

Article

ESG Rating Disagreement and Supply Chain Green Spillovers: Evidence from Chinese Listed Firms

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Abstract

Environmental, social, and governance (ESG) ratings have become central to sustainable finance, yet substantial disagreement among rating agencies creates information uncertainty that may extend beyond the rated firm itself. While the growing literature examines how ESG rating disagreement affects corporate behavior at the firm level, the question of whether such disagreement propagates along supply chains remains unexplored. Using matched customer–supplier panel data from Chinese A-share listed companies over the period 2015 to 2023, this paper investigates whether and how ESG rating disagreement of customer firms is related to the environmental performance of their suppliers. The baseline results indicate that greater ESG rating disagreement of customer firms is associated with a significant deterioration in supplier environmental performance in the subsequent year, and a one-standard-deviation increase in disagreement is associated with a 0.23% increase in supplier pollution emission intensity. Mechanism analysis points to three channels: greater ESG rating disagreement is associated with weaker green supply chain management practices, with tighter customer financing constraints that limit the resources available for supply chain governance, and with the lower quality of the ESG information transmitted to suppliers. Heterogeneity analysis shows that the negative spillover is more pronounced when suppliers are more dependent on the customer, when the supply chain relationship is more stable, when customer firms are privately owned, and when customers operate in pollution-intensive industries. A decomposition by rating pillar indicates that disagreement over the environmental pillar is the primary driver. These findings extend the ESG rating disagreement literature from the firm level to the supply chain network level, demonstrating that the costs of rating inconsistency are not confined to the rated entity but spill over to upstream partners.

Keywords: ESG rating disagreement; supply chain; green spillover; environmental performance; China; sustainable development



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1. Introduction

1.1. Research Background and Motivation

The rapid expansion of sustainable finance over the past decade has elevated environmental, social, and governance (ESG) ratings to a position of considerable influence in corporate decision-making and capital allocation. Investors use ESG ratings to screen portfolios, regulators reference them in designing disclosure requirements, and firms treat

them as benchmarks for sustainability strategy. However, unlike credit ratings, where major agencies typically converge on similar assessments, ESG ratings are characterized by pronounced disagreement. The same company evaluated in the same year can receive a top-tier score from one agency and a bottom-tier score from another. In China, this problem is especially visible: Kweichow Moutai, one of the most closely watched stocks on the A-share market, was simultaneously rated “AA” by Sino-Securities Index and “C+” by SynTao Green Finance for its ESG performance in 2020. Such contradictions are not isolated cases but reflect a systemic feature of the current ESG rating landscape, where differences in scope, methodology, and weighting criteria produce persistently divergent signals about the same underlying corporate behavior [1].

This disagreement matters beyond its immediate effect on capital markets because firms do not operate in isolation. Modern production is organized around supply chains in which the practices of a core customer firm shape the behavior of dozens or even hundreds of upstream suppliers. Major customers routinely impose environmental requirements on their suppliers, conduct green procurement audits, and set sustainability standards that suppliers must meet to maintain the business relationship [2]. These supply chain governance mechanisms have become an important driver of environmental improvement across industries, particularly in China, where large, listed companies increasingly embed green criteria into supplier selection and performance evaluation. If ESG rating disagreement disrupts a customer firm’s own sustainability agenda, whether by diverting managerial attention, tightening financial constraints, or generating strategic confusion, the resulting effects are unlikely to remain confined within the firm boundary. Instead, they may propagate through the supply chain and alter the environmental behavior of upstream partners who depend on the customer for market access and business continuity.

China is a well-suited setting for this question, for both substantive and practical reasons. On the substantive side, several domestic rating agencies coexist with markedly different scopes, indicators, and weighting, so cross-agency disagreement is high by international standards. On the practical side, listed firms are required to disclose their five largest customers and suppliers, which makes the customer–supplier relationships that this study requires observable at scale.

Despite the intuitive appeal of this logic, no study has yet examined whether ESG rating disagreement generates supply chain spillover effects. The ESG rating disagreement literature and the supply chain ESG spillover literature have developed in parallel without intersection. The former focuses on how disagreement affects the rated firm and its capital market participants, while the latter investigates how the level or quality of customer ESG attributes transmits to suppliers. The present study bridges this gap by asking a question that neither literature has posed: when the market’s assessment of a customer firm’s ESG performance is inconsistent and contested, how does this uncertainty propagate to the environmental behavior of its supply chain partners?

To address this question, we construct a matched customer–supplier panel dataset covering Chinese A-share listed companies from 2015 to 2023. ESG rating disagreement is measured as the cross-agency standard deviation of standardized ratings from four major Chinese providers (Huazheng, Wind, SynTao Green Finance, and MioTech). Using a fixed-effects framework with instrumental variable estimation and multiple robustness checks, we find that greater ESG rating disagreement of customer firms is associated with weaker environmental performance of their suppliers in the subsequent year. This negative spillover effect is robust to alternative variable definitions, Heckman selection correction, propensity score matching, and high-dimensional fixed effects. Mechanism analysis reveals that ESG rating disagreement transmits through three channels: it weakens the customer’s green supply chain management practices, tightens the customer’s financing constraints

and thereby reduces resources available for supply chain governance, and degrades the quality of ESG information transmitted to suppliers. Heterogeneity analysis further shows that the negative spillover is amplified when suppliers are more dependent on the customer, when the supply chain relationship is more stable, when customer firms are privately owned, and when customers operate in pollution-intensive industries.

1.2. Related Literature

This study is related to several strands of existing literature. The first strand concerns the causes and consequences of ESG rating disagreement. The foundational contribution by Berg et al. introduced the concept of “aggregate confusion” and identified scope divergence, measurement divergence, and weight divergence as the primary sources of rating inconsistency across agencies [1]. Subsequent theoretical and empirical work has examined the economic implications of such disagreement from multiple perspectives. On the capital market side, studies have demonstrated that rating disagreement introduces uncertainty premiums into asset pricing [3], increases stock return volatility and widens bid-ask spreads [4,5], affects institutional ownership patterns [5], and reduces stock price informativeness [6,7]. On the corporate behavior side, researchers have found that rating disagreement distorts green innovation incentives, leading to either suppression of substantive innovation or inflation of low-quality “green innovation bubbles” [8]. Other documented consequences include heightened earnings management [9,10], increased management tone manipulation, elevated corporate carbon risk, and deterioration of analyst forecast quality [11]. In the Chinese context specifically, the disagreement problem is compounded by the coexistence of multiple domestic rating systems with divergent methodological approaches, the absence of unified disclosure standards until very recently, and the relatively short history of ESG evaluation [12]. Despite the breadth and depth of this literature, a notable limitation is that every existing study treats ESG rating disagreement as a firm-level phenomenon. The possibility that the costs of rating inconsistency extend beyond the evaluated firm and affect other economic agents connected through supply chain relationships has not been considered.

ESG rating disagreement is not unique to China. The foundational studies document pronounced divergence among major international agencies and show that it affects asset prices and corporate behavior in developed markets as well [1,3–5]. China presents a sharper instance of the same problem over a shorter history. Its domestic rating systems emerged only in the 2010s and proliferated rapidly, while a unified disclosure and methodology standard remained absent until the sustainability reporting guidelines issued by the Shanghai, Shenzhen, and Beijing stock exchanges in 2024. As a result, broad multi-agency coverage, and the divergence it produces, became measurable only from the mid-2010s [6,12].

The second strand relates to ESG and environmental spillovers within supply chains. The theoretical foundation for such transmission rests on the premise that major customers possess the bargaining power and monitoring capacity to influence supplier behavior through procurement standards, contractual requirements, and ongoing relationship governance [13,14]. Early evidence from the Chinese market confirmed that customer ESG scores positively predict subsequent supplier ESG outcomes, with the environmental and social dimensions exhibiting stronger spillovers than governance [15]. More recent work shows that higher ESG disclosure quality by customers encourages suppliers to improve their own ESG practices [2,16], that the adoption of ESG reporting mandates in customer countries generates cross-border spillovers through global supply chain linkages [17,18], and that a supplier’s depth of integration into global supply chains shapes its own ESG performance [19]. While this body of work convincingly demonstrates that supply chains serve as

conduits for sustainability transmission, it has focused exclusively on what may be termed the level channel, examining whether higher or better-quality customer ESG attributes produce better supplier outcomes. A different question concerns the uncertainty channel: what happens to supply chain ESG transmission when the information surrounding the customer's ESG performance is itself noisy and contested? The present study addresses this gap by introducing ESG rating disagreement as a new dimension of customer-level heterogeneity that conditions the effectiveness of supply chain green governance.

1.3. Contributions

This study makes three contributions. First, it extends the ESG rating disagreement literature from the firm level to the supply chain network level. Existing studies treat rating disagreement as a problem that affects the rated firm and its capital-market participants; by showing that its consequences propagate through vertical supply chain linkages to the environmental behavior of upstream partners, this study reveals that the costs of rating inconsistency are systemic rather than firm-specific, and reframes ESG rating disagreement as a supply chain governance issue rather than merely a capital-market information problem. Second, it enriches the supply chain ESG spillover literature by introducing the uncertainty channel alongside the established level channel. While prior research shows that a higher customer ESG level transmits positive signals to suppliers, our findings indicate that greater uncertainty about that level, holding the level fixed, can weaken or offset this transmission, which implies that the effectiveness of supply chain sustainability governance depends not only on the substance of customer ESG practices but also on the coherence of the information surrounding them. Third, the study carries direct policy relevance for the standardization of ESG ratings now under way in China. Following the 2024 sustainability reporting guidelines issued by the Shanghai, Shenzhen, and Beijing stock exchanges, the findings show that the externalities of rating disagreement reach beyond the capital market into the real economy through supply chains, strengthening the case for harmonizing rating methodologies and for incorporating supply chain considerations into green finance policy.

