Phantom of the Supply Chain:
Unintended Blocks on the Road to Green [†]

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This draft: October 2025

First draft: May 2025

Abstract

Customer firms strategically disclose relationships with environmentally responsible ("good") suppliers while concealing associations with less sustainable ("bad") suppliers. We demonstrate that this green-induced nondisclosure for unsustainable suppliers hinders the green transition of supply chains by deterring the positive influence that customer firms can exert on their suppliers' environmental performance. Notably, customer firms achieve improved environmental performance at the expense of their suppliers' environmental profiles. To establish causality, we exploit two regulatory shocks to the incentives of customer firms to avoid environmental risks. Our cross-sectional analyses show that our baseline results vary regarding three types of common stakeholders, suppliers' environmental pressure, and customer inhibition. Moreover, further analysis reveals the real effects of green-induced nondisclosure. Overall, these findings provide critical insights into the consequences of strategic disclosure and its implications for supply chain sustainability management.

JEL Classifications: G14, G32, G38, M41, Q56

Keywords: Strategic disclosure, Supply chain sustainability, Environmental performance, Carbon emissions, Green innovation

[†]For helpful comments, we thank participants at the 2025 ReBI-FRIL Workshop. The usual disclaimer applies.

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1 Introduction

Global transition to a green economy is imperative to address climate change and achieve sustainable goals as laid out by the Paris Agreement. The green transition does not rely solely on governments' efforts to implement green policy frameworks, create market mechanisms, and incentivize low-carbon practices.[1] It also requires inclusive stakeholder engagement, especially the participation of corporations, to reduce carbon emissions and output green innovations.

Supply chain management plays a crucial role in the green transition of corporations. First, the majority of a company's environmental footprint arises from the supply chain. Notably, McKinsey has estimated that the carbon emissions stemming from the supply chain (Scope 3 emission) account for approximately 90% of a company's total emissions.[2] Second, an unsustainable supply chain of firms may lead to higher compliance costs and penalties because of increasingly stringent regulations.[3] Third, firms may experience a deterioration in operating and stock performance due to the poor management of sustainability in the supply chain (e.g., Jacobs and Singhal, 2020; Lin et al., 2023; Pankratz and Schiller, 2024). Anecdotal evidence highlights a variety of strategies that firms adopt to establish a green supply chain. For exam-

[1] Examples of government efforts for green transition may include imposing carbon tax (e.g., Martinsson et al., 2024), establishing carbon emission trading system (e.g., Bai and Ru, 2024), and taking environmental performance into account when allocating governments' procurement contracts (e.g., Flammer, 2018; Kim et al., 2025)

[2] For more details, see https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-are-scope-1-2-and-3-emissions.

[3] SEC enhanced the climate-related disclosures for investors, requiring firms to disclose material climate-related information about their suppliers' activities. See https://www.sec.gov/rules-regulations/2024/03/s7-10-22formoredetails.

ple, the BMW group has committed to conducting a multistage due diligence process and launching preventive and remediation measures for unsustainable suppliers.[4] Besides, a growing body of research shows the influence that firms exert on their suppliers for better CSR practices (e.g., Dai et al., 2021; Darendeli et al., 2022; Schiller, 2018).

Nevertheless, many firms choose to shirk their obligations for the green transition and transfer environmental risks to supplier firms. Prior studies document that firms may outsource their pollution to suppliers in other states or countries, particularly when facing tightened environmental policies (e.g., Bartram et al., 2022; Dai et al., 2024; Duchin et al., 2025). One alternative strategy to avoid responsibility is selectively establishing relationships with suppliers from weaker environmental regulation enforcement (Lu et al., 2023). These green obligation evasion behaviors of firms can have negative impacts on the sustainability of the supply chain and, consequently, impede the transition to a green economy. In this paper, we focus on strategic disclosure of firms caused by their suppliers' environmental profiles and investigate whether and how this green-induced strategic disclosure behavior influences the green transition of the supply chain.

Current reporting regulations for supply chain disclosure may inadvertently encourage firms to evade and shift environmental responsibility. Specifically, while existing regulations require firms to disclose their primary customers, they do not mandate the disclosure of their suppliers.[5] Observing this voluntary disclosure na-

[4]See https://www.bmwgroup.com/en/sustainability/supply-chain.html.

[5]Previous accounting standards, such as SFAS 14 and SFAS 131, usually require that public firms

ture, Shi et al. (2023) find that customer firms tend to strategically highlight connections with environmentally responsible suppliers while concealing relationships with environmentally detrimental ones, thereby fostering a misleading green image for investors and customers.

This strategic disclosure hinders the transparency of firms' environmental profiles, thereby intensifying the green information asymmetry and preventing stakeholders from identifying and addressing unsustainable practices through the supply chain. Thus, the stakeholders' perceptions of sustainability progress are distorted, and they cannot direct the funds flows to green businesses.[6] Most importantly, the lack of mandatory disclosure of supplier information enables firms to avoid investigations by stakeholders and regulators and keep themselves innocent from collaborating with less sustainable suppliers, leading to weaker incentives to help environmentally bad suppliers improve their performance. Instead, they may even transfer environmental risk to hidden suppliers without facing punishment from stakeholders and regulators. As a result, we postulate that the green-induced strategic disclosure of customer firms impedes the green transition of the supply chain.

To explore, we construct an indicator of green-induced strategic disclosure based on whether a supplier firm is concealed by its customer and whether the supplier

disclose the information of major customers (i.e., contributing 10% or above to revenues) and the extent of dependence on these customers in their annual reports. However, the SEC amended the regulatory framework (S-K regulation) in 2020 and eliminated the 10% reporting line. Instead, firms should disclose customer information that is material to an understanding of the company's business. As there is no specific or quantitative definition of "material", firms still have discretion in their disclosure approach.

[6]Institutional investors, financial intermediaries, and customers play pivotal roles in steering capital flows to the green economy. For example, see Houston and Shan (2022); Krueger et al. (2020); Meier et al. (2022).

exhibits poor environmental performance. Specifically, supplier firms are sorted each year based on their environmental score, and those firms below the thirtieth percentile are defined as unsustainable suppliers. We then define a dummy variable, *green-induced nondisclosure*, which equals one if a supplier is both hidden by its customers and unsustainable. This measure helps partially rule out the possibility that undisclosed customer–supplier relationships arise from factors unrelated to environmental performance, such as geopolitical or operational considerations.

Our main analysis focuses on whether the green-induced nondisclosure terminates and even reverses the positive unilateral impacts of customers on suppliers' environmental performance documented by Dai et al. (2021). If so, do customers transfer the environmental risk to unsustainable suppliers and enjoy improvements in environmental profile at the expense of suppliers' sustainability? Relying on the large sample of customer-supplier relationships, we find that the positive relation between the environmental performance of customers and suppliers disappears when customers withhold supplier information due to its poor environmental performance. Intriguingly, we find a negative relation between the environmental performance of customers and suppliers under the green-induced nondisclosure, suggesting that customers may evade obligations and transfer their environmental risk to suppliers. In contrast, we document that the positive effects of customers' green practices on suppliers' environmental performance are enhanced when customer firms voluntarily unveil the relationships with unsustainable suppliers, supporting the argument that the green-induced nondisclosure serves as a tool for customers' green obligation eva-

sion.

Next, we disentangle whether the negative relation between the environmental score of customers and suppliers caused by green-induced nondisclosure can be interpreted as customers experience improved environmental performance at the expense of suppliers' sustainability. To examine, we calculate the change of suppliers' and customers' environmental score and test the effects of green-induced nondisclosure on the changes in environmental score. Unsurprisingly, we demonstrate a negative relation between green-induced nondisclosure and change in suppliers' environmental scores, whereas the relation is positive when considering the customers' environmental score change. Obviously, this evidence supports the view of green obligation evasion for customer firms. In addition, we aggregate the changes of suppliers' and customers' environmental scores, aiming to investigate whether the green-induced nondisclosure leads to an aggregated deterioration in environmental scores of suppliers and customers.[7] We show that the overall changes in environmental scores of the supply chain are negatively related to green-induced nondisclosure, suggesting an obstacle for the green transition of the supply chain.

Given the reluctance of customer firms to support the green development of hidden unsustainable suppliers, we investigate whether the customer-supplier links are more likely to be terminated when customer firms opt for concealing the information about their unsustainable suppliers.[8] Our results reveal a positive relation between

[7]Edmans (2023) sheds light on the conflicts between partial and general equilibrium regarding the environmental externalities. A firm can improve its environmental metrics at the expense of other firms, causing a negative effect on aggregate externalities.

[8]On the one hand, firms may terminate existing supply-chain links when perceiving heightened

green-induced nondisclosure and supply chain termination probability, indicating that customer firms tend to get rid of those unsustainable suppliers quickly. By comparison, customer-supplier relationships are less likely to be terminated when customer firms uncover the information of less responsible suppliers, suggesting that customers may seek long-lasting relationships when they are willing to support green practices of unsustainable suppliers.

While we have shown that green-induced nondisclosure reverses the positive relation between suppliers' and customers' environmental scores, the causal inference of this link may be subject to endogeneity problems. To alleviate these concerns and support a causal interpretation for our baseline results, we exploit two regulatory shocks that may affect the incentives of firms to evade green obligations and transfer environmental risks. Intuitively, customer firms affected by the increasing stringency of environmental regulations have stronger incentives to transfer environmental risks to suppliers rather than support their green practices since they need to promptly comply with regulatory requirements and cater to stakeholders' demands. Based on this rationale, we first focus on the enactment of greenhouse gas (GHG) emissions targets across the different US states. Relying on a triple-interaction analysis with a sample only including US customer firms, we find stronger reversing effects of green-induced nondisclosure on the relationship between suppliers' and customers' environmental scores following the establishment of state-level GHG emission targets in

environmental risks of suppliers (e.g., Lu et al., 2023; Pankratz and Schiller, 2024). On the other hand, customer firms may not be eager to sever the supply-chain relationships as they can leverage improved environmental performance through transferring risks to suppliers.

the states where customer firms reside. In a similar spirit, we adopt the enforcement of GHG emission trading systems (ETS) across regions and countries, which enables us to conduct the analysis in an international setting. As the implementation of GHG ETSs imposes greater pressure on firms to reduce carbon emissions, they may shift this burden to their suppliers. Thus, the reversing effects of green-induced nondisclosure may be stronger when customer firms are affected by GHG ETSs. Consistent with this hypothesis, our triple-interaction analysis reveals stronger reversing effects of green-induced nondisclosure on the positive association between customers' and suppliers' environmental scores after the GHG ETSs are implemented in customers' countries.

