care more about reputation and consumer awareness (Servaes and Tamayo, 2013) and thus, have more incentive to create a better CSR image through the strategic disclosure of green suppliers.

In addition, we find that firms with more institutional ownership perform more supply chain strategic disclosure, as shown in Column (3) in Table 6. Prior papers show that institutional investors value portfolio firms' CSR performance (Flammer, 2015; Hartzmark and Sussman, 2019; Kim et al., 2019). For example, Dyck et al. (2019) and Choi et al. (2020) find that a firm's CSR performance is lower when the institutional investors are distracted and pay little attention to its operations. In particular, Our results add empirical evidence and show that firms cater to institutional investors by strategically disclosing green suppliers.

5.2 Public Awareness of Climate Change

We next inspect the role of external attributes of customer firms. We find that customers in countries with higher public environmental awareness may intensify their strategic disclosure of green suppliers and strategic non-disclosure of less green suppliers.

The mechanism we propose is that increased general awareness of climate change attracts more stakeholder attention to corporate environmental management. However, this greater public awareness of climate change may also increase the incentive for a customer to manage its environmental image through the strategic disclosure and non-disclosure of suppliers.

[Insert Table 7]

We employ abnormal temperatures and wildfires as exogenous shocks to public awareness of climate change. The news headlines in the summer of 2022 have been dominated by reports of heatwave events in the UK, across Europe, and the USA, putting much stress on society to deal with climate change. Existing literature also shows that high abnormal temperature increases public awareness of global warming (Lang, 2014; Herrnstadt and Muehlegger, 2014) as well as investor preference for "cleaner" firms in the capital market (Choi et al., 2020). To calculate abnormal temperature, we refer to Choi et al. (2020) and decompose local temperatures into three components, which account for year-average, seasonal, and the residual abnormal temperatures.[8] Considering abnormally high temperature increases the public awareness of climate change, which is people-related, we use population density as the weight to calculate the weighted average of country-level abnormal temperature. Column (1) of Table 7 reports the results. The positive coefficient of the interaction term between $Envscore^s$ and $AbTemp^c$ shows that customer firms are more likely to do strategic disclosure if they experience abnormally high temperatures.

Wildfires have caused severe damage in recent decades. In terms of climate, wildfires are driven by climate change and help further propel it. Public awareness of climate change increases when people abandon their houses due to wildfires and witness burnt forests and scorched animals. We construct a dummy $WildFire^c$, which equals one if at least one wildfire occurs in the country/state in which the customer is located in a given year.[9] Data on wildfire events are obtained from the

[8]We obtain historical weather data from the Terrestrial Air Temperature and Precipitation data. This data gives terrestrial gridded monthly time series from 1900 to 2017, i.e., worldwide monthly mean temperature and precipitation data at 0.5*0.5 degree resolution (approximately 56km*56km at the equator). The database interpolates values for each grid node from an average of 20 different weather stations, with corrections for elevation. The calculation method is as follows.

$$Temperature_{i,t} = Average\_Temp_{i,t} + Mon\_Temp_{i,t} + Ab\_Temp_{i,t}$$

where $Temperature_{i,t}$ is the monthly temperature of grid i in time t, $Average\_Temp_{i,t}$ is the average monthly local temperature in grid i over the 120 months prior to time t; $Mon\_Temp_{i,t}$ is the average deviation of this month's temperature from the $Average\_Temp_{i,t}$, that is, the average temperature in grid i in the same calendar month over the last 10 years minus $Average\_Temp_{i,t}$; and $Ab\_Temp_{i,t}$ is the remainder. We focus on $Ab\_Temp_{i,t}$ and then we average monthly $Ab\_Temp_{i,t}$ to the year level.

[9]For U.S. firms, $WildFire^c$ equals 1 if a wildfire occurs in the state in which the customer firm is located; for non-U.S. firms, $WildFire^c$ equals 1 if a wildfire occurs in the country in which the customer firm is located.

EM-DAT database, which records core disasters across the world from 1990 to the present day. Column (2) of Table 7 reports the results. The positive coefficient of the interaction term between $Envscore^s$ and $WildFire^c$ indicates that customers are more likely to strategically disclose green suppliers if wildfires occur around the firms.

5.3 Government Regulation and Supply Chain Strategic Disclosure

Strategically disclosing green suppliers and concealing dirty ones add difficulty for the public to determine whether the product cycle is environmentally responsible. Thus far, all of the mechanism analyses reinforce our main results. So how can we stop such opportunistic supply chain strategic disclosure? In this section, we identify one factor that mitigates strategic disclosure behavior. Using country-level government regulatory policy implementation, we find that information transparency reduces such behavior; as such supply-chain relationship strategic disclosure behavior gains fewer rewards when the market is more transparent in terms of information.

We collect a comprehensive sample of significant changes to mandatory environment reporting requirements around the world, as shown in Appendix Table A2. The main data source for environmental regulation changes is the website called Carrots & Sticks[10], which collects ESG and sustainability policies for each country. Although none of the reporting regulations clearly demand that firms must disclose their supplier lists, it is reasonable to believe that information transparency regarding CSR increased to some extent after the regulations were implemented.