Beyond documenting a previously unexamined relationship, the study advances the two studies it bridges in three specific respects. For the ESG rating disagreement literature, which has treated disagreement as a firm-level phenomenon affecting the rated entity and its capital-market participants, we reconceptualize disagreement as a network-level governance shock and extend the attention-based view to an inter-organizational setting. An attention shock localized at one firm is shown to propagate along governance and resource ties to the real environmental outcomes of connected firms, so that the externalities of imperfect information reach beyond the firm boundary at which this literature has stopped. For the supply chain sustainability spillover literature, which has characterized a customer's ESG profile as a level to be transmitted downstream, we distinguish the level of that profile from its coherence and show that coherence, with the level held fixed, conditions whether the substance is transmitted at all. This introduces an uncertainty channel alongside the established level channel, and it identifies signal coherence as a determinant of diffusion that the literature has not previously isolated. Finally, we delineate the conditions under which a signal-compensation incentive offsets the dominant attention crowding-out force, namely environmental materiality and the customer's reputational exposure. By specifying these boundary conditions rather than asserting the primacy of either mechanism, the study refines the perspectives it employs rather than merely applying them.

The remainder of this paper is organized as follows. Section 2 develops the theoretical framework and hypotheses. Section 3 describes the data and empirical strategy. Section 4 presents the results, including baseline estimates, endogeneity tests, and robustness checks.

Section 5 reports the mechanism analysis and Section 6 the heterogeneity analysis. Section 7 discusses the findings, and Section 8 concludes and offers policy recommendations.

2. Theoretical Framework and Research Hypotheses

2.1. Theoretical and Analytical Framework

To analyze how ESG rating disagreement of customer firms may influence the environmental performance of their suppliers, this study integrates three complementary theoretical perspectives: the attention-based view of the firm, signaling theory, and transaction cost theory. Each perspective illuminates a distinct facet of the supply chain transmission process, and their combination yields competing predictions about the direction and mechanisms of the spillover effect.

The attention-based view (ABV), introduced by Ocasio [20], posits that firm behavior is fundamentally shaped by how managers allocate their limited attention across competing issues and tasks. Because managerial attention is a scarce cognitive resource, organizational structures and environmental stimuli jointly determine which issues receive priority and which are neglected [21,22]. In the context of ESG rating disagreement, this perspective suggests that when a customer firm receives conflicting ESG assessments from multiple agencies, the resulting ambiguity demands significant managerial attention to interpret, respond to, and communicate about. This internal attention demand may crowd out the cognitive and organizational resources that would otherwise be directed toward supply chain governance, including the monitoring and promotion of supplier environmental practices.

Signaling theory addresses the behavior of economic agents when information is asymmetrically distributed [23,24]. In the supply chain context, the ESG performance of a customer firm serves as a signal to its suppliers about the importance the customer attaches to environmental standards and the likely trajectory of green procurement requirements. When ESG ratings are consistent across agencies, this signal is clear and credible, reinforcing suppliers' incentives to invest in environmental improvement. However, rating disagreement introduces noise into this signaling process. Contradictory assessments undermine the clarity and credibility of the customer's ESG signal, weakening the informational foundation on which suppliers base their environmental decisions [24].

Transaction cost theory emphasizes that governance structures emerge to economize on the costs of organizing economic exchanges [25]. Green supply chain governance, including environmental clauses in procurement contracts, supplier audits, and compliance monitoring, entails non-trivial transaction costs. When ESG rating disagreement increases the uncertainty surrounding a customer firm's own sustainability position, it raises the costs of defining, monitoring, and enforcing green supply chain standards. Increased uncertainty about what constitutes adequate environmental performance, given the absence of a clear external benchmark, elevates the specification and monitoring costs associated with supply chain environmental governance.

We integrate these three perspectives into a single mechanism, which we term the attention–cost–signal transmission mechanism, rather than treating them as parallel explanations of the same relationship. The three perspectives are sequential and mutually dependent: each accounts for one necessary stage of transmission, and the output of one stage is the input of the next. The attention-based view identifies the trigger. Because managerial attention is a finite cognitive resource [20–22], the interpretive and reputational demands of contradictory ESG assessments draw attention toward investor communication, disclosure adjustment, and reputation management, and away from discretionary governance. Transaction cost theory identifies the internal consequence of this diversion. Once attention is reallocated and the firm's own externally validated ESG position becomes ambiguous, the firm loses the external benchmark against which supplier requirements

are defined, so the cost of specifying, monitoring, and enforcing green supply chain standards rises [25], yielding less precise contracts and weaker enforcement. Signaling theory identifies the channel through which this consequence reaches the supplier. The weaker governance is accompanied by a noisier ESG signal, and it is this degraded signal that suppliers observe and act upon [23,24]. None of the three perspectives is sufficient alone: attention diversion explains why the customer disengages but not how disengagement raises governance cost; transaction cost theory explains the rising cost of governance but neither why attention was withdrawn nor how the consequence is transmitted; and signaling theory explains transmission to the supplier but presupposes the weaker governance that the first two stages generate. The sequence is therefore cumulative: attention diversion raises governance cost, and higher governance cost degrades the signal that reaches suppliers. Together the three perspectives describe one transmission mechanism rather than three complementary arguments.

This logic connects to, and is grounded in, several established studies, with each stage of the mechanism anchored in prior theory and evidence rather than in intuition. The buyer–supplier governance stage rests on the sustainable supply chain management literature, in which the customer is the focal actor whose procurement standards, audits, and contractual requirements integrate environmental criteria into supplier behavior [13,14,26,27], so that a weakening of this focal role propagates downstream. The transmission of environmental practice from customer to supplier is, more specifically, a process of environmental capability diffusion: prior work on supplier environmental development and green capability transfer shows that suppliers upgrade their environmental performance largely through the knowledge, monitoring, and assistance provided within the buyer–supplier relationship [28,29], so that a customer that disengages or transmits an incoherent signal slows this diffusion. Resource dependence theory [30] grounds the conditionality of the effect on power asymmetry: suppliers that derive a large share of revenue from a single customer have limited capacity to offset a deterioration in that customer’s governance; whereas, more diversified suppliers are buffered, an implication we test directly in the heterogeneity analysis. Stakeholder theory [31] grounds the direction of the attention reallocation: when external evaluations conflict, managers prioritize the most immediate and powerful stakeholders, typically investors and analysts, over the more diffuse and longer-horizon claims of supplier environmental performance. Institutional theory [32] grounds the signal stage at the field level: the supply chain is an organizational field in which environmental practices diffuse through mimetic and normative pressure, so that a contested and incoherent customer ESG signal weakens these pressures and dampens the capability diffusion that would otherwise occur. Taken together, these studies provide a theoretical warrant for each link in the mechanism, so that the conceptual framework is derived from prior work rather than motivated solely by the empirical pattern we observe.

2.2. Research Hypotheses: ESG Rating Disagreement and Supplier Environmental Performance

When a customer firm faces high ESG rating disagreement, two opposing forces may shape its supply chain governance behavior and, consequently, the environmental performance of its suppliers.

The first force operates through what we term the attention crowding-out mechanism. ESG rating disagreement creates a demanding informational environment for the customer firm’s management. Inconsistent external evaluations require managers to devote substantial time and effort to understanding the sources of disagreement, formulating responses to investor inquiries, adjusting disclosure strategies, and managing reputational risks [5,7]. Under the ABV framework, this internal attention burden draws cognitive and organizational resources away from other managerial tasks. Supply chain governance, par-

ticularly the monitoring and promotion of supplier environmental practices, is among the activities most vulnerable to such crowding-out for two reasons. First, green supply chain management is a discretionary and forward-looking activity that lacks the immediacy of responding to capital market pressures. Second, the benefits of supply chain environmental governance accrue over the long term and are difficult to attribute to specific managerial actions, making it a lower priority when attention is scarce. Simultaneously, ESG rating disagreement has been shown to exacerbate financing constraints [3,5], reducing the pool of financial resources available for supply chain sustainability investments such as green procurement programs, supplier training initiatives, and compliance monitoring systems. Through these channels, ESG rating disagreement is expected to weaken the customer's supply chain governance capacity and deteriorate supplier environmental performance.

The second force operates through what we term the signal-compensation mechanism, which rests on equally established reasoning. When the reputational return to demonstrating genuine sustainability commitment is high, a customer facing a contested ESG signal has an incentive to invest in actions that are costly to imitate and therefore credible [23,24,31]. Sustainable supply chain governance is one such action, because it requires sustained organizational commitment that firms engaged in superficial ESG practices cannot easily replicate [13,14]. This incentive is strongest under three conditions: when the customer is internationally exposed and therefore subject to demanding external standards; when it operates in an environmentally salient industry, in which the environmental dimension carries high materiality within the overall ESG assessment; and when it pursues an upward-alignment strategy, benchmarking its practices to the most stringent rather than the most lenient agency. Under these conditions, ESG rating disagreement could lead the customer to impose stricter environmental expectations on its suppliers and thereby improve, rather than worsen, their environmental performance.

Because these two forces operate in opposite directions, the net effect of ESG rating disagreement on supplier environmental performance is an empirical question. We therefore propose competing hypotheses:

Hypothesis 1a (Attention Crowding-out). *ESG rating disagreement of the customer firm has a negative effect on the environmental performance of its suppliers.*

Hypothesis 1b (Signal Compensation). *ESG rating disagreement of the customer firm has a positive effect on the environmental performance of its suppliers.*

2.3. Research Hypotheses: Mechanism Analysis

2.3.1. The Green Supply Chain Management Channel

Green supply chain management (GSCM) encompasses the set of practices through which customer firms integrate environmental criteria into their procurement decisions and supplier relationship governance [26,27]. These practices include embedding environmental clauses in procurement contracts, conducting periodic environmental audits of suppliers, requiring suppliers to obtain environmental certifications, and providing technical or financial assistance for supplier environmental upgrading. GSCM constitutes the most direct channel through which customer-level factors can influence supplier environmental behavior.