We examine the heterogeneity of the main findings from various perspectives to provide a better understanding of the mechanisms through which the green-induced nondisclosure behavior can impede the positive propagation of green practices from customers to suppliers. First, we test the channel related to information transparency. The rationale is that when these hidden relationships are disclosed by a third party, customers are under greater pressure to support unsustainable suppliers. Consistent with this conjecture, we find attenuated negative effects of green-induced nondisclosure on the link between customers' and suppliers' environmental scores when the customers and suppliers are held by common institutional investors, served by common auditors, and followed by common analysts.

Our second set of heterogeneity analysis focuses on the environmental pressure of suppliers. The resistance of customer firms to evade green obligations and shift envi-

ronmental risks may be higher when supplier firms are under tighter environmental regulations. In this case, the reversing effects of green-induced nondisclosure should be attenuated with tighter environmental regulations in suppliers' countries. We find this is indeed the case by employing the enactment of mandatory ESG disclosure in suppliers' countries and the country-level environmental performance index (EPI) as the measures for the tightness of environmental regulations. Third, we consider the customer inhibition (i.e., constraints or willingness) for supporting the green practices of supplier as customers may become more reluctant to help unsustainable suppliers when they have limited resources or incentives. We adopt financial constraints and the number of supplier firms to measure the inhibition of customer firms to support green practices of suppliers and find that financial constraints and the number of supplier firms exacerbate the effects of green-induced nondisclosure to reverse the positive relation between suppliers' and customers' environmental scores.

Finally, we investigate the real consequences of green-induced nondisclosure on supplier firms. We first focus on the carbon leakage that firms outsource their carbon emissions to supplier firms. Our results indicate that green-induced nondisclosure is positively related to carbon outsourcing behavior, that is, customers outsource part of their carbon emissions to concealed, unsustainable suppliers. In addition, we conduct supplier firm-level analysis to examine whether green-induced nondisclosure activities have long-term impacts on future green outcomes of supplier firms. Our results reveal that the green-induced nondisclosure dampen future green outcomes of affected supplier firms.

Our study contributes to the literature in several ways. First, it contributes to the burgeoning research exploring the determinants of green transition in business sectors, particularly the factors related to regulatory requirements. Conventional wisdom suggests that government mandates, such as environment-related disclosure policy and carbon trading system, are effective in reducing firm-level pollution and thus facilitate the green transition (Bai and Ru, 2024; Downar et al., 2021; Martinsson et al., 2024). Nevertheless, some studies challenge the positive effects of government mandates on green transition, documenting that firms export their pollution activities to places with weaker green policies when facing tightened regulatory requirements (Bartram et al., 2022; Ben-David et al., 2021). While prior studies mostly focus on the government's green policies that exert direct influence on firms' green transition, relatively little is known about whether policies unrelated to green practices have unintended effects on green transition in business sectors. Our study concentrates on supply-chain disclosure policy and finds that the prerogative of customer firms to voluntarily disclose their suppliers can impede the green transition since it reverses the positive unilateral effect from customers to suppliers regarding the green practices and leads to deterioration in overall environmental performance of the supply chain.

Second, our study adds to the literature examining the real effects of voluntary disclosure. A large theoretical literature on voluntary disclosure suggests that firms may conceal information to keep a competitive advantage (e.g., Darrough and Stoughton, 1990; Verrecchia, 1983). Empirical studies demonstrate the real effects of

voluntary disclosure on a variety of corporate strategies and outcomes.[9] Most relatedly, Shi et al. (2023) find that firms strategically disclose suppliers with good environmental performance but conceal the relationships with unsustainable suppliers. Through engaging in this green-induced strategic disclosure, firms can experience better stock market and operating performance. We extend the study of Shi et al. (2023) by examining the effects of green-induced strategic disclosure on the green transition in the supply chain and find robust evidence that this strategic disclosure can hinder the transition to a green economy since customer firms are no longer eager to support the green practices of their hidden, unsustainable suppliers. Meanwhile, our study also offers new insights on the real effects of voluntary disclosure by showing that voluntary disclosure can be regarded as a tool for firms to evade obligations and transfer risks. To the best of our knowledge, we are among the first to investigate whether and how firms can evade obligations and transfer risks by strategically disclosing information.

Third, our paper contributes to understanding the propagation of green practices through economically linked stakeholders, especially along the supply chain.[10] More explicitly, Dai et al. (2021) and (Schiller, 2018) document a unilaterally positive effect on environmental performance from customers to suppliers. One recent study by (Homroy and Rauf, 2024) concludes that the adoption of emission reduction targets of

[9]For example, voluntary disclosure can lead to higher stock liquidity (Balakrishnan et al., 2014), diverse stock market reactions to information (Kothari et al., 2009), reduced litigation risk (Field et al., 2005).

[10]It is worth noting that another strand of literature finds that green practices propagate among competitors (e.g., Asgharian et al., 2024; Cao et al., 2019).

customer firms can encourage suppliers to launch similar emission reduction projects, though suppliers do not ultimately walk the talk. Our study extends this strand of literature by providing new evidence regarding the factors that deter the propagation of green practices along the supply chain, which is detrimental to the green transition in business sectors.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 presents the results. Section 4 outlines the identification strategy. Section 5 explores the cross-sectional heterogeneity. Section 6 discusses the further analysis. Section 7 concludes.

2 Data and Summary Statistics

This study combines three primary databases to construct our final sample from 2003 to 2023: supply-chain relationship data from FactSet Reverse, environmental performance data from Refinitiv Asset4, and accounting data from Refinitiv Worldscope. In this section, we introduce the data sources and discuss the construction of variables used in the main analysis. We also present and discuss the summary statistics of our sample.

2.1 Data and Variables

We begin by retrieving the information for international supply-chain relationships from FactSet Revere, which is a specialized database providing relationship informa-

tion with economically linked stakeholders such as suppliers, customers and competitors of large and mostly listed firms. This dataset covers over 450,000 unique business relationships from 2003 and has been widely used in accounting and finance studies (e.g., Asgharian et al., 2024; Dai et al., 2021; Darendeli et al., 2022).

FactSet Reverse reports sixteen types of business relationships, and we restrict our focus to customer-supplier relationships.[11] FactSet Revere collects business relationship information from several public sources such as SEC 10-K filings, investor presentations and press releases, relying on a proprietary research method. Compared with Compustat Segment data, the coverage of FactSet Revere is noticeably broader since Compustat Segment only collects customer-supplier relationship information from 10-K filings, and thus is subject to the accounting standards requiring firms to disclose the information of customers that account for more than 10% of a firm's annual revenues in 10-K filings. Accordingly, FactSet Revere is more appealing than the Compustat Segment in our study. First, our focus is on the green-induced voluntary or strategic disclosure behavior of customers, while Compustat Segment data only includes supplier-disclosed information. Second, FactSet Revere allows us to study the effects of green-induced strategic disclosure on green transition in the supply chain globally, while Compustat Segment data only covers US firms. FactSet Revere also reports detailed information regarding the start year and end year for each documented customer-supplier relationship, enabling us to calculate the accu-

[11] In addition to customers, suppliers and competitors, there are other business types including partnerships: in-licensing, manufacturing, marketing, joint venture, out-licensing, technology, equity investment, distribution, integrated product, investor, research, product licensing and unknown.

rate relationship duration and track the termination of each relationship.

We then extract firm-level environmental performance data from Refinitiv Asset4 (formerly Thomson Reuters Asset4), which is one of the most widely used databases in ESG studies (e.g., Dai et al., 2024; Dyck et al., 2019). Starting from 2002, Asset4 has established a comprehensive ESG database, collecting numerous publicly available ESG-related information from various sources, including firm-level annual reports, company websites, CSR reports, NGO websites, stock exchange filings, and public news. The professional research analysts in Refinitiv then process and evaluate this raw information and ultimately generate the performance scores for four major categories: environmental, social, governance, and ESG controversy, based on more than 500 different ESG metrics. Thanks to the rigorous data collection and evaluation, the Refinitiv ESG database has a broad coverage of over 11,000 companies and over 80% global market cap. Our focus is firm-level environmental performance, which is evaluated within three primary categories: resource use, emission reduction, and environmental innovation. Based on these subcategories, Asset4 constructs an environmental pillar score for each firm, ranging from 0 to 1. Firms with higher environmental scores are regarded as leaders, while firms with lower scores are laggards in environmental practices.

After merging supply-chain data from FactSet Revere with firm-level environmental score from Refinitiv Asset4 using ISIN (International Security Identification Number) code, we construct the main independent variable of interest in this study, *green-induced nondisclosure*. Specifically, we start by defining a supplier-customer rela-

tionship as a nondisclosure one if it is not voluntarily reported by the customer firm. Next, we classify supplier firms into three categories based on their annual environmental scores: those exceeding the seventieth percentile are designated as sustainable suppliers; those falling below the thirtieth percentile are designated as unsustainable suppliers; and those in between are classified as neutral suppliers. Finally, we construct a dummy variable, *green-induced nondisclosure*, which equals one if the customer firm does not voluntarily disclose its relationship with a supplier and the supplier is classified as unsustainable, and zero otherwise.

In addition, we collect annual accounting data from Refinitiv Worldscope and construct a series of firm-level control variables for the main analyses. Moreover, the country-level control variable, GDP per capita, is obtained from the World Bank Indicator database. The detailed variable construction process and data sources are presented in Table A1.

2.2 Summary Statistics

Our final sample comprises 395,189 observations, covering 132,942 unique supplier-customer pairs from 2003 to 2023. Table 1 summarizes the variables used in the main analyses. The first series of variables is the supply chain-level variables. Since the first order focus of this study is to explore whether the green-induced nondisclosure behavior of customer firms deters the propagation of environmental practices from customers to suppliers, the independent variable of particular interest is green-induced nondisclosure. It has a mean value of 0.23, indicating that 23% of supplier-customer

relationships in our sample are concealed by customer firms due to the bad environmental performance of suppliers.[12] In a similar vein, we also construct the variable, green-induced disclosure, a dummy indicating whether a supplier-customer relationship is voluntarily reported by customer firms even though the supplier firms perform poorly in environmental issues. The mean value of green-induced disclosure is 0.03, suggesting that very few customer firms are willing to voluntarily disclose unsustainable suppliers. The average relationship length for a supplier-customer pair is approximately 3.6 years, and 21% of supplier-customer relationships are terminated during our sample period.