[Insert Table 8]

We construct a dummy that equals one if mandatory reporting requirements are in effect. In Column (1), Table 8, we first show that mandatory environment reporting requirements make customer firms more likely to disclose their suppliers. In the next column, we interact the mandatory

[10]https://www.carrotsandsticks.net/

reporting requirements dummy variable with the supplier environment score. The results shown in Column (2) use the most stringent customer-by-year fixed effects. The negative coefficients of the interaction term indicate that supply chain strategic disclosure reduces after the implementation of mandatory disclosure and reporting policies, which agrees with the theoretical predictions made by Wu et al. (2020). We further ensure that our results on government regulation are not spurious by adding interaction terms between the supplier environment score and characteristics of the customer country after taking into account that other country-level factors, such as developed economy status and governance strength, might correlate with the regulation change and may impact greenwashing behaviors. As shown in Column (3), our results are still robust after controlling for these interaction terms. In summary, mandatory environment reporting requirements not only make customer firms disclose more suppliers but also make them less likely to selectively disclose green suppliers.

6 Supply Chain Strategic Disclosure and Financial Outcomes

The previous sections show that customers strategically disclose green suppliers while not disclosing less green suppliers. In this section, we attempt to determine whether investors, analysts, and consumers correctly understand customer firms' strategic supply chain disclosure behaviors. If not, whether customer firms benefit from such behaviors.

Several greenwashing studies debate the financial and product market outcomes of greenwashing. Some suggest that by greenwashing itself, a firm can manipulate consumers to perceive a more positive corporate image. Lyon and Maxwell (2011) show that a firm's disclosure of a single positive environmental outcome can lead consumers to believe it has other positive outcomes as well. Intuitively, greenwashing helps firms to alleviate the pressures of regulation and public demand and thus save costs. However, some studies find negative effects of greenwashing. Parguel et al. (2011) conclude that consumers seek to determine a firm's intrinsic motivations rather than their

extrinsic images, which mediates the effects of CSR claims. Chen and Chang (2013) find that greenwashing increases consumer confusion and perceptions of risks, thereby reducing consumers' "green trust" of environmental claims.

Unlike the studies mentioned above, which focus on corporations' own greenwashing activities, we study the outcome of supply chain strategic disclosure (supply chain greenwashing). We divide the suppliers into three categories based on their environmental score. We construct a dummy ($High$) that equals one if the supplier environmental score is above the seventieth decile and a dummy ($Middle$) that equals one if the supplier environmental score is below the seventieth decile and above the thirtieth decile. We then interact $High$ ($Middle$) with $Disclose^c$, which denotes whether the supplier is voluntarily disclosed by the customer fidisrms. We include control variables from both the customer and supplier sides and use customer firm + year * country * industry fixed effect, as the granularity of outcome variables is customer firm by year. We first look at financial market reactions, including abnormal stock returns and analysts' forecasted earnings per share (EPS). We calculate the annual abnormal stock return as the cumulative value of the abnormal daily stock return, which is adjusted by Fama-French three factors. We obtain analysts' forecasted EPS from the IBES database. We focus on the forecast for the next fiscal year and use the median value of the forecast from all analysts. To mitigate reverse causality, we use the market reaction variables (i.e., $StockReturn^c$ and $ForecastEPS^c$) of the next year after disclosure. The main coefficient of interest is the interaction of $High$ and $Disclose^c$, i.e., the effect of disclosing a green supplier compared with having a green supplier but do not voluntarily disclose it, and the interaction of $Middle$ and $Disclose^c$, i.e., the effect of disclosing a medium-level green supplier compared with having such a supplier but withhold the information. In situations where a supply-chain relationship is openly acknowledged through means such as annual reports, investor presentations, company websites, and press releases, the mere voluntary disclosure of this relationship by customers should

not predict future financial market reactions. Assuming investors and analysts are rational and sufficiently attentive, they should factor in the presence of green suppliers into their forecasts and stock expectations. However, whether these green suppliers are disclosed voluntarily by customer firms should not significantly impact their assessments.

The findings presented in Table 9 suggest that investors place a higher value on customer firms that opt to voluntarily disclose their association with green suppliers in the previous year, as opposed to firms that have green suppliers but choose not to disclose this information. However, the act of disclosing a green supplier at a medium level does not yield a significant increase in abnormal stock returns. Moving to the following column, it becomes apparent that analysts exhibit a higher level of sophistication compared to investors, as their EPS forecasts remain largely unaffected by the disclosure behaviors of customer firms regarding their strategic supply chain choices. Our investigation then shifts to exploring whether such strategic supply chain disclosures contribute to improved firm performance. In Column (3) of Table 9, we present the results related to asset turnover (Sales/Asset). These outcomes indicate that, when compared to firms that have green suppliers but refrain from voluntarily disclosing these affiliations, companies that choose to disclose their relationships with highly environmentally-rated suppliers experience an enhancement in asset turnover. This suggests that the deliberate disclosure of select green suppliers serves to attract customers and bolster firm performance.

[Insert Table 9]

The rationale behind the incorrect interpretation of the strategic disclosure of suppliers by investors and consumers might stem from the contrasting nature of product-level greenwashing mechanisms and those underlying supply chain greenwashing (referred to as supply chain strategic disclosure). This disparity arises due to consumers holding diverse perceptions and attitudes toward these two aspects. On one hand, consumers are grappling with an overwhelming influx of products

labeled as "eco-friendly." Simultaneously, there's an increasing public consciousness surrounding green products. Consumers have become skeptical about the professed environmentally beneficial attributes of products. This skepticism leads them to make sure company's genuine motivations. Consequently, numerous studies have discovered that the act of product-level greenwashing holds adverse consequences for those engaging in such practices.(Parguel et al., 2011; Chen and Chang, 2013).