ESG rating disagreement may affect GSCM intensity through multiple pathways. From the attention-based perspective, the managerial bandwidth consumed by responding to inconsistent ESG evaluations reduces the organizational capacity for designing, implementing, and enforcing green supply chain programs. GSCM is a resource-intensive activity that requires dedicated personnel, information systems, and cross-functional coor-

dination between procurement, environmental management, and supplier relations teams. When the top management's attention is diverted toward managing the consequences of rating disagreement, the organizational infrastructure supporting GSCM is likely to receive less priority and fewer resources. From the transaction cost perspective, ESG rating disagreement increases the ambiguity surrounding what constitutes appropriate environmental standards for the supply chain. If the customer firm itself lacks a clear, externally validated ESG position, defining and communicating specific environmental requirements to suppliers becomes more costly and less effective. This ambiguity may lead to less precise environmental specifications in procurement contracts, less rigorous auditing, and weaker enforcement of green standards. Based on this analysis, we propose:

Hypothesis 2. *ESG rating disagreement of the customer firm reduces the intensity of its green supply chain management, which is associated with weaker subsequent supplier environmental performance.*

2.3.2. The Resource Constraint Channel

The second mechanism operates through the financial resources available for supply chain governance. A well-established finding in the ESG rating disagreement literature is that inconsistent ratings increase information asymmetry between the firm and its investors, leading to higher financing costs and tighter credit conditions [3,5]. When a customer firm faces elevated financing constraints as a result of rating disagreement, the consequences extend beyond its own investment decisions and reach its supply chain relationships.

Customer firms with constrained financial resources face pressure to prioritize core operational expenditures over discretionary sustainability investments. Supply chain environmental programs, which often involve subsidizing supplier upgrades, offering favorable payment terms conditional on environmental compliance, or absorbing the short-term cost premiums of green procurement, are among the first activities to be scaled back when budgets are tight. Moreover, financially constrained customer firms may shift procurement criteria toward cost minimization and away from environmental performance, weakening the green premium that incentivizes suppliers to invest in environmental improvement. This resource constraint transmission can be understood as an indirect pathway: rating disagreement tightens the customer's financial position, which in turn reduces both the willingness and the ability to invest in supply chain sustainability, ultimately limiting the resources and incentives that suppliers need to improve their environmental performance. Based on this analysis, we propose:

Hypothesis 3. *ESG rating disagreement of the customer firm tightens its financing constraints, which is associated with weaker subsequent supplier environmental performance.*

2.3.3. The Information Transmission Channel

The third mechanism concerns the quality of ESG-related information that flows from customer firms to their suppliers. In supply chains characterized by repeated interactions, the customer firm's ESG practices and disclosure serve an important informational function for suppliers. Suppliers observe the ESG standards, reporting practices, and strategic priorities of their major customers and use this information to calibrate their own environmental strategies. This observational learning and imitation process is a key driver of the positive ESG spillovers documented in prior research [2,15,16].

ESG rating disagreement disrupts this information transmission process in two ways. First, it reduces the credibility of the customer's ESG signal. When external rating agencies cannot agree on whether a customer firm is a strong or weak ESG performer, suppliers

face greater difficulty in interpreting the customer's environmental expectations. The informational value of the customer's ESG practices as a reference point for supplier decision-making is diminished. Second, disagreement reduces the clarity of the customer's own ESG strategy. A customer firm receiving contradictory ratings may itself be uncertain about which aspects of its ESG performance are valued by the market, leading to strategic ambiguity that is transmitted to its supply chain communications. The resulting informational noise weakens the demonstration effect through which customer ESG practices serve as a template for supplier behavior.

When information transmission is degraded, the positive ESG spillover that would ordinarily occur through supply chain learning is attenuated. Suppliers receiving unclear or contradictory signals about the importance of environmental performance in their customer relationships are less likely to allocate resources toward environmental improvement, as the expected returns from such investment become more uncertain. Based on this analysis, we propose:

Hypothesis 4. *ESG rating disagreement of the customer firm lowers the quality of the ESG information it transmits to suppliers, which is associated with weaker subsequent supplier environmental performance.*

3. Data and Methodology

3.1. Data Sources and Sample Construction

The empirical analysis requires us to link three types of data: ESG ratings from multiple agencies for customer firms, supply chain relationship information connecting customers to their suppliers, and environmental performance measures for supplier firms. We describe each data source and the sample construction process below.

ESG rating data are collected from four major Chinese ESG rating providers: Sino-Securities Index (Huazheng), Wind, SynTao Green Finance, and MioTech (MioYing). These four agencies are among the most widely used domestic ESG rating systems in the Chinese capital market and have been employed in prior research on ESG rating disagreement in the Chinese context. Each agency applies its own evaluation framework with distinct scope, indicator selection, and weighting schemes, which is the institutional foundation of the rating disagreement examined in this study. While international agencies such as MSCI and Sustainalytics also cover portions of the Chinese market, we focus on domestic raters for two reasons: their coverage of A-share listed companies is substantially broader, and their evaluation criteria are more closely aligned with the Chinese regulatory and institutional environment.

Supply chain relationship data are obtained from the CSMAR supply chain research database, which compiles information on the top five customers and suppliers disclosed by Chinese A-share listed companies in their annual reports. Under Chinese accounting standards, listed firms are required to disclose the names and transaction amounts of their five largest customers and suppliers. The database provides the identities of these trading partners, the transaction amounts, and the share of each partner in total sales or procurement. We use this information to construct customer–supplier pairs. Specifically, for each listed firm that discloses its major customers, we identify cases where the customer is also a listed company with available ESG rating data. This matching procedure yields a panel of customer–supplier–year observations in which the customer's ESG rating disagreement can be linked to the supplier's subsequent environmental performance.

Financial data for both customer and supplier firms are drawn from the CSMAR financial statement database. Environmental performance data are obtained from multiple sources: the CSMAR environmental research database provides pollution emission data and environmental investment figures; the Institute of Public and Environmental Affairs (IPE) Blue Map database provides records of environmental regulatory penalties; and the environmental sub-scores from the Huazheng ESG rating system serve as an alternative measure of supplier environmental outcomes. Text data used in the mechanism analysis are extracted from the CNRDS annual report text database and corporate CSR/ESG reports.

The sample period runs from 2015 to 2023, and both bounds are determined by data availability. The starting year is set by the coverage of domestic ESG rating agencies, because before 2015 the number of firms rated simultaneously by three or more agencies was too small to construct a stable cross-agency disagreement measure [1,6,12]. The ending year reflects the most recent year for which multi-agency ESG ratings, supply chain relationship records, supplier environmental performance data, and corporate report text could all be reconciled into a single matched panel at the time of analysis. The requirement that a firm be rated by at least three agencies in a given year follows directly from the construction of a cross-agency disagreement measure, which is the same data requirement underlying the international literature on ESG rating disagreement [1,4,5]. In developed markets, where commercial ESG rating coverage began earlier, this condition has been met over longer historical windows; in China, broad simultaneous coverage of A-share firms by multiple domestic agencies emerged only in the mid-2010s, which is why empirical work on ESG rating disagreement in the Chinese market begins its samples in this period [6,12].

We apply the following sample selection criteria: (1) we retain only non-financial A-share listed companies on the Shanghai and Shenzhen stock exchanges; (2) we require the customer firm to be covered by at least three ESG rating agencies in a given year; (3) we exclude customer–supplier pairs in which the supplier is not a listed company, as environmental performance data are unavailable for non-listed firms; (4) we drop observations flagged as ST or *ST; and (5) we exclude observations with missing values on key variables. All continuous variables are Winsorized at the 1st and 99th percentiles to mitigate the influence of outliers.

Applying these criteria sequentially reduces an initial set of 136,847 disclosed customer–supplier–year records to a final matched panel of 21,486 observations covering 1847 customer firms and 2563 supplier firms. The two largest reductions follow directly from the research design. The first is the requirement that the customer be a listed firm rated by at least three agencies in the same year, which is necessary to construct a stable cross-agency disagreement measure, and which removes records in which the customer is unlisted or thinly rated. The second is the requirement that the supplier be a listed firm, which is necessary to obtain audited environmental and financial data and which removes the large number of pairs whose suppliers are private or unlisted. Because both requirements tilt the sample toward larger and more visible firms, the estimates are best interpreted as applying to the population of listed customer–supplier pairs, and we return to the resulting external-validity limitation in Section 8.3.

3.2. Identification Strategy

The baseline regression model takes the following form:

$$Supplier_EP_{s,c,t+1} = \alpha + \beta ESG_Disagree_{c,t} + X'_{s,c,t} \gamma + \lambda_s + \lambda_t + \varepsilon_{s,c,t} \quad (1)$$

where $Supplier_EP_{s,c,t+1}$ denotes the environmental performance of supplier s linked to customer c in year $t + 1$; $ESG_Disagree_{c,t}$ is the ESG rating disagreement of customer c in year t ; $X'_{s,c,t}$ are a series of vectors of supplier-level, customer-level, and supply chain relationship

controls, respectively. The model includes supplier fixed effects λ_s and year fixed effects λ_y . Standard errors are clustered at the customer level to account for the correlation of error terms across suppliers sharing the same customer. The dependent variable is measured at $t + 1$ to allow time for supply chain transmission and to alleviate contemporaneous reverse causality concerns. The coefficient β is the parameter of primary interest. When the dependent variable is pollution emission intensity, a positive and significant β supports the attention crowding-out hypothesis (H1a), indicating that greater customer ESG rating disagreement deteriorates supplier environmental performance.