The second and third series of variables are supplier- and customer-level environmental variables, as well as other firm and country-level characteristics. The average environmental score for supplier firms is 0.46, while this value is 0.58 for customer firms, implying that customer firms have slightly better environmental performance than supplier firms on average.

[——Insert Table 1 About Here——]

Table 2 presents the distribution of supplier and customer firms across countries or regions. The average environmental score of all supplier firms and customer firms in each country is also calculated. Though our sample consists of supplier (customer) firms from 75 (80) unique countries, we only report the distribution in 32 countries with more than 1,500 supplier firms in our sample. Some stylized facts can be sum-

[12]Unreported descriptive statistics show that about 70% of supplier-customer relationships are hidden by customer firms, regardless of suppliers' environmental performance.

marized from Table 2. For example, the environmental performance of customer firms is generally better than that of suppliers since the greater bargaining power allows customer firms to outsource pollution to upstream suppliers. Second, firms located in developed countries (e.g., UK and France) have, on average, better environmental performance than those in developing countries (e.g., China and India) since green practices correlate strongly with economic development.

[—Insert Table 2 About Here—]

3 Green-induced Nondisclosure and Supply Chain Green Transition

In this section, we examine whether green-induced nondisclosure hinders the green transition of the supply chain. More explicitly, we explore whether the green-induced nondisclosure dampens or even reverses the positive impacts that customers exert on suppliers' environmental performance. To corroborate the argument that customer firms exploit strategic disclosure to evade green obligations for unsustainable suppliers, we explore the relationship between suppliers' and customers' environmental scores under the circumstances that customer firms voluntarily disclose unsustainable suppliers. Furthermore, we disentangle whether customers experience improved environmental performance at the expense of unsustainable suppliers, and whether green-induced nondisclosure has an aggregate negative impact on the environmental

practices of the supply chain. Finally, we conduct a battery of robustness tests by using different model specifications, as well as alternative measures for environmental scores and green-induced nondisclosure.

3.1 Baseline Results

To investigate whether and how green-induced nondisclosure influences the association between suppliers' and customers' environmental scores, we estimate the following regression model:

$$\begin{aligned} EnvScore^{S}_{i,t} = \alpha_0 &+ \alpha_1 EnvScore^{C}_{i,t-1} + \alpha_2 Green\text{-}induced\ Nondisclosure_{i,j,t} \\ &+ \beta_1 EnvScore^{C}_{i,t-1} \times Green\text{-}induced\ Nondisclosure_{i,j,t} \\ &+ \gamma_1 Z_{i,t} + \gamma_2 Z_{j,t} + FEs + \varepsilon_{p,i,c,t} \end{aligned} \tag{1}$$

where $EnvScore^{S}_{i,t}$ is the environmental score of the supplier firm i in year t and $EnvScore^{C}_{i,t-1}$ is the environmental score of the customer firm j in year $t-1$. The primary explanatory variable of interest, $Green\text{-}induced\ Nondisclosure_{i,j,t}$, is a dummy variable equals one if supplier i is not voluntarily disclosed by the customer j in year t, *and* the environmental score of i falls below the thirtieth percentile in year t. $Z_{i,t}$ ($Z_{j,t}$) represents supplier (customer) characteristics. We include various combinations of fixed effects, comprising customer–supplier industry fixed effects,[13] customer–supplier country fixed effects, supplier firm fixed effects, and year fixed effects.

[13] We define industry at the four-digit Standard Industrial Classification code (SIC-4) level.

Standard errors are clustered at the supplier-customer pair level. Our parameter of interest is β_1, which dictates the role of green-induced nondisclosure playing in the relationship between suppliers' and customers' environmental scores.

Table 3 reports the results with various control variables and fixed effects.[14] We first estimate the baseline model by incorporating only supplier-level control variables and customer-supplier industry, country, and year fixed effects. As in Column (1), the coefficient of the interaction term of customers' environmental scores and green-induced nondisclosure ($EnvScore^C \times$ *Green-induced Nondisclosure*) is -0.030, and significant at 1% level. This result indicates a negative relationship between the environmental performance of suppliers and customers when customer firms conceal suppliers due to their bad environmental performance. In contrast, the positive coefficient of $EnvScore^C$ is consistent with (Dai et al., 2021), suggesting that customer firms play an important role in supporting suppliers' green practices when they do not withhold the information of suppliers due to their poor environmental performance.[15] Collectively, our results show that the green-induced nondisclosure reverses the positive relation between suppliers' and customers' environmental scores, and consequently, hinders the propagation of positive environmental practices along the supply chain.

To rule out the possibility that supplier firm-level omitted variables drive the re-

[14]Since we incorporate a battery of fixed effects into the baseline regression model, the sample size is slightly smaller than the total number of supply-chain pair-years summarized in Table 1 due to dropped singleton observations.

[15]A supplier-customer relationship is defined as a relationship in which customers do not conceal the information of suppliers when it satisfies either of the following conditions: 1) customers voluntarily disclose suppliers irrespective of suppliers' environmental performance, or 2) customers withhold the information of suppliers without bad environmental performance.

sults, we control for the fixed effect at the supplier level. The results are reported in Column (2). We find the baseline results remain qualitatively similar despite a smaller magnitude of the coefficient in the interaction term. In Columns (3) and (4), we further add customer-level control variables. The coefficients on the interaction term are negative and significant at 1% level, while those of $EnvScore^C$ are positive and significant, supporting the argument that green-induced nondisclosure deters the positive influence of customer firms exerted on suppliers.

Our estimated results are also economically significant. Focusing on Column (4), a one-standard-deviation increase in customer environmental score is associated with a 0.426% higher supplier environmental score next year (calculated as $0.07 \times 0.28/0.46$) in the absence of green-induced nondisclosure.[16] However, green-induced nondisclosure reduces this effect by 0.974 percentage points (calculated as $-0.016 \times 0.28/0.46$), reversing the positive relationship between customer and supplier environmental performance. While the change in a single supplier's score may appear small, it is important to note that the average customer in our sample has 7.78 suppliers per year, implying that this reversing effect could have substantial aggregate consequences.

[——Insert Table 3 About Here——]

One potential interpretation of the observed negative impact on the positive relationship between supplier and customer environmental scores is that customer firms,

[16] Dai et al. (2021) report that a one-standard-deviation increase in customer environmental score raises supplier environmental score by 1.67% using a regression model that includes only customer-supplier industry, country, and year fixed effects. Our results are comparable if we apply the same model specification (Column (1) of Table 3), yielding an average improvement of 1.339% per one-standard-deviation increase in lagged customer environmental score.

by withholding information about unsustainable suppliers, tend to evade their green obligations that could improve these suppliers' environmental performance. However, this explanation may be confounded by other factors: customer firms might conceal supplier information and reduce support or disciplinary activities for reasons unrelated to suppliers' environmental performance.[17]

To address this concern, we explore whether and how the relation between suppliers' and customers' environmental performance evolves when customer firms voluntarily disclose the information of suppliers with bad environmental performance. Intuitively, if customer firms choose to voluntarily disclose, rather than conceal, their unsustainable suppliers, they are more likely to assist these suppliers in improving their environmental performance rather than evading such green obligations. In this case, we may find a stronger or, at the very least, unattenuated positive relation between suppliers' and customers' environmental scores when customer firms voluntarily disclose their unsustainable suppliers.

We repeat the baseline regression by replacing *Green-induced Nondisclosure* with *Green-induced Disclosure*. This variable equals one if customer firms voluntarily disclose a supplier even when its environmental score falls below the thirtieth percentile. The results are reported in Table 4. The positive coefficients of the interaction term, regardless of specification, indicate a stronger positive environmental practice propagating from customers to suppliers when customer firms opt for disclosing unsustainable suppliers. These findings corroborate the argument that evading green obliga-

[17]For example, corporate governance (Li and Ye, 2022) and operating risks (Ersahin et al., 2024) of supplier firms play important roles in the stability of the supply-chain relationship.

tions is the primary purpose behind green-induced nondisclosure, which ultimately reverses the positive relation between environmental scores of suppliers and customers.

[—Insert Table 4 About Here—]

To summarize, our baseline results demonstrate that corporate customers no longer play important roles in supporting or disciplining green practices of suppliers when they strategically conceal the information of unsustainable suppliers. Our further analysis focusing on the voluntary disclosure of unsustainable suppliers supports the interpretation regarding green obligation evasion for the reversed positive relation between suppliers' and customers' environmental scores triggered by green-induced nondisclosure. Most importantly, the propagation of positive environmental effects from customers to suppliers is disrupted for suppliers with the lowest environmental performance — those who may be in greatest need of external support to improve their green practices. However, the strategic disclosure behavior of customer firms that conceal information about unsustainable suppliers enables them to evade their obligation to support these suppliers in adopting greener practices and overcoming their challenges. Consequently, green-induced nondisclosure hinders the green transition of the supply chain.

3.2 Changes in Environmental Performance

The negative relation between the environmental scores of suppliers and customers caused by green-induced nondisclosure suggests that customer firms may improve their environmental performance at the expense of unsustainable suppliers by transferring environmental risks to these hidden suppliers. Nevertheless, an alternative explanation for the negative relation is that customer firms help the unsustainable suppliers promote environmental performance by sacrificing their own green performance, a practice may benefit the green transition in the supply chain. To discriminate between these two potential explanations, we examine how green-induced nondisclosure affects the changes in environmental scores of suppliers and customers. If hiding the information of unsustainable suppliers reduces the costs of customer firms to evade green obligations and transfer environmental risks, we may observe a decrease in supplier environmental scores and an increase in customer environmental scores.

Table 5 tabulates the results. In Column (1), we test the relation between green-induced nondisclosure and the annual change in supplier environmental score. The coefficient of green-induced nondisclosure is -0.079 and significant at 1% level, suggesting deteriorated environmental performance of suppliers. Conversely, we find an improved customer environmental score when customer firms withhold information about unsustainable suppliers, as evidenced in Column (2). The evidence is consistent with the view that concealing information about unsustainable suppliers enables

customer firms to transfer bad performance to these suppliers, therefore jeopardizing their potential positive impact on suppliers' environmental performance.

We then aggregate the changes in supplier and customer environmental score and construct the variable $\Delta EnvScore^{C+S}$ to measure the environmental performance at the supplier-customer pair level. By examining the impact of green-induced nondisclosure on changes in this aggregate score, we can determine whether green-induced nondisclosure harms the environmental performance of the entire supply chain. In other words, we aim to answer the key question of this study: Does green-induced nondisclosure hinder the green transition of the supply chain?