On the other hand, public awareness of the green supply chain is relatively weak and shallow compared to single products, because consumers do not have a sophisticated knowledge of the supply chain production. For example, people may prefer new energy cars. However, few people care about whether the entire manufacturing process for such cars, from raw material collection to the manufacturing production of electric motors and batteries and the final assembly, is green. Therefore, claiming that suppliers are green might be the spark that attracts consumers' attention in the period we are examining. Our research suggests that more attention should be paid to both the voluntarily disclosed suppliers and those not. In this way, consumers would gradually understand a firm's actual environmental performance, thus reducing its greenwashing benefits.

7 Additional Analyses

7.1 Alternative Measure of the US Supply Chain Relationships

Our main analyses rely on customer-supplier relationships recorded in FactSet Revere to measure the existence of supply chain relationships. However, since FactSet Revere only contains supply chain relationships that have been disclosed by either suppliers or customers, it is possible that the customer-supplier relationships in FactSet Revere are not complete. To address this potential limitation, we explore an alternative method for measuring these relationships in this section.

In this section, we use the Panjiva database to construct supply chain relationships for US firms. The Panjiva database contains data on sea-based imports to the US at the transaction level, based on the Bill of Lading Manifest. Firms are required to report all physical imports to US Customs and Border Protection (CBP) using the Bill of Lading Manifest, which includes detailed transaction information such as the supplier's and customer's names and addresses, a description of the goods, the quantity imported or exported, and other transaction-specific details. Panjiva, a subsidiary of S&P's Global Market Intelligence, processes the raw bill of lading information and links the supplier and customer entities to their ultimate parent firms with identifiers that are compatible with S&P's Capital IQ and Compustat databases. We combine the supply chain relationships recorded in the FactSet Revere database with those relationships recorded in Panjiva. To ensure consistency, we restrict the supply chain relationships in FactSet Revere to US customer firms and foreign supplier firms, as Panjiva only contains data on US importers and their foreign suppliers. We consider a supply chain relationship to be voluntarily disclosed by the customer firm if it is captured by FactSet Revere and the customer firm is the source of the disclosure.

[Insert Table 10]

Table 10 presents the results of our analysis using an alternative sample. The coefficients of $Envscore^s$ remain statistically significant and robust across different specifications, suggesting that our main results are not driven by unobserved factors that affect non-customer disclosed relationships. One advantage of using Panjiva is that it contains supply chain relationships that are not disclosed by both customers and suppliers, making it a more complete set of supply chain relationships for US customer firms and their foreign suppliers. This reduces the potential for endogenous relationship disclosure issues. However, it should be noted that Panjiva only records US firms and their international suppliers, which is only a small part of the entire supply chain. As such, we do not use this sample in our main analyses. Overall, the results from Table 10 further

confirm the robustness of our main findings.

7.2 Matching on the Supplier's Attributes

Table 4 shows that in addition to the environmental performance of the supplier, other supplier characteristics can significantly affect the probability of them being disclosed by the customer, i.e., the customers tend to disclose suppliers with better financial performance and of more importance. It is possible that suppliers with high and low environmental scores are different in unobserved characteristics and thus bias our estimation.

[Insert Table 11]

To address this concern, we use the coarsened exact matching method without replacement to allocate the treated and control firms into different groups, wherein a treated firm has one matched control firm. We divide the total sample into two groups: one group comprises the supply chain links with the suppliers with high environmental scores, and the other group comprises the links with the suppliers with low environmental scores. We then match the two groups based on the supplier's size, ROA, Tobin's Q, R&D expenditure, and institutional ownership within the same supplier industry and year. Thus, the suppliers in the treated and control groups are of similar significance to the customers in terms of all attributes except for their environmental scores. Table 11 shows the results using the matched sample. The coefficient of $Envscore^s$ remains positive and significant.[11]

[11]Since matching greatly reduces the effective sample size of supply chain observations, we use the full sample for other tests.

8 Conclusion

In this study, we investigate ESG in the setting of voluntary supply chain disclosure. We uncover robust empirical evidence showing that listed firms strategically disclose environmentally friendly suppliers while strategically not disclosing suppliers with poor environmental performance, i.e., they conduct supply chain greenwashing. This is a prevalent behavior in the sample of more than 40 major countries or regions around the world that we study. Our findings on the strategic disclosure of green suppliers are consistent with studies such as Li and Wu (2020) that more and more firms have been combining poor environmental performance with positive communication about environmental performance.

We identify some factors that can moderate strategic disclosure of suppliers by the supplier's environmental rating. In terms of firm-specific attributes, we find that customer firms that have worse environmental ratings, care more about brand image and reputation, and have larger shares of institutional holdings are more likely to conduct such strategic disclosure. We adopt abnormal temperatures and the occurrence of wildfires to show that public concerns about climate change do induce listed firms to strategically disclose more aggressively. Using country-level regulatory policy implementations, we find that information transparency reduces such behavior. Finally, we study the outcomes of strategically disclosing green suppliers and find that investors and consumers do not correctly understand customer firms' strategic supply chain disclosure and give them premiums.

Our findings have several social welfare implications for understanding the green practices of listed firms. First, we recommend that consumers and investors become more knowledgeable and pay attention to listed firms' strategic disclosures with respect to their ESG image. Suppose consumers and investors do not become savvy enough to detect greenwashing. In that case, companies that actually have superior environmental performance in terms of the supply chain may not receive fair recognition. Second, our findings are also relevant to government regulators and NGOs.