3.3. Variable Measurement

3.3.1. Dependent Variable: Supplier Environmental Performance

The baseline dependent variable is supplier pollution emission intensity. We include the principal regulated pollutants reported in the CSMAR environmental research database, namely chemical oxygen demand, ammonia nitrogen, sulfur dioxide, nitrogen oxides, and soot and dust. Because these pollutants are measured in different physical units, we standardize each pollutant's emissions across the sample and sum the standardized values into a composite emission measure, which we then scale by operating revenue to obtain an intensity, with higher values indicating worse environmental performance. Industry differences in baseline pollution intensity are addressed in two ways. Supplier fixed effects absorb time-invariant supplier characteristics, including the supplier's industry, so the estimate is identified from within-supplier variation over time. In addition, the robustness specification that replaces year fixed effects with industry-by-year fixed effects absorbs time-varying differences across industries, and the coefficient remains stable.

To ensure robustness, we employ two alternative measures of supplier environmental performance. The first is environmental investment intensity, defined as the ratio of environmental protection capital expenditures to total assets, which captures the supplier's proactive investment in environmental improvement. The second is the environmental sub-score (E-score) from the Huazheng ESG rating, which provides a composite assessment of the supplier's environmental management, resource usage, and pollution control performance.

3.3.2. Independent Variable: Customer ESG Rating Disagreement

The core independent variable measures the degree of disagreement among ESG rating agencies in their assessment of the customer firm. Following the methodology established by Berg et al. and subsequently applied in the Chinese context [1,6], we construct this variable through a three-step procedure.

First, we convert the categorical ESG ratings from each agency into numerical scores. Because the four agencies employ different rating scales, the raw scores are not directly comparable across agencies. Second, to address this scale incomparability, we standardize the numerical scores within each agency-year combinations using z-score normalization. For agency k in year t , the standardized score of firm i is computed as:

$$Z_{i,t}^k = \frac{Score_{i,t}^k - Score_t^k}{\sigma_t^k} \quad (2)$$

where $Score_t^k$ and σ_t^k are the cross-sectional mean and standard deviation of all firms rated by agency k in year t . This transformation places the ratings from all agencies on a common scale with mean zero and unit variance, enabling meaningful cross-agency comparison. Third, for each customer firm-year observation, we compute the standard deviation of the standardized scores across all agencies that cover the firm:

$$ESG_Disagree_{c,t} = \sqrt{\frac{1}{K_{c,t} - 1} \sum_{k=1}^{K_{c,t}} (Z_{c,t}^k - \bar{Z}_{c,t})^2} \quad (3)$$

where $K_{c,t}$ is the number of agencies rating customer c in year t , and $\bar{Z}_{c,t}$ is the mean of the standardized scores. A higher value of $ESG_Disagree$ indicates greater disagreement among rating agencies regarding the customer firm's ESG performance.

3.3.3. Control Variable

To isolate the effect of ESG rating disagreement from potential confounding factors, we include three sets of control variables. At the customer level, we control for the average ESG rating level (ESG_level), firm size ($Size_c$), return on assets (ROA_c), and leverage (Lev_c). A critical control variable is the customer's average ESG rating level, computed as the mean of standardized ratings across all agencies covering the firm. Including this variable ensures that the estimated coefficient on $ESG_Disagree$ captures the effect of rating dispersion conditional on the overall level of ESG performance, thereby separating the "uncertainty effect" from the "level effect" examined in prior supply chain ESG spillover studies. At the supplier level, we control for firm size ($Size_s$), leverage (Lev_s), return on assets (ROA_s), revenue growth ($Growth_s$), listing age (Age_s), cash flow ratio ($Cash_s$), Tobin's Q ($TobinQ_s$), state ownership (SOE_s), and the board size ($Board_s$). At the supply chain relationship level, we control for the supplier's sales dependence on the customer ($Dependence$), the duration of the relationship ($Duration$), whether both firms operate in the same industry ($Same_Ind$), and the geographic distance between the two firms (Geo_dist). Table 1 reports variable definitions and data sources, and Table 2 reports summary statistics.

Table 1. Variable definitions and data sources.

Variable	Definition	Source
Supplier_EP	Composite standardized emissions of main regulated pollutants scaled by operating revenue; higher is worse	CSMAR Environmental
ESG_Disagree	Cross-agency standard deviation of standardized ESG ratings	Huazheng, Wind, SynTao, MioTech
ESG_Level	Mean of standardized ESG ratings across covering agencies	Huazheng, Wind, SynTao, MioTech
Size_c/Size_s	Natural logarithm of total assets (customer/supplier)	CSMAR
ROA_c/ROA_s	Net income divided by total assets	CSMAR
Lev_c/Lev_s	Total liabilities divided by total assets	CSMAR
Growth_s	Annual growth rate of supplier operating revenue	CSMAR
Age_s	Natural logarithm of supplier listing age	CSMAR
Cash_s	Operating cash flow divided by total assets	CSMAR
TobinQ_s	Market value divided by replacement cost of assets	CSMAR
SOE_s	Equals one if the supplier is state-owned	CSMAR
Board_s	Natural logarithm of board size	CSMAR
Dependence	Share of supplier revenue derived from the focal customer	CSMAR supply chain
Duration	Consecutive years the pair appears in top-five disclosure	CSMAR supply chain
Same_Ind	Equals one if customer and supplier share the two-digit industry	CSMAR
Geo_Dist	Natural logarithm of the distance between registered addresses	CSMAR

Table 2. Summary statistics.

Variable	Obs	Mean	Std. Dev	Min	Max
Supplier_EP	21,486	0.032	0.045	0.000	0.238
ESG_Disagree	21,486	0.453	0.281	0.024	1.523
Customer Controls					
ESG_level	21,486	0.028	0.416	−1.231	1.182
Size_c	21,486	23.152	1.423	20.118	27.628
ROA_c	21,486	0.042	0.058	−0.185	0.213
Lev_c	21,486	0.432	0.192	0.048	0.893
Supplier Controls					
Size_s	21,486	22.378	1.253	19.847	26.473
Lev_s	21,486	0.412	0.193	0.043	0.879
ROA_s	21,486	0.039	0.062	−0.213	0.198
Growth_s	21,486	0.118	0.324	−0.538	1.847
Age_s	21,486	2.351	0.621	0.693	3.434
Cash_s	21,486	0.046	0.068	−0.157	0.237
TobinQ_s	21,486	2.053	1.276	0.862	8.347
SOE_s	21,486	0.321	0.467	0.000	1.000
Board_s	21,486	2.148	0.193	1.609	2.708
Supply Chain Controls					
Dependence	21,486	0.123	0.142	0.008	0.683
Duration	21,486	2.183	1.352	1.000	8.000
Same_Ind	21,486	0.231	0.422	0.000	1.000
Geo_Dist	21,486	6.418	1.527	0.000	8.152

4. Results

4.1. Baseline Regression Results

Table 3 presents the baseline regression results, in which we progressively add control variables to examine the relationship between customer ESG rating disagreement and supplier environmental performance. The dependent variable across all columns is pollution emission intensity measured at year $t + 1$, where higher values indicate worse environmental performance. All specifications include supplier fixed effects and year fixed effects, and standard errors are clustered at the customer level.

Table 3. Baseline results.

Variable	Dependent Variable: Supplier_EP			
	(1)	(2)	(3)	(4)
ESG_Disagree	0.0142 *** (4.23)	0.0118 *** (3.87)	0.0096 *** (3.42)	0.0083 *** (3.15)
ESG_Level			−0.0054 ** (−2.31)	−0.0048 ** (−2.17)
Supplier Controls	N	Y	Y	Y
Customer Controls	N	N	Y	Y
SC Relation Controls	N	N	N	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	21,486	21,486	21,486	21,486
Adj. R	0.412	0.438	0.446	0.451

Note: **, *** indicate significance at the 5%, and 1% levels. t -statistics in parentheses, based on standard errors clustered at the customer level. Subsequent tables are the same as Table 2 unless otherwise specified.

Column (1) includes only the core independent variable *ESG_Disagree* without any controls. The coefficient is positive and statistically significant at the 1% level, providing preliminary evidence that greater ESG rating disagreement of the customer firm is associated with higher pollution emission intensity of its suppliers. Column (2) adds supplier-level control variables, and the coefficient on *ESG_Disagree* remains positive and significant, though the magnitude decreases slightly as supplier characteristics absorb part of the variation. Column (3) further includes customer-level controls, most importantly *ESG_Level*, the average ESG rating of the customer firm. After controlling for the customer's overall ESG performance level, the coefficient on *ESG_Disagree* remains positive and significant. The attenuation relative to Column (2) confirms that part of the raw association between disagreement and supplier environmental outcomes operates through correlated differences in ESG levels, underscoring the importance of separating the “uncertainty effect” from the “level effect”. Notably, the coefficient on *ESG_Level* is negative and significant, consistent with prior findings that higher customer ESG performance generates positive supply chain spillovers.

Column (4) reports the full specification with all three sets of controls. The coefficient on *ESG_Disagree* is 0.0083, significant at the 1% level. In terms of economic magnitude, a one-standard-deviation increase in customer ESG rating disagreement is associated with a 0.23% increase in supplier pollution emission intensity in the following year. This effect is economically meaningful given that it captures an indirect, cross-firm transmission channel rather than a direct policy intervention. The results support Hypothesis 1a, suggesting that the dominant mechanism is one in which ESG rating disagreement diverts customer firms' attention and resources away from supply chain environmental governance, leading to a deterioration of supplier environmental performance.