According to Column (3) of Table 5, the coefficient of green-induced nondisclosure is negative and significant at the 1% level, indicating that green-induced nondisclosure, in aggregate, leads to a decline in the environmental performance of the supply chain. This finding further reinforces the evidence of its detrimental impact on the green transition of the supply chain.

[—Insert Table 5 About Here—]

3.3 Termination Probability and Relationship Length

As customer firms are reluctant to support the green development of their hidden unsustainable suppliers, it is crucial to examine whether these customer-supplier relationships are more likely to be terminated. On the one hand, since customer firms are unwilling to undertake responsibility for supporting unsustainable sup-

pliers, they may be more inclined to sever these relationships. On the other hand, green-induced nondisclosure enables firms to transfer environmental risks to suppliers while enhancing their own environmental performance at a low cost, which may reduce the likelihood of termination of the relationships.

To disentangle these hypotheses, we construct a dummy variable, *Termination Year*, which equals one if a given supplier-customer relationship ends after the current year. Column (1) of Table 6 reports the result using a linear probability model. We find that the green-induced *nondisclosure* is related to a higher probability of customer-supplier relationship severance. In contrast, a customer-supplier relationship is less likely to be terminated when customer firms voluntarily *disclose* their unsustainable suppliers (as shown in Column (2)). This result indicates that customer firms tend to establish long-standing relationships with unsustainable supplier firms when they are willing to support them to improve environmental performance. Collectively, the opposite impacts of green-induced nondisclosure and disclosure on the termination probability of the supply chain are consistent with the argument that customer firms are more inclined to get rid of these unsustainable supplier firms.

We also test the relation between green-induced *nondisclosure/disclosure* and the length of a customer-supplier pair. We calculate *Relationship Length* as one plus the gap between the current year and the starting year of a given relationship. Columns (3) and (4) show the results. In line with the finding for termination probability, green-induced *nondisclosure* is associated with a significantly shorter customer-supplier relationship length (as shown in Column (3)). By contrast, Column (4) indicates a

positive relationship between green-induced *disclosure* and relationship length, albeit statistically insignificant.

[—–Insert Table 6 About Here—–]

3.4 Robustness Tests

We conduct various robustness tests by using different model specifications, different definitions of green-induced nondisclosure, and alternative measures of environmental scores retrieved from other ESG rating agencies.

Alternative Model Specifications We repeat the baseline analysis by adding customer-supplier pair-level fixed effects to control omitted variables at the customer-supplier pair level. The results are reported in Column (1) of Table 7. The coefficient on the interaction between the customer's environmental score and green-induced nondisclosure remains negative and significant, indicating that the baseline results are unlikely to be driven by unobserved shocks at the customer–supplier pair level.

Alternative Green-induced Nondisclosure Definitions In the baseline analysis, the main independent variable, *green-induced nondisclosure*, takes the value of one if a customer firms withhold the information of a supplier with environmental performance below the bottom 30th percentile. We construct two alternative measures of green-induced nondisclosure by defining the green-induced nondisclosure based on the bottom 50th and 70th percentiles, respectively. As shown in Columns (2) and (3) of Table 7, the coefficients on the interaction terms remain negative and significant,

indicating that our results are not driven by the construction of the variable.

Additionally, it is worth noting that the magnitude of coefficients becomes smaller as the thresholds for unsustainable suppliers increase (i.e., from 30% to 70%). This pattern suggests that the reversing effects of green-induced nondisclosure on the positive relation between customers' and suppliers' environmental performance are stronger for suppliers with poorer environmental profiles.

Alternative Environmental Scores Recent literature picks up substantial disagreements across ESG ratings from different data providers (e.g., Berg et al., 2022). To examine whether our results are sensitive to rating agency identity, we construct alternative measures using environmental scores from Sustainalytics. Column (4) continues to document a significant positive relation between customers' and suppliers' environmental performance using Sustainalytics data. Moreover, as suggested by the negative estimate for the interaction term, customers' green-induced nondisclosure attenuates this relationship. This finding indicates that our result is not sensitive to ESG rating divergence.

[—Insert Table 7 About Here—]

4 Identification Strategies

While the baseline results are consistent with our hypothesis and robust to various alternative tests, the reversing effects of green-induced nondisclosure on the positive relation between may be subject to endogeneity concerns. First, our baseline results

may stem from omitted variables despite a variety of control variables and fixed effects. For example, short-term managers and institutional investors of customer firms could simultaneously affect the customer firms' incentives to support suppliers' green practices and the propensity to conceal the information of suppliers performing poorly in environmental issues.[18] Second, it is also plausible that the customer firms engaging in green obligation evasion and environmental risk transfer through the supply chain are less likely to voluntarily disclose their suppliers. Hence, our baseline results could be driven by reverse causality.

To alleviate these concerns and facilitate a causal inference of our baseline results, we employ two regulatory shocks to the incentives of customer firms to evade green obligations and transfer environmental risks. Specifically, we examine whether and how the enactment of US state-level GHG emission targets and the implementation of the global GHG emission trading system influence the reversing effects of green-induced nondisclosure on the relation between suppliers' and customers' environmental performance.

4.1 The Enactment of US State-level GHG Emission Target

The stringency of environmental regulations varies across US states. In response to heightened regional regulations, affected firms adjust their corporate policies such

[18]Pursuing short-term profits is the goal of short-term managers and institutional investors. In this case, they are less likely to allocate resources to support the green practices of suppliers since green activities may not pay off over the short run (Edmans, 2020; Martin and Moser, 2016). Meanwhile, they are more likely to withhold the information about unsustainable suppliers because this strategic disclosure can create near-term benefits (Shi et al., 2023).

as capital structure (Dang et al., 2023) and the design of executive compensation contracts (Choi et al., 2024). Most importantly, Bartram et al. (2022) and Dai et al. (2024) show that the increasing stringency of environmental regulations can incentivize firms to shift emissions to suppliers with lax regulations.

In a similar vein, we focus on the enactment of US state-level GHG emission targets and examine whether these targets influence our baseline results. As of 2023, 23 US states have established economy-wide GHG emission targets, while 3 states have published recommended targets. To meet their targets, these states may implement enforceable statutory measures and executive actions and thus pose a higher level of environmental pressure on firms in these states. Consequently, customer firms in these states may engage more in shifting their emissions to suppliers to avoid contingent scrutiny and penalties. In the context of our study, the reversing effects of green-induced nondisclosure on the relation between suppliers' and customers' environmental performance are expected to be stronger.

To explore, we estimate the following regression model with a triple-interaction term using the information on US state-level GHG emission targets from the Center

for Climate and Energy Solutions (C2ES):[19]

$$
\begin{aligned}
EnvScore^{S}_{i,t} = {} & \alpha_0 + \alpha_1 EnvScore^{C}_{i,t-1} + \alpha_2 Green\text{-}induced\ Nondisclosure_{i,j,t} + \alpha_3 GHGTarget_{j,t-1} \\
& + \beta_1 EnvScore^{C}_{i,t-1} \times Green\text{-}induced\ Nondisclosure_{i,j,t} \times GHGTarget_{j,t-1} \\
& + \beta_2 EnvScore^{C}_{i,t-1} \times Green\text{-}induced\ Nondisclosure_{i,j,t} \\
& + \beta_3 Green\text{-}induced\ Nondisclosure_{i,j,t} \times GHGTarget_{j,t-1} \\
& + \beta_4 EnvScore^{C}_{i,t-1} \times GHGTarget_{j,t-1} \\
& + \gamma_1 Z_{i,t} + \gamma_2 Z_{j,t} + FEs + \varepsilon_{p,i,c,t}
\end{aligned}
\tag{2}
$$

where $GHGTarget_{j,t-1}$ is a binary variable that takes the value of one if a state where the customer firm j resides enacted the statutory or executive targets for GHG emissions within the past five years. We incorporate all control variables and fixed effects as used in the baseline regression. The coefficient of the triple-interaction term, β_1, captures the impacts of GHG emission targets on the intensity that green-induced nondisclosure reverses the positive relation between the environmental performance of suppliers and customers. Accordingly, a negative coefficient of this triple-interaction term suggests greater reversing effects of green-induced nondisclosure, and therefore a stronger effect of environmental risk shifting from customers to suppliers.

Consistent with our hypothesis, we find a significantly negative coefficient of the triple-interaction term. This finding indicates that customer firms affected by the establishment of GHG emission targets become more reluctant to support the green practices of suppliers with poor environmental performance when they withhold the

[19]For more details, see https://www.c2es.org/document/greenhouse-gas-emissions-targets/.

information about these suppliers. Instead, these customer firms even transfer more environmental risks to these suppliers when facing increasing regulatory stringency and consequently have greater negative impacts on the propagation of positive environmental practices along the supply chain.

For robustness, we conduct a placebo test with falsified timing for the enactment of the state-level GHG emission target. More explicitly, we construct a dummy of placebo GHGTarget by assuming that one state enacts a GHG emission target two years before the actual enactment year. As reported in Column (2), there is no evidence that the placebo enactment of GHG targets has any statistically significant impact.

[—Insert Table 8 About Here—]

4.2 The Implementation of Global GHG Emission Trading System

Another regulatory shock to the incentives of customer firms to evade green obligations and transfer environmental risks is the implementation of GHG Emission Trading Systems (ETS) globally. Similar to US state-level GHG emission targets, GHG ETSs exert pressure on firms to reduce carbon emissions (e.g., Bai and Ru, 2024) and, in turn, firms are more likely to shift their emissions to suppliers, which may be reflected as a stronger reversing effect of green-induced nondisclosure on the positive relation between the environmental performance of customers and suppliers. Additionally, the implementation of GHG ETSs across countries and regions enables

us to examine the impacts of heightened environmental regulations in an international setting, while the scope for the enactment of state-level GHG emission targets is restricted to the US.

To investigate whether the establishment of GHG ETSs affects our baseline results, we collect data on GHG ETSs at regional, national, and subnational levels dating back to 1991 from the World Bank Carbon Pricing Dashboard.[20] We replace $GHGTarget_{j,t-1}$ with $ETS_{j,t-1}$, which equals one if a country or US state where customer firms reside adopts GHG ETSs after year $t-1$,[21] and re-estimate Model 2. Column (1) of Table 9 shows the result.