Countries around the world have implemented various regulations on environmental responsibility, which usually focus directly on focal firms' behaviors but pay less attention to their suppliers. As a result, it is possible for some profit-driven firms to hide environmentally polluting production processes in their complex supply chains, as strategic disclosure of the supply chain for a green image is more hidden and difficult to detect. Therefore, from the perspective of firms' environmental footprint, regulations that aim to increase transparency in the firm's supply chain network should be strengthened.

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Table 1: Summary Statistics

This table reports summary statistics of the dependent variable, a dummy variable ($Disclose^c$) which denotes whether the supply chain relationship is disclosed by the customer, the independent variable, i.e., the lag value of the supplier's environment score ($Envscore^s$), control variables of the supplier side, moderating variables, and outcome variables. $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. Control variables are size ($Size^s$, measured by the log of assets), return on assets (ROA^s), the proportion of institutional holdings ($InstOwn^s$), the ratio of R&D expenses to total sales ($R\&D^S$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$) of suppliers. Moderating variables related to the customer are the customer firm's environmental score ($Envscore^c$), the ratio of selling, general, and administrative expenditures to total sales ($SG\&A^c$), the proportion of institutional holdings ($InstOwn^c$), abnormal temperature of the customer firm's country ($AbTemp^c$), the occurrence of wildfire around the customer firm ($WildFire^c$), and the dummy variable that denotes whether mandatory regulations related to environmental disclosure are in effect in the customer country ($Regulation^c$). Outcome variables are customer's asset turnover, i.e., Sales/Asset ($AssetTurnover^c$), annual abnormal stock return ($StockReturn^c$), and analysts' forecasted earnings per share (EPS), i.e., $ForecastEPS^c$ in the next year of disclosure.

Variable	Obs.	Mean	Std Dev	Median	p10	p90
Dependent and Independent Variables						
$Disclose^c$	203057	0.51	0.50	1.00	0.00	1.00
$Envscore^s$	203057	0.66	0.32	0.83	0.14	0.95
Control Variables						
$Size^s$	203057	23.07	1.73	22.97	20.85	25.43
ROA^s	203057	0.08	0.09	0.07	0.00	0.17
$InstOwn^s$	203057	0.53	0.32	0.54	0.12	0.96
$R\&D^s$	203057	0.20	0.88	0.04	0.00	0.22
$Tobin'sQ^s$	203057	1.96	1.30	1.53	0.97	3.45
$DisRatio^s$	203057	0.37	0.22	0.34	0.09	0.71
Moderating Variables						
$Envscore^c$	110645	71.55	28.81	87.52	17.24	94.67
$SG\&A^c$	181793	0.24	0.19	0.18	0.05	0.48
$InstOwn^c$	203057	0.42	0.33	0.32	0.03	0.92
$AbTemp^c$	151333	0.17	0.41	0.16	-0.44	0.78
$WildFire^c$	203057	0.14	0.35	0.00	0.00	1.00
$Regulation^c$	203057	0.30	0.46	0.00	0.00	1.00
Outcome Variables						
$AssetTurnover^c$	198677	0.99	0.79	0.77	0.24	1.99
$StockReturn^c$	156783	-0.00	0.32	-0.01	-0.42	0.41
$ForecastEPS^c$	177579	2.26	3.47	1.25	0.01	6.09

Table 2: Supplier and Customer Firm Distribution

This table reports the number of supplier–year and customer–year observations in each country or region listed in the FactSet Revere database.

	Number of			Number of	
Country/Region	**Suppliers**	**Customers**	**Country/Region**	**Suppliers**	**Customers**
Argentina	357	436	Malaysia	1768	2012
Australia	4120	5180	Mexico	1017	1272
Austria	429	512	Netherlands	1164	1324
Belgium	717	818	New Zealand	510	576
Bermuda	2635	2976	Norway	991	1216
Brazil	1935	2531	Pakistan	512	838
Canada	6078	7789	Peru	329	667
Chile	1097	1351	Philippines	726	991
China	13422	13124	Poland	1194	1337
Denmark	601	698	Russia	1308	1837
Finland	708	845	Portugal	181	309
France	3627	3869	Singapore	1943	2158
Germany	3632	3811	South Africa	1098	1428
Greece	417	601	Spain	914	1051
Hong Kong	905	1236	Sweden	2438	2460
India	5136	7365	Switzerland	1739	1841
Indonesia	2961	3495	Taiwan	6859	6213
Ireland	541	660	Thailand	1888	2356
Israel	2342	2278	Turkey	1098	1426
Italy	1747	1841	United Kingdom	7130	9070
Japan	19603	18696	United States	53081	56012
South Korea	8529	8327	Viet Nam	649	1083

Table 3: Model-Free Estimation

This table presents the results of the model-free estimation. Suppliers are classified into two groups depending on whether they are voluntarily disclosed by the customers or passively disclosed, i.e., not disclosed by the customers, but by the suppliers themselves. Panel A reports the quintile averages of the environmental scores ($Envscore^s$) of the two groups in percentage points. Column (3) shows the differences between the two groups. In Panel B, suppliers are sorted based on their size and environmental score into 25 groups. Each cell shows the average difference in $Envscore^s$ between voluntarily disclosed and passively disclosed suppliers. * p <0.1, ** p < 0.05, *** p < 0.01 indicate the significance level using two-tailed tests.