4.2. Endogeneity Tests

Although the one-year lag structure and supplier fixed effects in the baseline specification help mitigate reverse causality and time-invariant omitted variable concerns, the possibility remains that unobserved time-varying factors simultaneously drive both customer ESG rating disagreement and supplier environmental performance. We address this issue through instrumental variable estimation and Heckman selection correction.

Given that each approach has limits. The fixed effects absorb time-invariant supplier characteristics and shocks common to all firms in a given year, but not time-varying confounders specific to a customer or a relationship; the one-year lag mitigates contemporaneous reverse causality but not forward-looking anticipation; the instruments are valid only under the exclusion restrictions set out below; and the Heckman procedure corrects only for selection on observables. We therefore read the consistency of the estimates across these approaches as strong and mutually reinforcing evidence rather than as a single decisive test.

4.2.1. Instrumental Variable Estimation

We employ two instrumental variables for the customer's ESG rating disagreement.

The first instrument is the leave-one-out mean of ESG rating disagreement among other firms located in the same city and operating in the same two-digit industry as the customer firm (*IV_Peer*). The relevance condition is satisfied because firms in the same city and industry are exposed to a common local information environment, including analyst coverage density, media attention, regional ESG policy initiatives, and the operational presence of rating agencies. These shared environmental factors influence the degree of ESG rating disagreement that individual firms experience. The exclusion restriction requires that the average rating disagreement of peer firms does not directly affect the

focal supplier's environmental performance except through its correlation with the focal customer's own rating disagreement.

The second instrument is the number of ESG rating agencies that cover the customer firm in a given year (Num_Raters). The relevance condition holds because firms covered by more rating agencies are mechanically more likely to exhibit rating disagreement, since each additional assessment introduces another potentially divergent evaluation. The exclusion restriction relies on the observation that the decision of an ESG rating agency to cover a particular firm is primarily driven by the firm's index membership, market capitalization, and industry representativeness, rather than by the environmental practices of its suppliers. We report on the first-stage F statistic and conduct weak instrument tests to verify the strength of the instruments.

In addition, to ensure that the results do not depend on the more contestable second instrument, the number of rating agencies covering the firm (Num_Raters), Column (3) reports a just-identified specification using IV_Peer alone; the estimate is almost identical to the over-identified estimate, and the Hansen J test does not reject the joint validity of the instrument set ($p = 0.314$). Finally, Column (4) addresses the concern that instrument relevance might operate through firm visibility, international exposure, or transparency. It adds the customer's overseas revenue share (Export) and institutional ownership (InstOwn) to the second stage, with firm size already controlled in the baseline, and the coefficient on *ESG_Disagree* is essentially unchanged.

The first-stage results in Column (1) in Table 4 confirm that the instruments are relevant. Both the peer disagreement instrument and the number of rating agencies enter with the expected positive sign and are individually significant. The Kleibergen–Paap F statistic of 35.46 and the Cragg–Donald statistic of 38.72 both lie well above the conventional weak-instrument thresholds, so the analysis does not suffer from a weak-instrument problem. The second-stage coefficient in Column (2) is 0.0127, somewhat larger than the ordinary least squares estimate of 0.0083. Two explanations account for this pattern, and both work against finding a spurious effect: classical measurement error in the disagreement variable attenuates the ordinary least squares estimate toward zero, and the local average nature of the instrumental-variable estimate isolates the component of disagreement driven by the surrounding information environment rather than by the firm's own choices. The estimate is stable across the remaining specifications, falling only marginally to 0.0118 in the just-identified Column (3), reaching 0.0123 with additional confounder controls in Column (4). Together with the over-identification test, which does not reject the validity of the instrument set, these results indicate that the positive association is not an artifact of weak instruments, of the more contestable number-of-agencies instrument, or of the firm characteristics that a reader might suspect to be correlated with rating coverage.

Table 4. Endogeneity tests.

Variable	(1) First Stage	(2) IV-2SLS	(3) IV_Peer Only	(4) Confounders	(5) Heckman
	ESG_Disagree	Supplier_EP	Supplier_EP	Supplier_EP	Supplier_EP
ESG_Disagree		0.0127 ** (2.48)	0.0118 ** (2.21)	0.0123 ** (2.36)	0.0079 *** (2.96)
IV_Peer	0.3420 *** (8.67)				
Num_Raters	0.0583 *** (5.23)				
Export				−0.0039 * (−1.83)	

Table 4. Cont.

Variable	(1) First Stage ESG_Disagree	(2) IV-2SLS Supplier_EP	(3) IV_Peer Only Supplier_EP	(4) Confounders Supplier_EP	(5) Heckman Supplier_EP
InstOwn				−0.0028 (−1.43)	
IMR					−0.0034 (−1.52)
Controls	Y	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Kleibergen–Paap F	35.46		75.18	30.12	
Hausman <i>p</i> -value		0.314		0.297	
Observations	21,486	21,486	21,486	21,486	21,486

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels.

4.2.2. Heckman Selection Correction

The CSMAR supply chain database covers only firms that disclose the names of their top-five trading partners, and this disclosure decision may be non-random. Firms with stronger governance or greater transparency may be more likely to name their trading partners, potentially biasing the sample toward customer–supplier pairs with systematically different ESG characteristics. We address potential sample selection bias arising from the disclosure of trading partners using the Heckman two-step procedure [33]. In the first stage, we estimate a probit model on the full universe of A-share non-financial listed firms, in which the dependent variable equals one if the firm discloses the names of its major customers or suppliers. The predictors include firm size, state ownership, institutional ownership, analyst coverage, and Big Four auditor status, along with industry and year fixed effects. The first-stage results indicate that larger firms, firms with higher institutional ownership, and firms audited by Big Four auditors are significantly more likely to disclose partner names, consistent with the notion that disclosure is associated with stronger external monitoring. From this model we compute the inverse Mills ratio (IMR) for each observation. In the second stage, the IMR is included as an additional control in the baseline regression to correct for the potential non-randomness of sample entry.

As shown in Table 4, Column (5), the coefficient on ESG_Disagree remains positive and significant, while the coefficient on the IMR is statistically insignificant. The insignificance of the IMR suggests that, after conditioning on observables, the selection into our sample does not materially bias the estimated relationship between customer ESG rating disagreement and supplier environmental performance.

4.2.3. Other Robustness Tests: Alternative Estimation Approaches

We conduct several robustness tests that modify the estimation approach while retaining the baseline variable definitions. Table 5 reports the results.

Propensity score matching. To address the concern that customer firms with high versus low ESG rating disagreement may differ systematically in observable characteristics, we implement propensity score matching (PSM). Customer firms are classified into high- and low-disagreement groups using the annual median of ESG_Disagree as the threshold. We then match each high-disagreement customer–supplier pair with its nearest neighbor in the low-disagreement group based on propensity scores estimated from customer characteristics (Size_c, ROA_c, Lev_c, ESG_Level), supplier characteristics (Size_s, ROA_s, Lev_s), and supply chain relationship variables. The baseline regression is re-estimated on the matched sample. As shown in Column (1), the coefficient on ESG_Disagree remains positive and significant, and the reduction in sample size does not alter the statistical inference.

Table 5. Robustness tests: alternative estimation approaches.

Variable	(1)	(2)	(3)	(4)	(5)
	PSM	Industry $\times$ Year FE	Customer FE	Pair FE	Env_Perf_c
ESG_Disagree	0.0091 *** (2.83)	0.0072 ** (2.56)	0.0076 *** (2.88)	0.0081 *** (2.71)	0.0078 *** (2.91)
Controls	Y	Y	Y	Y	Y
Supplier FE	Y	Y	Y	N	Y
Customer FE	N	N	Y	N	N
Pair FE	N	N	N	Y	N
Industry $\times$ Year FE	N	Y	N	N	N
Year FE	Y	Y	Y	Y	Y
Observations	16,842	21,486	21,486	18,743	21,486
Adj. R ²	0.453	0.467	0.489	0.561	0.452

Note: **, *** indicate significance at the 5% and 1% levels.

High-dimensional fixed effects. Column (2) replaces the separate year fixed effects with customer-industry-by-year interacted fixed effects, which absorb all time-varying factors at the customer industry level. This specification accounts for the possibility that certain industries face heightened ESG scrutiny in particular years due to regulatory changes or environmental incidents. The coefficient on ESG_Disagree remains positive and significant, though the magnitude is somewhat smaller as the high-dimensional fixed effects absorb additional variation. To further address relationship-level confounders, Column (3) adds customer fixed effects to the supplier and year fixed effects, and Column (4) replaces them with customer-supplier pair fixed effects, which absorb all time-invariant features of each specific trading relationship. The coefficient remains positive and significant in both.

Controlling for customer environmental performance. A potential concern is that the estimated effect of ESG rating disagreement merely proxies for the direct transmission of customer environmental performance to suppliers. Column (5) addresses this by adding the customer's own pollution emission intensity (Env_Perf_c) as an additional control. The coefficient on ESG_Disagree is essentially unchanged, confirming that the disagreement effect operates through channels distinct from the direct environmental performance spillover.

4.2.4. Other Robustness Tests: Alternative Variable Definitions

To examine whether the baseline results are sensitive to the measurement of key variables, we replace the measurement method with several alternative indicators and re-estimate the baseline model. The results are reported in Table 6.

Table 6. Robustness tests: alternative variable definitions.

Variable	(1)	(2)	(3)	(4)
	Penalty	E_Score	ESG_Range	Extend Lag
ESG_Disagree	0.0415 ** (2.34)	−0.0186 *** (−3.08)		0.0061 * (1.89)
ESG_Range			0.0052 ** (2.42)	
Controls	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	21,486	21,486	21,486	18,213
Adj. R	0.318	0.392	0.449	0.436

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels.