We find a negative and significant coefficient of the triple-interaction term of one-year lagged customer environmental score, green-induced nondisclosure, and the indicator for GHG ETSs, suggesting that the reversing effects of green-induced nondisclosure become stronger after the implementation of GHG ETSs in customer firms' countries or states. This finding further corroborates the argument that tightened environmental regulations induce firms to transfer more environmental risks to unsustainable suppliers when they can hide the relationship with these suppliers, which is consistent with the evidence in the previous section.[22]

In Column (2), we conduct a similar falsification test as that for the GHG Target

[20] https://carbonpricingdashboard.worldbank.org/compliance/instrument-detailformoredetails.

[21] Since US customer firms account for more than 40% in our sample and there is no federal-level ETS scheme in the US, we consider the state-level implementation of GHG ETSs to ensure the validity of our results.

[22] It is noteworthy that one of the largest GHG ETSs – ETS in European Union (EU ETS) – is shown to be unrelated to carbon outsourcing activities (Colmer et al., 2024). To check the robustness of our results, we exclude customer firms located in the European Union and find qualitatively similar results in unreported analysis.

regression by assuming the implementation of GHG ETSs in a country or state happens two years before the actual implementation year. We find no evidence that the placebo GHG ETS indicator has a statistically significant impact.

[——Insert Table 9 About Here——]

Taken together, these two shocks capture the increasing stringency of environmental regulations for customer firms. Under the pressure of these regulations, customer firms may opt for shifting environmental risks to suppliers rather than supporting the green practices of unsustainable suppliers. Thus, we find that stronger reversing effects of green-induced nondisclosure on the positive relation between customers' and suppliers' environmental performance. These findings also support the interpretation of our baseline results that the main purposes for customer firms to withhold the relationship with unsustainable suppliers are evading green obligations and transferring environmental risks.

5 Cross-Sectional Heterogeneity

To better understand the mechanisms by which customer firms engage in green obligation evasion and environmental risk shift for unsustainable suppliers with hidden relationships, we conduct several tests to examine the cross-sectional heterogeneity of our main results from various perspectives. If the green-induced nondisclosure indeed reflects the intention of customer firms to evade green obligations and transfer environmental risks, we would expect that our main results become stronger (weaker)

with factors encouraging (discouraging) customer firms to avoid green responsibility and transfer environmental risks to suppliers.

5.1 Common Stakeholders

The first possible channel through which green-induced nondisclosure can reverse the positive relation between customers' and suppliers' environmental performance is related to information transparency. Intuitively, customer firms are less likely to evade green obligations and shift environmental risks to hidden unsustainable suppliers if these supply-chain relationships are possibly unveiled by a third party. When a third party potentially discloses the relationship, customer firms face greater pressure to support the green practices of unsustainable suppliers and to facilitate the green transition along the supply chain, as their actions toward these suppliers may be subject to regulatory scrutiny. After all, unethical treatment of suppliers may expose firms to regulatory penalties and stakeholder boycotts.

As such, we expect that the reversing effects of green-induced nondisclosure are weaker with a higher level of information environment transparency improved by common stakeholders in the supply chain. More specifically, we consider three types of common stakeholders: common institutional investors who simultaneously hold stakes of both suppliers and customers, common auditors who serve suppliers and customers at the same time, and common analysts who follow both sides in the supply chain.

Existing literature documents that these three types of common stakeholders play

important roles in improving information transparency.[23] Hence, they could be effective in deterring customer firms from evading green obligations and shifting environmental risks to their concealed unsustainable suppliers. Accordingly, we hypothesize that the reversing effects of green-induced nondisclosure are weaker when the three types of common stakeholders exist in the supply chain.

To test this hypothesis, we estimate the following model:

$$\begin{aligned} EnvScore^{S}_{i,t} = {} & \alpha_0 + \alpha_1 EnvScore^{C}_{i,t-1} + \alpha_2 Green\text{-}induced\ Nondisclosure_{i,j,t} + \alpha_3 Common_{i,j,t} \\ & + \beta_1 EnvScore^{C}_{i,t-1} \times Green\text{-}induced\ Nondisclosure_{i,j,t} \times Common_{i,j,t} \\ & + \beta_2 EnvScore^{C}_{i,t-1} \times Green\text{-}induced\ Nondisclosure_{i,j,t} \\ & + \beta_3 Green\text{-}induced\ Nondisclosure_{i,j,t} \times Common_{i,j,t} \\ & + \beta_4 EnvScore^{C}_{i,t-1} \times Common_{i,j,t} \\ & + \gamma_1 Z_{i,t} + \gamma_2 Z_{j,t} + FEs + \varepsilon_{p,i,c,t} \end{aligned} \tag{3}$$

where $Common_{i,j,t}$ represents different measures of common stakeholders. Specifically, we define common institutional ownership (*Common IO*) as the number of institutional investors who own the shares of suppliers and customers simultaneously. Common auditor (*Common Auditor*) is a binary variable taking the value of one if the

[23] Prior research shows that common institutional investors, auditors, and analysts in the supply chain can improve information flow and coordination between customers and suppliers, thereby enhancing relationship stability and reducing information asymmetry. For example, common institutional ownership can strengthen supply-chain relationships, facilitate information sharing, and lower creditor risk premiums (Freeman, 2025; Tian et al., 2024). Common auditors can reduce information-processing costs and mitigate hold-up problems, fostering more transparent supplier–customer interactions (Dhaliwal et al., 2017; Kim et al., 2024). Similarly, analysts covering both customers and suppliers can exploit informational complementarities to provide more accurate earnings forecasts for supplier firms (Guan et al., 2015; Luo and Nagarajan, 2015).

supplier and customer share the same auditor. Common analyst (*Common Analyst*) is a dummy variable that equals one if at least one analyst issues earnings forecasts for both supplier and customer.

Table 10 reports the results. The coefficients of interest are those of the triple-interaction terms, which capture the variation of baseline results for different types of common stakeholders. For instance, in Column (1), we find that common institutional investors along the supply chain play a disciplinary role to prevent customer firms from shifting environmental risks to concealed, unsustainable suppliers. We document a similar effect for common auditor and common analyst, suggesting that reduced information asymmetry and improved transparency stemming from common stakeholders can deter customer firms from engaging in unethical actions on hidden suppliers with poor environmental performance.

[—Insert Table 10 About Here—]

5.2 Supplier Environmental Pressure

We then investigate whether the environmental pressure on suppliers alters our baseline results. The rationale is that suppliers are more likely to resist the environmental risks shifting from customers when they are located in places with tighter environmental regulations. As such, the environmental pressure on suppliers may attenuate the reversing effects of green-induced nondisclosure on the positive relation between the environmental performance of customers and suppliers.

We adopt two measures for country-level environmental regulation stringency. First, we exploit the enactment of mandatory ESG disclosure in suppliers' countries. When suppliers' ESG information is unveiled to the public, they have stronger incentives to pursue better performance on environmental issues to attract investors and customers. In this case, they are not reluctant to be the receiver of environmental risks shifting from suppliers. Second, we use the country-level environmental performance index (EPI) scores that proxy for the enforcement strength of ESG-related standards. Lu et al. (2023) find that customer firms are less likely to transfer environmental risks to suppliers located in countries with higher EPI, even when they face tighter environmental regulations.

We collect information on ESG mandatory disclosure worldwide from Krueger et al. (2024) and country-level EPI scores from Yale Center for Environmental Law and Policy (YCELP). Next, we re-estimate Model (3) by replacing common stakeholder variables with regulatory stringency variables. Table 11 documents the results. Focusing on the triple-interaction terms, we show that the enactment of mandatory ESG disclosure in suppliers' countries, as well as the stringency of supplier countries' ESG-related standards, attenuates the reversing effects of green-induced nondisclosure. Overall, this evidence corroborates the argument that suppliers' environmental pressure plays an important role in suppressing the green obligation evasion and environmental risk transfer of customer firms.

[——Insert Table 11 About Here——]

5.3 Customer Inhibition

The third possible mechanism by which green-induced nondisclosure negatively influences the relation between customers' and suppliers' environmental performance is the inhibition (i.e., constraints or willingness) of customer firms to support green practices of unsustainable suppliers. First, we focus on the financial constraints of customer firms. A large literature shows that financial constraints hinder firms from engaging in green practices (e.g., Bartram et al., 2022; Xu and Kim, 2022). In other words, when customer firms suffer financial constraints, they tend not to support the green practices of suppliers due to limited resources. As such, the reversing effects of green-induced nondisclosure are expected to be stronger when customer firms are financially constrained.

We adopt the Kaplan-Zingales (KZ) index to measure firm-level financial constraints (see Kaplan and Zingales, 1997; Lamont et al., 2001). A customer firm is categorized as financially constrained if it has an above-median KZ index compared with other customer firms. Column (1) of Table 12 documents a negative coefficient for the triple interaction term, suggesting that financially constrained customers are more likely to evade green obligations and transfer environmental risks to hidden unsustainable suppliers.

Second, customer firms may not have adequate resources (or incentives) to support the green practices of suppliers when they have multiple suppliers. Based on this rationale, we postulate that the reversing effects of green-induced nondisclosure

become stronger with the increasing number of suppliers. Column (2) of Table 12 presents evidence consistent with this conjecture.

Overall, these findings are consistent with the notion that the customer firms engage more in shifting environmental risks to suppliers when they have no capability to support the green development of suppliers.

[—Insert Table 12 About Here—]

6 Further Analysis

6.1 Carbon Outsource

To further examine whether the green-induced nondisclosure of customer firms leads to green obligation evasion and environmental risk shift, we focus on the carbon outsourcing activities along the supply chain. One drawback of environmental rating is that it may not reflect the real effects of green-induced nondisclosure since environmental rating is processed by data providers with ambiguous methods. To explore the real effects, we investigate whether green-induced nondisclosure is related to carbon outsourcing activities in the supply chain.

Carbon outsourcing, namely, firms outsource their carbon emissions to upstream suppliers with lax environmental regulations, has been widely documented in prior studies (e.g., Dai et al., 2024; Li and Zhou, 2017). In our context, customer firms tend to outsource carbon emissions to unsustainable suppliers when they can withhold the

information about these suppliers. Thus, we hypothesize that green-induced nondisclosure is positively related to carbon outsourcing activities in the supply chain.