Panel A: Model-free estimation sorted by the supplier's environmental score (%)

$Envscore^s$ Quintiles	$Envscore^s$ (%) for Voluntarily-Disclosed Suppliers	$Envscore^s$ (%) for Passively-Disclosed Suppliers	Difference
	(1)	(2)	(3)
1	25.81	12.84	12.96***
2	75.42	26.03	49.39***
3	90.64	58.90	31.74***
4	93.61	85.04	8.57***
5	95.06	93.59	1.47***
Total	76.10	55.27	20.83***

Panel B: Model-free estimation sorted by the supplier's environmental score (%) and size

	Supplier's size Quintiles				
$Envscore^s$ Quintiles	*Low*	2	3	4	*High*
Low	9.17***	12.97***	13.60***	14.44***	20.35***
2	45.70***	46.23***	48.92***	50.53***	53.60***
3	32.93***	31.76***	31.33***	27.25***	30.75***
4	9.62***	8.52***	8.33***	8.21***	7.75***
High	2.09***	1.78***	1.31***	1.36***	1.16***

Note:* p <0.1, ** p < 0.05, *** p < 0.01 indicate the significance level using two-tailed tests.

Table 4: Main Results

This table presents the baseline results from the regression of the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed voluntarily by the customer based on the supplier's environment score ($Envscore^s$), as described below. The supplier's environmental score is lagged by one year.

$$Disclose^c_{i,j,t} = \alpha + \beta \times Envscore^s_{j,t-1} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

Control variable Z^s represents the firm characteristics of the supplier firm. It comprises the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables are z-scored. All of the variables are defined in Appendix Table A1. The observation number is the number of customer–supplier–year observations. The regressions also include intercepts and different combinations of customer firm fixed effects and year, industry, and country fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)				
	(1)	(2)	(3)	(4)	(5)
$Envscore^s$	0.046***	0.044***	0.046***	0.043***	0.039***
	(8.706)	(8.402)	(8.739)	(8.149)	(7.122)
$Size^s$	0.104***	0.104***	0.104***	0.102***	0.096***
	(55.075)	(55.177)	(54.906)	(53.462)	(48.132)
ROA^s	0.004***	0.003**	0.003**	0.002**	0.001
	(3.052)	(2.351)	(2.465)	(2.069)	(1.012)
$InstOwn^s$	-0.008***	-0.007***	-0.008***	-0.007***	-0.005***
	(-5.675)	(-4.877)	(-5.278)	(-4.531)	(-3.338)
$R\&D^s$	0.002**	0.002**	0.002	0.002**	0.001
	(1.995)	(2.061)	(1.557)	(2.146)	(1.291)
$Tobin'sQ^s$	0.012***	0.012***	0.012***	0.012***	0.013***
	(8.573)	(8.929)	(9.068)	(8.781)	(8.951)
$DisRatio^s$	0.083***	0.082***	0.082***	0.079***	0.074***
	(50.278)	(49.773)	(49.806)	(47.693)	(42.466)
Constant	0.480***	0.481***	0.480***	0.483***	0.481***
	(132.574)	(133.149)	(132.226)	(131.824)	(126.031)
Fixed Effect	Customer Firm+ Year	Customer Firm+ Country* Year	Customer Firm+ Industry* Year	Customer Firm+ Country* Industry* Year	Customer Firm* Year
Observations	203,057	203,057	203,057	203,057	203,057
R-squared	0.692	0.696	0.695	0.710	0.738

Table 5: Selective Disclosure by Low Environmental Rating Customer Firms

This table presents the results using the subsample of which the customer firm's environmental score is below the median value. The regression specification is the same as Table 4. The dependent variable is the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed voluntarily by the customer. The independent variable is the supplier's environment score ($Envscore^s$), as described below. The supplier's environmental score is lagged by one year.

$$Disclose^c_{i,j,t} = \alpha + \beta \times Envscore^s_{j,t-1} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

Control variable Z^s represents the firm characteristics of the supplier firm. It comprises the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables are z-scored. All of the variables are defined in Appendix Table A1. The observation number is the number of customer–supplier–year observations. The regressions also include intercepts and different combinations of customer firm fixed effects and year, industry, and country fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)				
	(1)	(2)	(3)	(4)	(5)
$Envscore^s$	0.053***	0.051***	0.050***	0.051***	0.047***
	(5.186)	(4.927)	(4.883)	(4.815)	(4.312)
$Size^s$	0.123***	0.123***	0.123***	0.120***	0.116***
	(34.775)	(34.623)	(34.869)	(33.104)	(31.420)
ROA^s	0.007***	0.007***	0.007***	0.008***	0.007***
	(3.634)	(3.456)	(3.499)	(3.680)	(3.329)
$InstOwn^s$	-0.011***	-0.010***	-0.012***	-0.011***	-0.009***
	(-3.997)	(-3.540)	(-4.070)	(-3.715)	(-3.082)
$R\&D^s$	0.004**	0.004**	0.004**	0.005***	0.004**
	(2.391)	(2.478)	(2.198)	(2.619)	(2.167)
$Tobin'sQ^s$	0.016***	0.016***	0.017***	0.016***	0.016***
	(6.670)	(6.614)	(6.876)	(6.282)	(6.227)
$DisRatio^s$	0.106***	0.105***	0.105***	0.103***	0.098***
	(35.406)	(35.226)	(34.954)	(33.787)	(30.881)
Constant	0.428***	0.430***	0.430***	0.432***	0.438***
	(62.007)	(62.116)	(62.356)	(61.115)	(60.089)
Fixed Effect	Customer Firm+ Year	Customer Firm+ Country* Year	Customer Firm+ Industry* Year	Customer Firm+ Country* Industry* Year	Customer Firm* Year
Observations	55,338	55,338	55,338	55,338	55,338
R-squared	0.629	0.634	0.637	0.653	0.679