Alternative dependent variables. Columns (1) and (2) replace pollution emission intensity with two alternative measures of supplier environmental performance. In Column (1), the dependent variable is the natural logarithm of one plus the number of environmental regulatory penalties (Penalty). The coefficient on *ESG_Disagree* is positive and significant, indicating that suppliers of customers with greater rating disagreement receive more environmental penalties. In Column (2), the dependent variable is the Huazheng environmental sub-score (*E_Score*), where higher values indicate better environmental performance. The coefficient is negative and significant, confirming that greater customer rating disagreement is associated with lower composite environmental performance of suppliers. The sign reversal relative to the baseline is expected given the opposite directionality of this measure, and the consistency across all three dependent variables strengthens confidence in the underlying relationship.

Alternative independent variable. Column (3) replaces the standard-deviation-based disagreement measure with the range-based measure (*ESG_Range*), defined as the difference between the highest and lowest standardized ratings a customer firm receives. The coefficient is positive and significant, demonstrating that the result is not an artifact of the specific operationalization of rating disagreement.

Extended lag structure. Column (4) measures the dependent variable at $t + 2$ rather than $t + 1$ to examine whether the supply chain spillover effect persists beyond one year. The coefficient remains positive and marginally significant. The attenuation in both magnitude and significance relative to the baseline is consistent with the expectation that the transmission effect weakens as the temporal distance between the cause and outcome increases, but the persistence of the effect at the 10% level suggests that rating disagreement has consequences for supplier environmental behavior that extend beyond the immediate subsequent year.

5. Mechanism Analysis

The baseline results establish that customer ESG rating disagreement has a negative effect on supplier environmental performance, consistent with the attention crowding-out hypothesis. This section investigates the channels through which this effect is transmitted. As discussed in Section 2.3, we hypothesize three mechanisms: weakened green supply chain management, tightened financing constraints, and degraded ESG information transmission. Following recent methodological recommendations on mechanism testing in applied economics, we focus on estimating the relationship between the independent variable and each proposed mediator rather than relying on the traditional Baron–Kenny three-step procedure. Specifically, for each mechanism, we estimate:

$$M_{c,t+1} = \alpha + \beta \text{ESG_Disagree}_{c,t} + X'_{s,c,t} \gamma + \lambda_s + \lambda_t + \varepsilon_{s,c,t} \quad (4)$$

where $M_{c,t+1}$ denotes the mediating variable measured at $t + 1$. The remaining notation is consistent with the baseline model. A statistically significant β in the theoretically predicted direction provides evidence that the proposed channel is operative. This approach allows us to examine ESG rating disagreement affects the proposed mechanism variables.

Two interpretive cautions apply throughout this mechanism analysis. First, in line with current methodological guidance, we estimate the effect of ESG rating disagreement on each proposed mediator rather than a full mediation model. This design shows whether each channel responds to disagreement in the theoretically predicted direction, but it does not by itself establish that the effect on supplier environmental performance is transmitted through that channel. Second, and as a consequence, the mediating variables should be read as correlates consistent with the hypothesized pathways rather than as conclusively demonstrated causal mechanisms.

5.1. Mechanism Analysis of Green Supply Chain Management Channel

The first mechanism posits that ESG rating disagreement weakens the customer firm's green supply chain management (GSCM) practices, which in turn reduces the environmental pressure and support that suppliers receive (H2). Following established practice in the textual analysis of corporate disclosure [34,35] and the green supply chain management literature [26,27], we construct keyword-based measures of green supply chain content from annual and CSR reports. We apply keyword matching to identify terms related to green procurement, supplier environmental auditing, supply chain carbon management, environmental supplier selection criteria, and green supply chain initiatives.

We construct two measures from these keywords. The first is GSCM keyword density (GSCM_Den), defined as the total frequency of matched terms normalized by the total word count of the report, multiplied by 1000 for readability. This measure captures the relative prominence of supply chain environmental governance in the firm's overall corporate communication. The second is the natural logarithm of one plus the raw keyword count (GSCM_Cnt), which captures the absolute volume of GSCM-related content independent of report length. The distinction matters because a firm might reduce the emphasis on GSCM while maintaining a baseline level of disclosure.

Table 7 reports the results. In Column (1), the coefficient on ESG_Disagree is negative and significant at the 5% level, indicating that greater customer ESG rating disagreement is associated with lower GSCM keyword density in subsequent corporate reports. In Column (2), the coefficient is likewise negative and significant, confirming that the reduction extends to the absolute volume of GSCM-related content. These results are consistent with the attention-based view: when managerial attention is consumed by the ambiguity arising from inconsistent ESG evaluations, the organizational resources devoted to supply chain environmental governance decline. For suppliers, this translates into weaker monitoring, less stringent green procurement standards, and fewer environmental auditing activities, all of which plausibly contribute to the deterioration of environmental performance documented in the baseline analysis.

Table 7. Mechanism analysis: green supply chain management channel.

Variable	GSCM_Den	GSCM_Cnt
	(1)	(2)
ESG_Disagree	−0.0234 ** (−2.41)	−0.0387 ** (−2.28)
Controls	Y	Y
Supplier FE	Y	Y
Year FE	Y	Y
Observations	21,486	21,486
Adj. R	0.285	0.273

Note: ** indicates significance at the 5% levels.

One measurement caveat applies to this channel. The keyword-based indicators capture the prominence and volume of green supply chain content in the customer's corporate communication. They serve as an observable proxy for the emphasis the firm places on supply chain environmental governance, but they do not directly measure the audits conducted, the certifications required, or the standards enforced.

5.2. Mechanism Analysis of Financing Constraint Channel

The second mechanism argues that ESG rating disagreement exacerbates the customer firm's financing constraints, thereby reducing the financial resources available for supply chain sustainability investments (H3). Prior research has established that inconsistent

ESG evaluations increase information asymmetry between the firm and external capital providers, leading to higher costs of capital and more restricted access to financing [3,5]. When customer firms face tighter financial conditions, they are less able to invest in green supply chain programs such as subsidizing supplier environmental upgrades, offering preferential payment terms tied to environmental compliance, or absorbing the cost premiums associated with green procurement.

We employ two measures of financing conditions. The first is the absolute value of the SA index, computed as $|SA| = | -0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age |$, where higher values indicate more severe constraints. Financing constraints are measured by the SA index, which is preferred over the KZ index because it is constructed solely from firm size and age and is therefore less subject to endogeneity [36]. The second measure is the cost of debt financing (CoD), defined as the ratio of interest expenses to average interest-bearing liabilities. This measure complements the SA index by capturing the price of external financing rather than its structural determinants, providing a direct reflection of how capital markets respond to the information uncertainty generated by rating disagreement.

Table 8 reports the results. In Column (1), the coefficient on ESG_Disagree is positive and significant at the 5% level, confirming that greater ESG rating disagreement is associated with tighter financing constraints as measured by the SA index. In Column (2), the coefficient is positive and significant at the 10% level, indicating that customer firms facing higher rating disagreement also experience higher debt financing costs in the subsequent year. The convergence of evidence from a structural constraint measure and a market-based price measure strengthens confidence in the resource constraint channel. The resulting financial pressure limits the customer firm's capacity to maintain and expand supply chain sustainability programs, providing an indirect pathway through which rating disagreement translates into worse supplier environmental outcomes.

Table 8. Mechanism analysis: financing constraint channel.

Variable	SA Index	CoD
	(1)	(2)
ESG_Disagree	0.0285 ** (2.18)	0.0053 * (1.92)
Controls	Y	Y
Supplier FE	Y	Y
Year FE	Y	Y
Observations	21,486	21,486
Adj. R	0.712	0.486

Note: *, ** indicate significance at the 10% and 5% levels.

5.3. Mechanism Analysis of ESG Information Transmission Channel

The third mechanism concerns the quality of ESG-related information that flows from customer firms to their suppliers (H4). In stable supply chain relationships, suppliers observe and learn from the ESG practices and disclosure standards of their major customers, and this observational learning process is a key driver of the positive ESG spillovers documented in prior research [13,14,16]. When ESG rating disagreement is high, the informational content of the customer's ESG signal is degraded: contradictory external evaluations make it difficult for suppliers to assess whether the customer genuinely prioritizes environmental performance, and the customer's own ESG strategy may become less coherent as management responds to conflicting external signals.

We employ two measures of ESG information quality. The first is a composite disclosure quality index (InfoQ) that integrates three dimensions: (1) whether the firm publishes a standalone ESG or CSR report (scored 0 or 1); (2) the proportion of quantitative perfor-

mance indicators in the report; and (3) whether the report has been verified by a third-party assurance provider (scored 0 or 1). The three components are standardized and averaged to form the composite index. The second measure isolates one particularly informative dimension: the quantitative disclosure ratio (QDR), defined as the number of numerically quantified environmental indicators divided by the total number of environmental indicators disclosed. This ratio captures the precision and verifiability of the environmental information that customers transmit to the market and, indirectly, to their supply chain partners. The distinction between the composite index and the quantitative ratio is that the former captures the breadth and infrastructure of ESG disclosure, while the latter captures the depth and specificity of the environmental information content.

Table 9 reports the results. In Column (1), the coefficient on ESG_Disagree is negative and significant at the 1% level, indicating that customer firms experiencing greater ESG rating disagreement subsequently exhibit lower overall ESG disclosure quality. In Column (2), the coefficient is negative and significant at the 5% level, confirming that the degradation extends specifically to the quantitative precision of environmental disclosure. The information transmission channel exhibits the strongest statistical significance among the three mechanisms, suggesting that it may be a particularly important pathway in the supply chain spillover process. This finding aligns with the signaling theory prediction: when external assessments of a firm's ESG performance are contradictory, the firm faces heightened uncertainty about which aspects of its ESG agenda are valued by the market, leading to less focused and lower-quality ESG communication. For suppliers, this translates into a noisier informational environment in which the expected returns from environmental investment are harder to assess, weakening the incentive to improve environmental performance.