We estimate the baseline regression by replacing the environmental scores of customers and suppliers with the carbon emission measures (i.e., the natural logarithm of carbon emissions) calculated using the data from S&P Trucost. Consistent with Dai et al. (2024), Column (1) of Table 13 documents a positive relationship between customers' and suppliers' Scope 1 carbon emissions, suggesting a positive spillover of environmental performance along the supply chain.[24]

More importantly, we find a negative and significant coefficient of the interaction term of green-induced nondisclosure and customers' scope 1 carbon emissions, suggesting the tendency for customer firms to impose a heavier carbon burden on hidden suppliers with poor environmental performance. Put differently, these hidden unsustainable suppliers may undertake reduced carbon emissions by shifting customers. As shown in Column (2), this result is robust to using the Scope 2 emission. Overall, these findings indicate that green-induced nondisclosure is positively related to carbon outsourcing activities in the supply chain, thus reinforcing the argument that green-induced nondisclosure is detrimental to the green transition ithe n supply chain.

[——Insert Table 13 About Here——]

[24]The empirical setting of Dai et al. (2024) slightly differs from ours. Since they conduct baseline analysis at the firm level instead of the chain level, they find that Scope 1 emissions correlate strongly with Scope 3 upstream for customer firms.

6.2 Supplier Response

This study so far reveals that the strategic disclosure behavior of customer firms, depending on the environmental performance of their suppliers, deters the positive propagation of green practices from customers to suppliers. Further analysis demonstrates that customer firms engaging in green-induced nondisclosure even shift environmental risks to their suppliers and, consequently, deteriorate the environmental profiles of these suppliers. In this section, we aim to explore whether and how these supplier firms respond to their deteriorated environmental performance. In other words, will affected supplier firms take some actions in the future to combat the environmental risks transferred by their customers?

Two potential ways for supplier firms to achieve improved environmental performance under the pressure of customers are adopting more green patents and reducing environmental incidents in the future. To obtain green patent data, we follow Hascic and Migotto (2015) to obtain patent CPC class from the KPSS patent dataset (Kogan et al., 2017). We further match these CPC classes with OECD green CPC classes to identify green patents, as compiled by (Jaggi, 2025).[25] The environmental incident data are obtained from RepRisk, which screens various media, regulatory, and commercial documents globally to search for ESG incidents using advanced machine learning algorithms. Next, we calculate the percentage of customer firms engaging in green-induced nondisclosure for each supplier firm in a given year. A

[25]We appreciate David Jaggi for making these data publicly available at https://github.com/davidjaggi/oecd-green-classes.

higher percentage of these customer firms indicates a higher level of environmental risk shifting activities from customers to suppliers.

Table 14 reports results by regressing the number of green patents and environmental incidents on the percentage of customer firms engaging in green-induced nondisclosure. In Panel A, we find a persistent and increasingly negative effect over time of a supplier's exposure to nondisclosure practices on its green patenting activities. In addition, Panel B shows that the supplier's nondisclosure exposure substantially increases the number of its environmental incidents in the future.

Taken together, our results do not find that supplier firms take real actions to combat the environmental risks transferred by customer firms. Instead, we reveal that suppliers' future environmental profile may further deteriorate, indicating that the harms of environmental risk shift activities of customers on suppliers may be irreversible.

[——Insert Table 14 About Here——]

7 Conclusion

Since there is no mandatory disclosure requirement for customer firms to unveil the information of their suppliers, customer firms strategically disclose suppliers with good environmental performance while withholding the information of suppliers with poor environmental performance, aiming to create a green image (Shi et al., 2023). In this study, we focus on the unintended consequences of this disclosure

policy on the green transition in the supply chain by exploring whether the green-induced nondisclosure behavior of customer firms instigates them to evade green obligations and even transfer environmental risks to those hidden unsustainable suppliers. Specifically, we find robust evidence that the positive relation between environmental scores of customers and suppliers is dampened by the green-induced nondisclosure, suggesting that the propagation of positive green practices from customers to suppliers terminates. More seriously, further analysis shows that customer firms achieve improved environmental performance by sacrificing the environmental performance of those hidden unsustainable suppliers, reflecting severely detrimental effects of green-induced nondisclosure on green transition in the supply chain. To support a causal interpretation for baseline results, we adopt two regulatory shocks to the incentives of customer firms to transfer environmental risks.

We also investigate the cross-sectional heterogeneity of the baseline results. Our empirical results show that information transparency, suppliers' environmental pressure, and inhibition of customer firms to support the green practices of suppliers may affect baseline results. Finally, we explore the real effects of green-induced nondisclosure by focusing on the carbon outsource and long-lasting effects on suppliers' future green actions.

In summary, our study provides new evidence on the consequences of strategic disclosure behavior on the green transition of the supply chain. In particular to stakeholders and policymakers, our study offers several important insights for them. First, for stakeholders such as shareholders and customers, they may need to manu-

ally collect the information of target firms' supply chain and cautiously evaluate the environmental performance of these firms in the context of supply chain when making investment or purchasing decisions. Second, policymakers and regulators should re-evaluate the efficiency of the disclosure policy not mandating customer firms to disclose suppliers, since it may pose negative impacts on the green transition of the whole supply chain, thereby hindering the transition to a green economy.

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Tables

Table 1: Summary Statistics

This table reports the summary statistics. Chain-level variables include indicators representing nondisclosure behavior of firms due to suppliers' bad environmental performance (*green-induced nondisclosure*) and voluntary disclosure of unsustainable suppliers (*green-induced disclosure*), as well as the length of customer-supplier relationship (*relationship length*), a dummy indicating whether the year is the last year of this relationship (*termination year*), and the sum of changes in environmental scores of customers and suppliers ($\Delta EnvScore^{C+S}$). Firm-level variables are reported for both suppliers (superscript *S*) and customers (superscript *C*). The sample period is from 2003 to 2023. Variable definitions can be found in Table A1.

	Obs	Mean	SD	p25	Median	p75
Supply Chain-Level Variables						
Green-induced Nondisclosure	395,189	0.23	0.42	0.00	0.00	0.00
Green-induced Disclosure	395,189	0.03	0.17	0.00	0.00	0.00
Relationship Length	395,189	3.65	3.17	2.00	3.00	5.00
Termination Year	395,189	0.21	0.41	0.00	0.00	0.00
$\Delta EnvScore^{C+S}$	362,328	0.04	0.12	-0.02	0.02	0.08
Supplier Firm-Level Variables						
$EnvScore^{S}$	395,189	0.46	0.30	0.19	0.49	0.73
$\Delta EnvScore^{S}$	362,328	0.02	0.08	-0.01	0.00	0.04
$Size^{S}$	395,189	22.44	2.05	21.02	22.35	23.87
$Leverage^{S}$	395,189	0.26	0.21	0.12	0.24	0.37
ROA^{S}	395,189	0.03	0.14	0.01	0.04	0.08
$TobinQ^{S}$	395,189	2.20	3.93	1.12	1.54	2.44
Sales $Growth^{S}$	395,189	0.19	20.76	-0.01	0.07	0.18
$GDPperCap^{S}$	395,189	10.67	0.77	10.61	10.89	11.09
Customer Firm-Level Variables						
$EnvScore^{C}$	395,189	0.58	0.28	0.38	0.65	0.81
$\Delta EnvScore^{C}$	395,189	0.02	0.08	-0.01	0.00	0.03
$Size^{C}$	395,189	23.66	1.95	22.35	23.76	25.06
$Leverage^{C}$	395,189	0.29	0.22	0.15	0.26	0.39
ROA^{C}	395,189	0.04	0.20	0.01	0.04	0.08
$TobinQ^{C}$	395,189	1.84	1.70	1.05	1.34	2.02
Sales $Growth^{C}$	395,189	0.25	24.79	-0.01	0.05	0.14
$GDPperCap^{C}$	395,189	10.64	0.78	10.59	10.85	11.07

Table 2: Supplier and Customer Firm Distribution by Country and Region

This table reports the distribution of supplier- and customer-year observations in each country or region. Only countries with more than 1,500 suppliers in our sample are presented in this table. $EnvScore^S$ and $EnvScore^C$ refer to the average environmental scores of all suppliers and customers in the corresponding country.

Country/Region	#Supplier Firms	#Customer Firms	$EnvScore^S$	$EnvScore^C$
US	180,775	167,784	0.38	0.52
UK	25,234	23,894	0.48	0.64
Japan	22,662	33,973	0.66	0.70
France	17,617	18,885	0.68	0.80
Germany	15,655	18,542	0.63	0.74
China	11,268	8,312	0.37	0.46
India	10,795	9,870	0.44	0.58
Canada	10,736	10,035	0.40	0.52
South Korea	10,369	12,769	0.62	0.67
Australia	9,832	9,256	0.34	0.47
Switzerland	7,714	7,495	0.55	0.73
Sweden	7,041	5,708	0.50	0.62
Netherlands	4,358	4,042	0.61	0.70
Italy	3,641	3,387	0.56	0.69
Finland	3,490	1,959	0.69	0.74
Spain	3,428	3,666	0.70	0.80
Hong Kong	3,302	4,701	0.62	0.57
Mexico	3,276	2,280	0.46	0.53
Ireland	3,237	3,141	0.57	0.57
South Africa	3,204	5,153	0.44	0.47
Malaysia	2,947	2,645	0.40	0.41
Brazil	2,934	4,172	0.50	0.59
Singapore	2,833	2,257	0.48	0.56
Thailand	2,712	2,366	0.47	0.57
Israel	2,615	1,460	0.23	0.30
Chile	2,108	2,855	0.49	0.47
Norway	1,956	2,219	0.49	0.64
Denmark	1,746	1,673	0.54	0.61
Belgium	1,614	1,356	0.57	0.61
Bermuda	1,606	943	0.33	0.31
Indonesia	1,597	2,166	0.41	0.36
Luxembourg	1,562	1,164	0.49	0.59