Table 6: Moderator: Customer Firm Characteristics

This table presents the results of the regression of the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed by the customer based on the supplier's environment score ($Envscore^s$), moderating factors (X), and the interaction term between$Envscore^s$ and moderating factors (X).

$$Disclose^c_{i,j,t} = \alpha + \beta_1 \times Envscore^s_{j,t-1} + \beta_2 \times Envscore^s_{j,t-1} \times X^c_{i,t} + \beta_3 \times X^c_{i,t} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

X denotes customer firm attributes such as the environmental score of the customer ($Envscore^c$), the ratio of selling, general and administrative expenditure to total sales ($SG\&A^c$), and proportion of institutional ownership ($InstOwn^c$). Control variables represent the firm characteristics of the supplier. They comprise the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InstOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables and moderating variables are z-scored. All specifications employ the strictest fixed effects, i.e., customer firm-by-year fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)		
	(1)	(2)	(3)
$Envscore^s \times Envscore^c$	-0.033***		
	(-5.438)		
$Envscore^s \times SG\&A^c$		0.014***	
		(3.032)	
$Envscore^s \times InstOwn^c$			0.055***
			(11.645)
$Envscore^s$	0.044***	0.047***	0.030***
	(6.122)	(7.905)	(5.555)
Controls	Yes	Yes	Yes
Fixed Effect	Customer Firm* Year	Customer Firm* Year	Customer Firm* Year
Observations	110,645	181,793	203,057
R-squared	0.632	0.734	0.739

Table 7: Moderator: Public Awareness

This table presents results from the regression of the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed by the customer based on the supplier's environment score ($Envscore^s$), and the interaction of $Envscore^s$ and variables related to public awareness of climate change and country-level regulations on CSR disclosure. Variables related to public awareness of climate change include the abnormal temperature weighted by the population density of the customer firm's country and the occurrence of wildfires ($WildFire^c$) around the customer firm.

$$\begin{aligned} Disclose^c_{i,j,t} =& \alpha + \beta_1 \times Envscore^s_{j,t-1} + \beta_2 \times Envscore^s_{j,t-1} \times X^c_{i,t} + \beta_3 \times X^c_{i,t} \\ &+ \phi_s \times Z^s_{j,t} + FE + \epsilon_t \end{aligned}$$

Control variables include firm characteristics of the supplier firm. They are the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InstOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ is divided by 100 from the raw scores in ASSET4 to normalize to the range of 0 to 1. All of the control variables and variables for the characteristics of the customer's country are z-scored. All specifications employ the strictest fixed effects, i.e., customer firm-by-year fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)	
	(1)	(2)
$Envscore^s \times AbTemp^c$	0.012***	
	(3.745)	
$Envscore^s \times WildFire^c$		0.076***
		(6.660)
$Envscore^s$	0.037***	0.029***
	(5.929)	(5.042)
Controls	Yes	Yes
Fixed Effect	Customer Firm* Year	Customer Firm* Year
Observations	151,333	203,057
R-squared	0.737	0.738

Table 8: Moderator: Mandatory Environmental Reporting Regulations

Column (1) of this table reports the results of the regression of the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed by the customer firm on the supplier's environment score ($Envscore^s$) and the dummy variable ($Regulation^c$), which denotes whether mandatory regulation related to CSR disclosure is in effect in the customer country. Column (2) adds the interaction of $Envscore^s$ and $Regulation^c$. As robustness checks, Column (3) adds interaction terms between $Envscore^s$ and characteristics of the customer firm's country, such as economic development (measured by GDP per capita) and the score of governance quality.

Control variable Z^s represents the firm characteristics of the supplier firm. It comprises the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables are z-scored. All of the variables are defined in Appendix Table A1. The observation number is the number of customer–supplier–year observations. The regressions also include intercepts. Column (1) adopts customer firm and year-industry fixed effect, and Columns (2) and (3) adopt customer firm-by-year fixed effect. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)		
	(1)	(2)	(3)
$Envscore^s$	0.045***	0.053***	0.048***
	(8.367)	(8.167)	(7.376)
$Regulation^c$	0.024***		
	(4.610)		
$Envscore^s \times Regulation^c$		-0.051***	-0.037***
		(-5.381)	(-3.557)
$Envscore^s \times EconomicDevelopment^c$			0.032***
			(3.514)
$Envscore^s \times GovernanceQuality^c$			-0.028***
			(-3.402)
Controls	Yes	Yes	Yes
Fixed Effect	Customer Firm+ Year*Industry	Customer Firm* Year	Customer Firm* Year
Observations	192,813	192,813	192,813
R-squared	0.694	0.737	0.737

Table 9: Outcome of Strategic Disclosure

This table shows the results from regressions of the financial performances and market reactions of the customer firm on the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed by the customer, dummy variable ($High$), which denotes whether the supplier's environment score is above the seventieth decile, dummy variable ($Middle$), which denotes whether the supplier's environment score is below the seventieth decile but above the thirtieth decile, and the interaction term between $Disclose^c$, and $High$ and $Middle$, respectively. Dependent variables, i.e., financial performances and market reactions towards the customer firm, include annual abnormal stock return ($StockReturn^c$), analysts' forecasted earnings per share ($ForecastEPS^c$), and asset turnover ($AssetTurnover^c$). All dependent variables are forwarded by one year.

$$Outcome^c_{i,t+1} = \alpha + \beta_1 \times Disclose^c_{i,j,t} + \beta_2 \times Disclose^c_{i,j,t} \times High^s_{j,t} + \beta_3 \times Disclose^c_{i,j,t} \times Middle^s_{j,t} + \beta_4 \times High^s_{j,t} + \beta_5 \times Middle^s_{j,t} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

Unreported control variables include the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). All of the control variables are z-scored. All specifications employ the strict (customer firm + year * country * industry) fixed effects. Observations denote the number of customer-supplier-year observations. Standard errors are clustered at the customer-supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels denoted at the 10%, 5%, and 1% levels, respectively.