Table 9. Mechanism analysis: ESG information transmission channel.

Variable	InfoQ	QDR
	(1)	(2)
ESG_Disagree	−0.0412 *** (−3.25)	−0.0278 ** (−2.53)
Controls	Y	Y
Supplier FE	Y	Y
Year FE	Y	Y
Observations	21,486	21,486
Adj. R	0.341	0.308

Note: **, *** indicate significance at the 5% and 1% levels.

As with the green supply chain measures, a caveat applies. The disclosure-quality indicators capture the quality of the customer's market-facing ESG information; from this we infer, but do not directly observe, the information actually transmitted to suppliers. These proxies are informative but imperfect.

Across the three channels, the evidence is consistent in direction. Greater customer ESG rating disagreement is associated with lower green supply chain management intensity (H2), tighter customer financing constraints (H3), and lower quality of the ESG information transmitted to suppliers (H4). Each of these moves in the direction that would weaken supplier environmental performance, and the three are mutually reinforcing rather than competing. A customer that is financially constrained and distracted by a contested rating has both less capacity to fund supplier upgrading and less incentive to articulate clear environmental expectations; the weaker green supply chain effort and the noisier ESG signal that result are precisely what suppliers observe.

The information transmission channel shows the strongest association of the three. We read this as suggesting that the spillover operates as much through what suppliers learn

from the customer as through what the customer can afford or chooses to enforce. This ordering is also consistent with the pillar decomposition reported in Section 7.3, in which disagreement over the environmental dimension, the dimension most directly tied to the signal suppliers act upon, is the primary driver. We reiterate the cautions set out at the start of this section: these results identify channels whose movements are consistent with the main effect, and they should not be read as a complete decomposition of the total effect into separately quantified mediated components.

6. Heterogeneity Analysis

The baseline analysis documents a negative supply chain spillover effect that holds on average across the full sample. In practice, however, the strength of this effect is likely to vary with the characteristics of the supply chain relationship, the customer firm, and the supplier firm. This section explores such heterogeneity by splitting the sample along theoretically motivated dimensions and testing for significant differences in the coefficient on ESG_Disagree across subgroups. For each heterogeneity test, we re-estimate the full baseline model separately on each subsample and report the inter-group coefficient difference test based on the seemingly unrelated estimation approach.

6.1. Heterogeneity by Supply Chain Relationship

The first set of heterogeneity tests focuses on characteristics of the customer–supplier relationship that may moderate the strength of the spillover effect. We examine two dimensions: the supplier’s dependence on the customer and the stability of the relationship. Table 10 reports the results.

Table 10. Heterogeneity by supply chain relationship.

Variable	(1)	(2)	(3)	(4)
	High Dep	Low Dep	Stable Rel	Unstable Rel
ESG_Disagree	0.0126 *** (3.52)	0.0038 (1.24)	0.0112 *** (2.87)	0.0047 (1.45)
Difference test P		0.028		0.043
Controls	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	10,743	10,743	11,264	10,222
Adj. R	0.462	0.441	0.458	0.443

Note: *** indicates significance at the 1% levels.

Supplier dependence. We split the sample at the annual median of Dependence, which is measured as the share of supplier revenue derived from the focal customer [37], into high-dependence and low-dependence subgroups. A supplier that relies heavily on a single customer for a large portion of its revenue is, in theory, more exposed to changes in that customer’s supply chain governance behavior. When the customer reduces green supply chain management intensity due to rating disagreement, a highly dependent supplier faces this weakened governance with fewer alternative customer relationships to compensate. Columns (1) and (2) confirm this prediction. In the high-dependence subsample, the coefficient on ESG_Disagree is positive, large, and significant at the 1% level. In the low-dependence subsample, the coefficient is much smaller and statistically insignificant. The inter-group difference is statistically significant. This result indicates that the negative spillover effect is concentrated among suppliers that are economically dependent on the customer, consistent with the theoretical expectation that bargaining power asymmetry amplifies the transmission of customer-level shocks to supplier behavior.

Relationship duration. We split the sample at the median of Duration (the number of consecutive years the customer–supplier pair appears in the top-five disclosure) into stable and unstable relationship subgroups. Longer-lasting supply chain relationships tend to involve greater relationship-specific investments, deeper information exchange, and more developed governance routines [25,30,37]. Paradoxically, these characteristics may make suppliers in stable relationships more, rather than less, sensitive to changes in customer governance. Suppliers that have invested heavily in meeting a customer’s environmental standards face higher adjustment costs when those standards weaken or become inconsistent, and their deeper integration into the customer’s governance system means they are more exposed to disruptions in that system. Columns (3) and (4) support this reasoning. In the stable-relationship subsample, the coefficient on ESG_Disagree is positive and significant at the 1% level, whereas in the unstable-relationship subsample, the coefficient is smaller and insignificant. The inter-group difference is statistically significant. This finding suggests that the supply chain spillover effect of ESG rating disagreement operates most powerfully within embedded, long-term relationships where the informational and governance linkages between customer and supplier are strongest.

6.2. Heterogeneity by Customer Firm

The second set of tests examines whether the spillover effect varies with characteristics of the customer firm. We focus on two dimensions: ownership structure and industry pollution intensity. Table 11 reports the results.

Table 11. Heterogeneity by customer firm characteristics.

Variable	(1)	(2)	(3)	(4)
	POE Customer	SOE Customer	Pollution-Inten	Non-Pollution
ESG_Disagree	0.0118 *** (3.64)	0.0042 (1.18)	0.0137 *** (3.28)	0.0051 * (1.71)
Difference test P		0.035		0.047
Controls	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	14,578	6908	8352	13,134
Adj. R	0.457	0.439	0.471	0.442

Note: *, *** indicate significance at the 10% and 1% levels.

State ownership. We classify customer firms into state-owned enterprises (SOEs) and privately owned enterprises (POEs) based on the ultimate controller recorded in the CSMAR ownership database. SOEs and private firms differ in several ways that are relevant to the supply chain transmission of ESG rating disagreement. SOEs face stronger political constraints and policy mandates related to environmental governance, which may provide an institutional buffer against attention crowding-out: even when ESG rating disagreement diverts managerial attention, the political imperative to maintain environmental standards may sustain baseline levels of supply chain governance. Private firms, by contrast, have greater discretion in allocating managerial attention and may be more responsive to the informational shocks created by rating disagreement. Columns (1) and (2) support this interpretation. For private customer firms, the coefficient on ESG_Disagree is positive and significant at the 1% level. For SOE customers, the coefficient is positive but statistically insignificant. The inter-group difference is significant. This result suggests that the institutional obligations and political accountability faced by SOEs partially insulate their supply chain governance from the disruptive effects of ESG rating

disagreement; whereas, private firms' supply chain environmental governance is more vulnerable to attention reallocation.

Industry pollution intensity. We classify customer firms into pollution-intensive and non-pollution-intensive groups based on whether their industry falls within the list of heavily polluting industries designated by China's Ministry of Ecology and Environment. For customer firms in pollution-intensive industries, the environmental dimension of ESG ratings carries greater material significance: environmental performance is more central to the firm's ESG profile, environmental-related rating criteria receive higher weight, and stakeholder attention to environmental issues is more intense [38]. Consequently, ESG rating disagreement in pollution-intensive industries is more likely to generate substantive uncertainty about the customer's environmental position, producing stronger supply chain transmission effects. Columns (3) and (4) confirm this expectation. The coefficient on ESG_Disagree is larger and more significant for customers in pollution-intensive industries than for those in non-pollution-intensive industries. The inter-group difference is statistically significant. This finding is consistent with the intuition that supply chain green spillovers are more sensitive to informational disruptions when the environmental dimension is more salient to the customer's overall ESG assessment.

6.3. Heterogeneity by Supplier Firm and Geographic Distance

The final set of tests examines heterogeneity along supplier characteristics and the geographic structure of the supply chain relationship. Table 12 reports the results.

Table 12. Heterogeneity by supplier characteristics and geographic distance.

Variable	(1)	(2)	(3)	(4)
	Small Supplier	Large Supplier	Low-Distance	High-Distance
ESG_Disagree	0.0124 *** (3.41)	0.0045 (1.36)	0.0115 *** (3.12)	0.0048 (1.52)
Difference test P		0.031		0.052
Controls	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	10,743	10,743	10,743	10,743
Adj. R	0.448	0.456	0.459	0.443

Note: *** indicates significance at the 1% levels.

Supplier size. We split the sample at the annual median of supplier total assets. Larger suppliers typically possess more bargaining power within the supply chain relationship, more diversified customer portfolios, and greater internal capacity for environmental management. These attributes may buffer them against the negative spillover of customer ESG rating disagreement. Smaller suppliers, by contrast, are more reliant on individual customer relationships, have fewer internal resources for independent environmental governance, and are therefore more vulnerable when customer-level governance weakens. Columns (1) and (2) confirm this expectation. For small suppliers, the coefficient on ESG_Disagree is large and significant at the 1% level. For large suppliers, the coefficient is smaller and statistically insignificant. The inter-group difference is significant. This pattern underscores that the costs of ESG rating disagreement fall disproportionately on smaller, more vulnerable firms in the supply chain, an observation with direct implications for policies aimed at supporting small and medium-sized enterprises in the green transition.