Table 3: Baseline Results – The Effects of Green-induced Nondisclosure

This table presents the regression results from the baseline model, which examines whether and how the green-induced nondisclosure of customer firms influences the positive relation between suppliers' and customers' environmental scores. The dependent variable is the environmental score of supplier firms ($EnvScore^S$). The main independent variables include the one-year lagged environmental score of customer firms ($EnvScore^C$), a dummy representing green-induced nondisclosure (*Green-induced Nondisclosure*), and their interaction term. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Dependent Variable: $EnvScore^S$			
	(1)	(2)	(3)	(4)
$EnvScore^C$ × Green-induced Nondisclosure	-0.030***	-0.017***	-0.030***	-0.016***
	(0.003)	(0.002)	(0.003)	(0.002)
$EnvScore^C$	0.022***	0.014***	0.018***	0.007***
	(0.002)	(0.001)	(0.003)	(0.001)
Green-induced Nondisclosure	-0.271***	-0.179***	-0.272***	-0.179***
	(0.002)	(0.002)	(0.002)	(0.002)
$Size^S$	0.072***	0.032***	0.072***	0.032***
	(0.000)	(0.001)	(0.000)	(0.001)
$Leverage^S$	-0.035***	0.001	-0.035***	0.001
	(0.004)	(0.003)	(0.004)	(0.003)
ROA^S	0.007**	-0.002	0.007**	-0.002
	(0.003)	(0.002)	(0.003)	(0.002)
$TobinQ^S$	0.000***	-0.000***	0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Sales $Growth^S$	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$GDPperCap^S$	0.021***	0.091***	0.023***	0.092***
	(0.005)	(0.004)	(0.005)	(0.004)
$Size^C$			0.001***	0.002***
			(0.000)	(0.000)
$Leverage^C$			0.001	0.001
			(0.002)	(0.001)
ROA^C			-0.001	-0.001
			(0.002)	(0.001)
$TobinQ^C$			0.000	0.000
			(0.000)	(0.000)
Sales $Growth^C$			-0.000*	0.000
			(0.000)	(0.000)
$GDPperCap^C$			-0.008*	-0.004
			(0.004)	(0.003)
CS-Industry Pair FE	Yes	Yes	Yes	Yes
CS-Country Pair FE	Yes	Yes	Yes	Yes
Supplier Firm FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Adj R^2	0.805	0.923	0.805	0.923
Observations	391,162	390,686	391,162	390,686

Table 4: The Effects of Green-induced Disclosure

This table reports the regression results regarding whether and how the green-induced disclosure of customer firms influences the positive relation between suppliers' and customers' environmental scores. The dependent variable is the environmental score of supplier firms ($EnvScore^S$). The main independent variables include the one-year lagged environmental score of customer firms ($EnvScore^C$), a dummy that takes the value of one if customer firms voluntarily disclose the information of suppliers with bad environmental performance (below the bottom thirtieth percentile). (*Green-induced Disclosure*), and their interaction term. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Dependent Variable: $EnvScore^S$	
	(1)	(2)
$EnvScore^C$ × Green-induced Disclosure	0.026***	0.019***
	(0.008)	(0.006)
$EnvScore^C$	0.006**	0.000
	(0.003)	(0.001)
Green-induced Disclosure	-0.246***	-0.120***
	(0.004)	(0.003)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	No	Yes
Year FE	Yes	Yes
Adj R^2	0.731	0.907
Observations	391,162	390,686

Table 5: Changes in Environmental Scores

This table reports the regression results examining the relation between green-induced nondisclosure and changes in environmental scores of suppliers and customers. The main dependent variables are one-year changes in suppliers' and customers' environmental scores in Column (1) and (2), respectively. Column (3) presents the results regarding the aggregate changes in environmental scores of both suppliers and customers. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	$\Delta EnvScore^S$	$\Delta EnvScore^C$	$\Delta EnvScore^{C+S}$
	(1)	(2)	(3)
Green-induced Disclosure	-0.079***	0.002***	-0.077***
	(0.001)	(0.001)	(0.001)
Supplier Controls	Yes	No	Yes
Customer Controls	No	Yes	Yes
CS-Industry FE	Yes	Yes	Yes
CS-Country FE	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj R^2	0.201	0.056	0.150
Observations	357,507	390,686	357,507

Table 6: Relationship Length and Termination Probability

This table shows the regression results regarding whether and how the green-induced nondisclosure and disclosure influences the supplier-customer termination probability and relationship length. Columns (1) and (2) present the regression results based on a linear probability model specification. The dependent variable is termination year, a dummy equaling one if the current year is the last year of the supplier-customer relationship. Columns (3) and (4) report the regression results using relationship length as the dependent variable, which is calculated using the current year minus the starting year of the relationship plus one. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Termination Year		Relationship Length	
	(1)	(2)	(3)	(4)
Green-induced Nondisclosure	0.008**		-0.135***	
	(0.003)		(0.028)	
Green-induced Disclosure		-0.045***		0.070
		(0.005)		(0.053)
Supplier Controls	Yes	Yes	Yes	Yes
Customer Controls	Yes	Yes	Yes	Yes
CS-Industry FE	Yes	Yes	Yes	Yes
CS-Country FE	Yes	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj R^2	0.415	0.415	0.086	0.086
Observations	390,686	390,686	390,686	390,686

Table 7: Robustness Tests

This table reports the results of robustness tests by adopting alternative fixed effects, alternative measures of green-induced nondisclosure, and environmental scores based on other ESG rating agencies. Column (1) shows the results of using customer-supplier pair-level fixed effects. In Column (2) and (3), the green-induced nondisclosure is defined as the behavior that customer firms withhold the information of suppliers with environmental performance below the 50th and 70th percentile, respectively. Column (5) reports the result using the environmental score of Sustainalytics. All regressions include supplier and customer controls. For the results in Columns (1) to (3), the sample spans from 2003 to 2023. The sample period is 2009-2018 for the results based on Sustainalytics environmental scores (Column (4)). Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Dependent Variable: $EnvScore^S$			
	(1) CS-Firm FE	(2) Bottom50%	(3) Bottom70%	(4) Sustainalytics
$EnvScore^C \times$ Green-induced Nondisclosure	-0.026***	-0.015***	-0.012***	-0.015***
	(0.005)	(0.002)	(0.002)	(0.003)
Green-induced Nondisclosure	-0.186***	-0.171***	-0.115***	-0.066***
	(0.003)	(0.002)	(0.002)	(0.002)
$EnvScore^C$	0.011***	0.011***	0.012***	0.008***
	(0.004)	(0.001)	(0.002)	(0.002)
Supplier Controls	Yes	Yes	Yes	Yes
Customer Controls	Yes	Yes	Yes	Yes
CS-firm FE	Yes	No	No	No
CS-Industry FE	Yes	Yes	Yes	Yes
CS-Country FE	Yes	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj R^2	0.924	0.925	0.915	0.678
Observations	362,372	390,686	390,686	291,254

Table 8: US State-level GHG Emission Target

This table presents the results of triple-interaction effects using the establishment of US state-level GHG emission targets. The dependent variable is the environmental score of supplier firms. Column (1) reports the main results, where the key explanatory variable is the triple-interaction term of the one-year lagged customer environmental score, the green-induced nondisclosure dummy, and the GHG target indicator (*GHGtarget*). This indicator takes the value of one if a state enacted an executive or statutory GHG emission reduction target within the past five years. Column (2) shows the results of a placebo test, replacing the *GHGtarget* with *Placebo Target*, which assumes the enactment year of the GHG target is two years earlier than the actual year. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	GHGTarget	Placebo Target
	(1)	(2)
$EnvScore^C \times$ Green-induced Nondisclosure $\times$ GHGtarget	-0.011**	-0.003
	(0.005)	(0.005)
$EnvScore^C \times$ Green-induced Nondisclosure	-0.019***	-0.021***
	(0.003)	(0.003)
Green-induced Nondisclosure $\times$ GHGtarget	0.005	0.001
	(0.003)	(0.003)
$EnvScore^C \times$ GHGtarget	0.012***	0.005
	(0.003)	(0.003)
$EnvScore^C$	0.005**	0.007**
	(0.002)	(0.003)
Green-induced Nondisclosure	-0.180***	-0.179***
	(0.003)	(0.003)
GHGtarget	-0.005**	-0.002
	(0.002)	(0.002)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.921	0.921
Observations	165,377	165,377

Table 9: Global Implementation of GHG Emission Trading System

This table presents the results of triple-interaction effects using the implementation of the GHG emission trading system (ETS) worldwide. The dependent variable is the environmental score of supplier firms. Column (1) reports the main results, where the key explanatory variable is the triple-interaction term of the one-year lagged customer environmental score, the green-induced nondisclosure dummy, and the ETS indicator (ETS). This indicator takes the value of one if a country or a US state has launched the ETS. Column (2) shows the results of a placebo test, replacing the *ETS* with *Placebo ETS*, which assumes the implementation year of ETS is two years earlier than the actual year. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	ETS	Placebo ETS
	(1)	(2)
$EnvScore^C \times$ Green-induced Nondisclosure $\times$ ETS	-0.006*	-0.004
	(0.003)	(0.003)
$EnvScore^C \times$ Green-induced Nondisclosure	-0.015***	-0.015***
	(0.002)	(0.003)
Green-induced Nondisclosure $\times$ ETS	0.007***	0.007***
	(0.002)	(0.002)
$EnvScore^C \times$ ETS	0.003*	0.003
	(0.002)	(0.002)
$EnvScore^C$	0.006***	0.006***
	(0.002)	(0.002)
Green-induced Nondisclosure	-0.181***	-0.181***
	(0.002)	(0.002)
ETS	0.000	-0.001
	(0.001)	(0.001)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.923	0.923
Observations	390,686	390,686

Table 10: Cross-sectional heterogeneity – Common Stakeholders

This table reports the heterogeneous effects of green-induced nondisclosure on the relationship between suppliers' and customers' environmental scores depending on the existence of various common stakeholders in the supply chain. The dependent variable is the environmental score of supplier firms. The main explanatory variable of interest is the triple-interaction term of $EnvScore^C$, *Green-induced Nondisclosure*, and the *Common* Stakeholder indicator. *Common* represents common institutional investors (*Common IO*), common auditor (*Common Auditor*), and common analyst (*Common Analyst*) for each column. All regressions include supplier and customer controls. All variables are defined in Table A1. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Dependent Variable: $EnvScore^S$		
	(1) Common IO	(2) Common Auditor	(3) Common Analyst
$EnvScore^C$ × Green-induced Nondisclosure × Common	0.030***	0.015**	0.014***
	(0.022)	(0.007)	(0.004)
$EnvScore^C$ × Green-induced Nondisclosure	-0.022***	-0.017***	-0.027***
	(0.003)	(0.002)	(0.003)
Green-induced Nondisclosure × Common	-0.074***	-0.019***	-0.018***
	(0.009)	(0.005)	(0.003)
$EnvScore^C$ × Common	-0.015***	-0.005	-0.002
	(0.004)	(0.002)	(0.002)
$EnvScore^C$	0.011***	0.008***	0.009***
	(0.002)	(0.001)	(0.002)
Green-induced Nondisclosure	-0.164***	-0.177***	-0.166***
	(0.002)	(0.002)	(0.003)
Common	0.011***	0.005*	0.004***
	(0.003)	(0.002)	(0.001)
Supplier Controls	Yes	Yes	Yes
Customer Controls	Yes	Yes	Yes
CS-Industry FE	Yes	Yes	Yes
CS-Country FE	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj R^2	0.923	0.923	0.923
Observations	390,686	390,686	390,686