Variables	$StockReturn^c$	$ForecastEPS^c$	$AssetTurnover^c$
$Disclose^c \times High$	0.007**	-0.021	0.005*
	(1.998)	(-0.885)	(1.828)
$Disclose^c \times Middle$	0.003	-0.023	0.002
	(0.855)	(-1.070)	(0.814)
$Disclose^c$	0.003	0.018	-0.001
	(1.080)	(0.853)	(-0.314)
$High$	-0.002	-0.013	-0.003*
	(-0.947)	(-0.740)	(-1.876)
$Middle$	0.001	-0.013	-0.002
	(0.318)	(-1.008)	(-1.136)
Controls	Yes	Yes	Yes
Customer Firm	Yes	Yes	Yes
Country*Industry*Year	Yes	Yes	Yes
Observations	156,783	177,579	198,677
R-squared	0.467	0.879	0.962

Table 10: Robustness Checks Using the US Customs Bill of Lading

This table presents the results using the combination of supply chain relationships constructed based on the US Customs Bill of Lading and Factset Revere. The sample is restricted to US customer firms and foreign (non-US) supplier firms. The dependent variable is the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed voluntarily by the customer. The independent variable is the supplier's environment score ($Envscore^s$), which is lagged by one year.

$$Disclose^c_{i,j,t} = \alpha + \beta \times Envscore^s_{j,t-1} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

Control variable Z^s represents the firm characteristics of the supplier firm. It comprises the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables are z-scored. All of the variables are defined in Appendix Table A1. The observation number is the number of customer–supplier–year observations. The regressions also include intercepts, and different combinations of customer firm fixed effects and year and industry fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)			
	(1)	(2)	(3)	(4)
$Envscore^s$	0.081***	0.031***	0.031***	0.036***
	(5.801)	(3.127)	(3.143)	(3.261)
$Size^s$	0.046***	0.036***	0.036***	0.035***
	(9.964)	(10.761)	(10.790)	(9.475)
ROA^s	0.003	0.006***	0.006***	0.006**
	(0.978)	(2.611)	(2.590)	(2.279)
$InstOwn^s$	0.017***	0.009***	0.010***	0.010***
	(4.660)	(3.408)	(3.472)	(3.207)
$R\&D^s$	-0.000	-0.002	-0.003*	-0.003*
	(-0.238)	(-1.502)	(-1.675)	(-1.698)
$Tobin'sQ^s$	0.015***	0.001	0.000	-0.000
	(3.887)	(0.206)	(0.161)	(-0.071)
$DisRatio^s$	0.214***	0.097***	0.096***	0.091***
	(61.907)	(27.481)	(26.940)	(22.433)
Constant	0.221***	0.259***	0.259***	0.239***
	(20.564)	(33.491)	(33.374)	(27.413)
Fixed Effect	No	Customer Firm+Year	Customer Firm+Year*Industry	Customer Firm*Year
Observations	47,042	47,042	47,042	47,042
R-squared	0.279	0.681	0.686	0.704

Table 11: Main Results using Matched Sample

Panel A of this table reports the main results using the matched sample. Matching criteria include the supplier's size, ROA, Tobin's Q, institutional ownership, R&D expenditure. We also restrict suppliers to be in the same industry and year between the high-score group and the low-score group. The dependent variable is the dummy variable ($Disclose^c$), which denotes whether the supply chain relationship is disclosed voluntarily by the customer firm. The independent variable is the supplier's environment score ($Envscore^s$). The supplier's environmental score is lagged by one year. Panel B of this table reports the result of the covariants balance test.

$$Disclose^c_{i,j,t} = \alpha + \beta \times Envscore^s_{j,t-1} + \phi_s \times Z^s_{j,t} + FE + \epsilon_t$$

The unreported control variable Z^s represents the firm characteristics of the supplier firm. It comprises the log of total assets ($Size^s$), return on assets (ROA^s), the proportion of shares held by institutional investors ($InsOwn^s$), the ratio of R&D expenses to total sales ($R\&D^s$), Tobin's Q ($Tobin'sQ^s$), and industry disclosure ratio ($DisRatio^s$). $Envscore^s$ obtained from the raw scores in ASSET4 is divided by 100 to normalize to the range of 0 to 1. All of the control variables are z-scored. All of the variables are defined in Appendix Table A1. The observation number is the number of customer–supplier–year observations. The regressions also include intercepts, and different combinations of customer firm fixed effects and year, industry, and country fixed effects. Standard errors are clustered at the customer–supplier pair level. T-statistics are reported in parentheses. *, **, and *** are significance levels at the 10%, 5%, and 1% levels, respectively.