Table 11: Cross-sectional heterogeneity – Supplier Environmental Pressure

This table reports the heterogeneous effects of green-induced nondisclosure on the relationship between suppliers' and customers' environmental scores depending on the environmental pressure of suppliers. The dependent variable is the environmental score of supplier firms. The main explanatory variable of interest is the triple-interaction term of $EnvScore^C$, *Green-induced Nondisclosure*, and $Pressure^S$, which represents the requirement of mandatory ESG disclosure in suppliers' country (*Mandatory Disclosure*) and supplier country-level Environmental Performance Index (*EPI*) in Columns (1) and (2). All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Mandatory Disclosure	EPI
	(1)	(2)
$EnvScore^C \times$ Green-induced Nondisclosure $\times$ $Pressure^S$	0.010**	0.087***
	(0.004)	(0.010)
$EnvScore^C \times$ Green-induced Nondisclosure	-0.019***	-0.075***
	(0.002)	(0.007)
Green-induced Nondisclosure $\times$ $Pressure^S$	-0.006***	-0.059***
	(0.002)	(0.008)
$EnvScore^C \times$ $Pressure^S$	-0.009**	-0.068***
	(0.004)	(0.006)
$EnvScore^C$	0.009***	0.053***
	(0.002)	(0.005)
Green-induced Nondisclosure	-0.176***	-0.139***
	(0.002)	(0.006)
$Pressure^S$	-0.018***	-0.040***
	(0.002)	(0.008)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.923	0.924
Observations	390,686	390,686

Table 12: Cross-sectional heterogeneity – Customer Inhibition

This table reports the heterogeneous effects of green-induced nondisclosure on the relationship between suppliers' and customers' environmental scores, depending on the inhibition of customer firms to support the green practices of suppliers. The main explanatory variable of interest is the triple-interaction term of $EnvScore^C$, *Green-induced Nondisclosure*, and $Inhibition^C$, which represents the financial constraints of customer firms (measured by the KZ index of Kaplan and Zingales (1997)) and the number of suppliers in Columns (1) and (2). All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Financial Constraints	Number of Suppliers
	(1)	(2)
$EnvScore^C \times$ Green-induced Nondisclosure $\times$ $Inhibition^C$	-0.007**	-0.015***
	(0.003)	(0.005)
$EnvScore^C \times$ Green-induced Nondisclosure	-0.013***	-0.016***
	(0.003)	(0.002)
Green-induced Nondisclosure $\times$ $Inhibition^C$	0.001	0.015***
	(0.002)	(0.005)
$EnvScore^C \times Inhibition^C$	0.003	0.013***
	(0.002)	(0.004)
$EnvScore^C$	-0.181***	-0.181***
	(0.002)	(0.002)
Green-induced Nondisclosure	0.007***	0.006***
	(0.002)	(0.002)
$Inhibition^C$	0.000	-0.011***
	(0.001)	(0.003)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.923	0.923
Observations	390,686	390,686

Table 13: Carbon Outsource

This table reports the effects of green-induced nondisclosure on the relationship between carbon emissions of customers and suppliers. The dependent variables are the natural logarithm of suppliers' Scope1 and Scope2 carbon emissions in Column (1) and (2), respectively. The key independent variables of interest are the interaction terms of the natural logarithm of customers' carbon emissions and green-induced nondisclosure. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

	Dependent Variable	
	$\log(Scope1^S)$	$\log(Scope2^S)$
	(1)	(2)
$\log(Scope1^C)\times$ Green-induced Nondisclosure	-0.017***	
	(0.002)	
$\log(Scope1^C)$	0.007***	
	(0.001)	
$\log(Scope2^C)\times$ Green-induced Nondisclosure		-0.008***
		(0.001)
$\log(Scope2^C)$		0.009***
		(0.001)
Green-induced Nondisclosure	0.280***	-0.002
	(0.022)	(0.019)
Supplier Controls	Yes	Yes
Customer Controls	Yes	Yes
CS-Industry FE	Yes	Yes
CS-Country FE	Yes	Yes
Supplier Firm FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.959	0.961
Observations	335,053	335,746

Table 14: Strategic Responses by Supplier Firms

This table reports the supplier firm-level regression results regarding whether and how the green-induced nondisclosure activities of customer firms affect the strategic actions related to environmental issues by supplier firms in the future. The independent variable for these analyses is the *%Nondisgreen*, which is the percentage of customer firms engaging in green-induced nondisclosure divided by the total number of customer firms for a given supplier firm. In Panel A (B), the dependent variable is the *Green Patents* (*E Incidents*). The sample period is 2003-2021 for Panel A and 2007-2023 for Panel B. All regressions include supplier and customer controls. All variables are defined in Table A1. The sample spans from 2003 to 2023. Standard errors are clustered at the customer-supplier pair level. *,**, and *** denote significance levels at 1%, 5%, and 10%.

Panel A: Number of Green Patents

	Green Patents$_{t+1}$	Green Patents$_{t+2}$	Green Patents$_{t+3}$
	(1)	(2)	(3)
%Nondisgreen	-1.269*	-2.059**	-2.870***
	(0.749)	(0.838)	(0.923)
Supplier Controls	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj R^2	0.730	0.740	0.742
Observations	5,577	4,597	3,781

Panel B: RepRisk Environmental Incidents

	E Incidents$_{t+1}$	E Incidents$_{t+2}$	E Incidents$_{t+3}$
	(1)	(2)	(3)
%Nondisgreen	1.525***	2.031***	1.648**
	(0.501)	(0.512)	(0.659)
Supplier Controls	Yes	Yes	Yes
Supplier Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj R^2	0.804	0.812	0.816
N	6,312	4,802	3,782

A Appendix

Table A1: Definition of Variables

Variable	Definition
Supply Chain Variables	
Green-induced Nondisclosure	A dummy equals to one if the supplier-customer relationship is not voluntarily disclosed by customer firms and the supplier firms' environmental performance falls into the bottom thirtieth percentile in a given year (Source: FactSet Revere and Refinitiv Asset4)
Green-induced Disclosure	A dummy equal to one if the supplier–customer relationship is voluntarily disclosed by customer firms and the supplier firms' environmental performance falls into the bottom thirtieth percentile in a given year (Source: FactSet Revere and Refinitiv Asset4).
Termination Year	A dummy equal to one if the current year is the last year of the supplier–customer relationship (Source: FactSet Revere).
Relationship Length	The length of a supplier–customer relationship in years, calculated as the current year minus the starting year of this relationship plus one (Source: FactSet Revere).
%*Nondisgreen*	The percentage of customer firms engaging in green-induced nondisclosure over the total number of customer firms for a given supplier firm (Source: FactSet Revere and Refinitiv Asset4).
Environmental Variables	
$EnvScore^S$	The Asset4 environmental pillar score of supplier firms (Source: Refinitiv Asset4).
$\Delta EnvScore^S$	The one-year change in a supplier's environmental score, calculated as the gap between the environmental score in the current and prior year (Source: Refinitiv Asset4).
$EnvScore^C$	The Asset4 environmental pillar score of customer firms (Source: Refinitiv Asset4).
$\Delta EnvScore^C$	The one-year change in a customer's environmental score, calculated as the gap between the environmental score in the current and prior year (Source: Refinitiv Asset4).
$\log(Scope1^S)$	The natural logarithm of scope 1 GHG emissions of supplier firms (Source: S&P Trucost).

(*continued*)

Table A1 Continued

$\log(Scope1^C)$	The natural logarithm of scope 1 GHG emissions of customer firms (Source: S&P Trucost).
$\log(Scope2^S)$	The natural logarithm of scope 2 GHG emissions of supplier firms (Source: S&P Trucost).
$\log(Scope1^C)$	The natural logarithm of scope 2 GHG emissions of customer firms (Source: S&P Trucost).
Green Patents	The number of green patents filed by a supplier firm, where green patents are classified following Hascic and Migotto (2015) (Source: David Jaggi, 2025).
E Incidents	The number of RepRisk environmental incidents for a supplier firm (Source: RepRisk).
Identification Variables	
$\Delta EnvScore^{C+S}$	The sum of one-year changes in environmental scores of suppliers and customers (Source: Refinitiv Asset4).
GHGTarget	A binary indicator equal to one for five years starting from one year after the state in which the customer firm resides enacts an executive or statutory GHG emission target (Source: C2ES).
Placebo Target	A similar binary indicator to GHGTarget, but assuming that the enactment year of the state-level GHG emission target is two years before the actual enactment year (Source: C2ES).
ETS	A binary indicator equal to one if a country or U.S. state has implemented a GHG emissions trading system before year t (Source: World Bank Carbon Pricing Dashboard).
Placebo ETS	A similar binary indicator to ETS, but assuming that the implementation year of the country- or state-level ETS is two years before the actual enactment year (Source: World Bank Carbon Pricing Dashboard).
Mechanism Variables	
Common IO	The number of common institutional investors who own the shares of both suppliers and customers in a given year, divided by 100 (Source: FactSet Ownership).
Common Auditor	A dummy variable equal to one if the supplier and customer are served by the same auditor in a given year (Source: Audit Analytics).
Common Analyst	A dummy variable equal to one if at least one analyst issues earnings forecasts for both the supplier and customer in a given year (Source: Thomson Reuters IBES).

(*continued*)

Table A1 Continued

Mandatory Disclosure	An indicator equal to one if the country of the supplier has adopted mandatory ESG disclosure in the past (Source: Krueger et al., 2024).
EPI	The country-level environmental performance index of suppliers' countries, divided by 100 (Source: YCELP).
Financial Constraints	A dummy variable equal to one if a customer's KZ index, calculated based on Kaplan and Zingales (1997), is above the median of the KZ index among other customer firms in a given year (Source: WorldScope).
Number of Suppliers	The number of suppliers for each customer firm, divided by 100 (Source: FactSet Revere).
Control Variables	
Size	The natural logarithm of total assets in U.S. dollars plus one (Source: Worldscope).
Leverage	The percentage of total debt over total assets (Source: Worldscope).
ROA	Net income before preferred dividends divided by total assets (Source: Worldscope).
TobinQ	The sum of market capitalization and total liabilities divided by the aggregated value of common equity, total liabilities, and common or preferred redeemed funds (Source: Worldscope).
Sales Growth	The one-year net sales growth (Source: Worldscope).
GDPperCap	The natural logarithm of gross domestic product in current U.S. dollars divided by domestic population (Source: World Bank Indicator).