Panel A: Regression results

Dependent Variable	Customer Voluntary Disclosure of Supplier ($Disclose^c$)				
	(1)	(2)	(3)	(4)	(5)
$Envscore^s$	0.105***	0.104***	0.105***	0.104***	0.094***
	(9.453)	(9.357)	(9.415)	(8.887)	(7.131)
Controls	Yes	Yes	Yes	Yes	Yes
Fixed Effect	Customer Firm+ Year	Customer Firm+ Country* Year	Customer Firm+ Industry* Year	Customer Firm+ Country* Industry* Year	Customer Firm* Year
Observations	64,082	64,082	64,082	64,082	64,082
R-squared	0.722	0.728	0.728	0.748	0.773

Panel B: T-test results

Variable	Mean Value		Difference	p-value
	High-score Suppliers	Low-score Suppliers		
$Size^s$	23.3790	23.3783	-0.0006	0.9600
ROA^s	0.0776	0.0776	0.0000	0.9910
$InstOwn^s$	0.5063	0.5062	-0.0001	0.9519
$R\&D^s$	0.1827	0.1832	0.0004	0.9468
$Tobin'sQ^s$	1.8497	1.8490	-0.0007	0.9357
$DisRatio^s$	0.3860	0.3859	-0.0001	0.9471

Appendix

Table A1: Variable Definition and Data Source

Variable	Definition	Data Source
Dependent and Independent Variables		
$Disclose^c$	Dummy=1 if supply chain relationship is disclosed by the customer firm	FactSet Revere
$Envscore^s$	A score associated with the environmental pillar of CSR rating	ASSET4
Control Variables		
$Size^s$	Natural logarithm value of total assets	Worldscope
ROA^s	Earnings before interest and taxes (EBIT)/total assets	Worldscope
$InstOwn^s$	Total proportion of shares held by institutional investors	FactSet Lionshares
$R\&D^s$	Research and development expenses/sales	Worldscope
$Tobin's\ Q^s$	(Market value of common equity+ Total Asset-Book value of common equity) divided by Total Asset	Worldscope
$DisRatio^s$	Ratio of customer firms disclosing supply chain relationship within the industry	FactSet Revere
Moderating Variables		
$Envscore^c$	A score associated with the environmental pillar of CSR rating	ASSET4
$SG\&A^c$	Selling, general, and administrative expense/sales	Worldscope
$InstOwn^c$	Total proportion of shares held by institutional investors	FactSet Lionshares
$AbTemp^c$	Country-level abnormal temperature weighted by population density	Terrestrial Air Temperature; Socioeconomic Data and Applications Center
$WildFire^c$	Dummy=1 if there are wildfires in the state (US) or country (non-US) of the customer firm	EM-DAT
$Regulation^c$	Dummy=1 if mandatory environment-related regulation is in effect	Carrots & Sticks
Outcome Variables		
$AssetTurnover^c$	Sales/Total Asset	Worldscope
$StockReturn^c$	Cumulative value of the daily abnormal stock return within a year. The daily abnormal stock return is adjusted by Fama-French three factors	Compustat
$ForecastEPS^c$	Analysts' forecasted EPS	IBES

Table A2: Mandatory Environmental Reporting Regulations

Country or Region	Starting Year	Issuer	Regulations or Requirements
Argentina	2014	Government	Sustainability reporting for companies operating in the country
Australia	2003	Regulator	Product disclosure statement
Austria	2016	Government	Transposition of EU NFR Directive
Canada	2004	Stock exchange	The TSX timely disclosure policy of ESG issues
Chile	2016	Government	Disclosures of information to evaluate suppliers on social and environmental aspects
China	2008	Stock exchange	Environmental information disclosure of listed companies
Denmark	2008	Government	Report on intellectual capital resources and environmental aspects
Finland	2016	Government	Transposition of EU NFR Directive
France	2001	Government	Public firms are required to publish information on the manner in which they address the social and environmental impacts of their activities
Germany	2016	Government	Transposition of EU NFR Directive
Hong Kong	2015	Stock exchange	Mandatory ESG reporting
Hungary	2016	Government	Transposition of EU NFR Directive
India	2015	Stock exchange	Mandatory business responsibility reporting for large listed firms
Indonesia	2016	Regulator	Mandatory ESG disclosure in the annual report
Ireland	2016	Government	Transposition of EU NFR Directive
Italy	2016	Government	Transposition of EU NFR Directive
Malaysia	2015	Stock exchange	Disclosure of a "Sustainability Statement" covering material sustainability issues
Netherlands	2016	Government	Transposition of EU NFR Directive
Norway	2013	Government	Report on human rights, labor rights and social issues, the environment and anti-corruption
Peru	2019	Regulator	Report on ESG impact
Philippines	2019	Regulator	Disclosure of ESG information
Poland	2016	Government	Transposition of EU NFR Directive
Portugal	2010	Government	Disclosure of environment issues in the annual report
Singapore	2016	Stock exchange	Annual sustainability report of listed firms
South Africa	2010	Stock exchange	An integrated report of ESG issues
Slovenia	2017	Government	Transposition of EU NFR Directive
South Korea	2012	Government	Environmental information disclosure
Spain	2012	Government	Annual sustainability report
Taiwan	2015	Stock exchange	Mandatory ESG reporting
United Kingdom	2013	Government	A standalone strategic report on GHG emissions, human rights, and diversity
Vietnam	2016	Stock exchange	Environmental and social disclosure

Note: This table summarizes all of the major environment-related disclosure regulations mandatorily implemented around the world.