Geographic distance. We split the sample at the median of Geo_Dist (the natural logarithm of the great-circle distance between the customer's and supplier's registered addresses). Geographic proximity facilitates more frequent face-to-face interactions, easier

monitoring, and denser information flows between trading partners [32]. When a customer and supplier are located close to each other, the supply chain governance relationship is typically more active, and the supplier is more attuned to changes in the customer's ESG practices and priorities. As a consequence, disruptions in the customer's ESG are more readily transmitted to nearby suppliers, while distant suppliers may be partially insulated by the thinner information channel. Columns (3) and (4) provide evidence consistent with this logic. For geographically proximate pairs, the coefficient on ESG_Disagree is positive and significant at the 1% level. For geographically distant pairs, the coefficient is positive but statistically insignificant. The inter-group difference is marginally significant. This finding aligns with the information transmission mechanism identified in Section 5.3: supply chain spillovers are stronger when the information channel between customer and supplier is denser, and geographic proximity is a key determinant of information channel density [39].

6.4. Interaction Models

The subsample splits in Sections 6.1–6.3 are intuitive but have two limitations: they estimate each group on a different sample, and they do not provide a single test of whether the difference between groups is itself significant once the rest of the model is held fixed. To address both, we estimate full-sample interaction models that interact ESG_Disagree with each moderator indicator in turn. The indicator equals one for the high-dependence, stable-relationship, private-customer, pollution-intensive, small-supplier, and low-distance groups, respectively. In this specification, the coefficient on ESG_Disagree measures the association within the base (low-exposure) group, the interaction term measures how much stronger the association becomes in the high-exposure group, and their sum gives the association within the high-exposure group. The moderator level term and the full set of controls and fixed effects are included throughout.

The results in Table 13 reinforce the subsample evidence and sharpen its interpretation. In every column, the coefficient on ESG_Disagree alone is small and statistically insignificant. For the low-exposure groups, namely diversified suppliers, transient relationships, state-owned customers, non-pollution-intensive customers, large suppliers, and distant pairs, customer rating disagreement is therefore not meaningfully associated with supplier environmental performance. The interaction terms, by contrast, are uniformly positive and significant, ranging from 0.0069 for geographic proximity to 0.0091 for supplier dependence. Adding the interaction to the base coefficient implies a total association in the high-exposure groups of roughly 0.011 to 0.013. This is close to the high-group estimates from the subsample splits and confirms that the spillover is concentrated in these groups rather than reflecting a uniform effect across the full sample.

Table 13. Heterogeneity: interaction models.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Dependence	Duration	Ownership	Pollution	Size	Distance
ESG_Disagree	0.0035 (1.15)	0.0041 (1.32)	0.0040 (1.12)	0.0049 * (1.69)	0.0043 (1.30)	0.0046 (1.49)
ESG_Disagree × Moderator	0.0091 ** (2.38)	0.0074 ** (2.21)	0.0079 ** (2.27)	0.0088 ** (2.34)	0.0082 ** (2.29)	0.0069 * (1.88)
Moderator Level	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	21,486	21,486	21,486	21,486	21,486	21,486

Note: *, ** indicate significance at the 10% and 5% levels.

This pattern is consistent with the theoretical framework. The amplifying role of supplier dependence and relationship stability follows from resource dependence theory: suppliers that rely on a single customer for market access, and that have made relationship-specific investments, are least able to insulate themselves from a deterioration in that customer's governance. The stronger effect for private and pollution-intensive customers fits the view that state ownership buffers environmental governance through political mandates, and that the environmental dimension carries higher materiality where pollution is central to operations. Finally, the concentration of the effect among small and geographically close suppliers is consistent with smaller firms having less slack to absorb customer-level shocks, and with proximity supporting the denser information and monitoring channels through which the spillover travels. Because the interaction tests hold the full sample and model fixed, they provide more credible evidence of these contingencies than the subsample splits alone.

7. Discussion

7.1. Interpretation of the Main Finding and the Competing Hypotheses

The central result is that the net association between customer ESG rating disagreement and supplier environmental performance is negative, supporting the attention crowding-out hypothesis (H1a) over the signal-compensation hypothesis (H1b). The interpretation we favor is the following: for the average customer, the cognitive and organizational demands of managing a contested external evaluation crowd out the discretionary, long-horizon effort that supply chain environmental governance requires, and the resulting weaker governance and noisier signal reach suppliers. Three features of the evidence support this reading. First, the effect appears at a one-year horizon, the lag over which a reprioritization of managerial attention would plausibly show up in supplier outcomes. Second, it survives controlling for the customer's ESG level, which rules out the simpler alternative that disagreement merely proxies for low customer ESG performance. Third, it is accompanied by movements in all three proposed channels in the predicted direction, as the attention, resource, and signaling mechanisms jointly imply.

At the same time, the heterogeneity results show that the balance between the two opposing forces is not fixed but depends on the customer's incentives. The crowding-out force dominates on average, but not uniformly. The association is weak among customers for whom the reputational return to visible green governance is lowest, namely state-owned and non-pollution-intensive customers, and strongest among private and pollution-intensive customers. This is the pattern one would expect if a compensation incentive partially offsets crowding-out precisely where the environmental dimension is most material to the customer's standing. The evidence therefore suggests that H1a and H1b are not mutually exclusive: both forces operate, and their relative strength is governed by the materiality of the environmental dimension and the customer's exposure to environmental scrutiny.

7.2. The Three Transmission Channels and Their Limits

The channel evidence helps explain how a customer-level informational shock comes to affect a supplier's physical environmental performance, a link that is not obvious a priori. The three channels correspond to the three theoretical mechanisms and describe complementary aspects of a single process. The green supply chain management channel captures the capability and effort dimension, since disagreement is associated with less emphasis on the audits, requirements, and supplier engagement through which customers actually shape supplier behavior. The financing channel captures the resource dimension, since a customer whose information environment raises its cost of capital has less slack to

fund the supplier upgrading and favorable terms that green procurement often requires. The information channel captures the signal dimension, since disagreement degrades the clarity and credibility of the customer's ESG signal and weakens the demonstration effect through which suppliers infer the standards expected of them. That the information channel shows the strongest association fits the view that suppliers in repeated buyer–supplier relationships rely heavily on what they observe and learn from the customer. Degrading this signal is therefore at least as consequential as reducing the customer's capacity to enforce its requirements.

This channel evidence warrants caution. As explained in Section 5, the design estimates the response of each mediator to disagreement rather than a fully identified mediation model. The channels are therefore best understood as carriers whose behavior is consistent with the main effect, not as components of a decomposition with separately quantified shares. The proxies reinforce this caution: the text-based green supply chain measures capture disclosed emphasis rather than verified practice, and the disclosure-quality measures capture the customer's market-facing reporting rather than the information a supplier actually receives. These limits bound the strength of the mechanism claims, but they do not undermine the central inference. The three channels move in the same theoretically predicted direction and jointly describe a coherent governance story rather than an artifact of any single proxy.

7.3. Evidence by Rating Pillar

Our disagreement measure aggregates the environmental, social, and governance pillars, whereas the outcome is environmental. To examine which pillar drives the result, we construct disagreement separately for each pillar using the same cross-agency dispersion method and re-estimate the baseline. As shown in Table 14, disagreement over the environmental pillar carries the largest and most significant association with supplier environmental performance; disagreement over the social pillar has a smaller but still significant association; and disagreement over the governance pillar is not significant. When the three measures enter jointly, the environmental pillar remains dominant. This pattern is consistent with a materiality interpretation, under which disagreement matters most where the contested dimension is most relevant to the outcome, and it aligns with the stronger spillover observed for customers in pollution-intensive industries.

Table 14. ESG rating disagreement by pillar.

Variable	(1)	(2)	(3)	(4)
	E_Disagree	S_Disagree	G_Disagree	All
E_Disagree	0.0114 *** (3.41)			0.0098 *** (2.89)
S_Disagree		0.0067 ** (2.34)		0.0051 * (1.92)
G_Disagree			0.0031 (1.18)	0.0019 (0.71)
Controls	Y	Y	Y	Y
Supplier FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	19,872	19,872	19,872	19,872
Adj. R2	0.449	0.445	0.443	0.451

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels.

7.4. Theoretical Implications

Two broader theoretical implications follow. The first concerns the unit at which the consequences of information problems should be analyzed. The literature on ESG rating disagreement, and more generally on information quality, has been built around the rated entity, asking how noise in an evaluation affects that entity and its investors. Our findings indicate that when rated entities are embedded in networks of real economic dependence, the relevant unit of analysis is the network rather than the firm, because the effects of an informational shock travel along the same governance and resource ties that carry ordinary economic influence. This reframing links the ESG disagreement literature to the attention-based, resource-dependence, and signaling traditions, each of which concerns how conditions at one organization shape the behavior of those connected to it. It also suggests that studies stopping at the firm boundary systematically understate the externalities of imperfect information.

The second implication concerns how the supply chain sustainability literature should characterize a customer's ESG profile. That literature has implicitly treated the profile as a scalar, a level to be transmitted downstream. Our results show that the profile has at least two distinct properties that matter for transmission: its level and its coherence. These can move independently, and even in opposite directions, because a customer can be highly rated on average yet deeply contested across raters. Because we hold the level fixed, the weaker supplier outcomes we document are attributable to the coherence dimension rather than the level. For theory, this means that models of sustainability diffusion through supply chains should incorporate the quality of the informational environment surrounding customer practices, not only the substance of those practices, because coherence appears to govern whether substance is transmitted. This distinction between the level channel and the uncertainty channel is, in our view, the study's principal theoretical contribution.

Stated in terms of the perspectives we employ, the results refine, extend, and in one respect qualify each of them. They extend the attention-based view by moving its level of analysis from the firm to the network: the view was developed to explain how a firm allocates attention internally, whereas our evidence indicates that one firm's attention allocation has measurable consequences for the environmental outcomes of firms connected to it, implying a form of attention externality across organizational boundaries. They refine signaling theory by separating the coherence of a signal from its level: the signaling literature has emphasized signal strength and credibility, but our finding that disagreement weakens transmission while the customer's ESG level is held constant indicates that the internal consistency of a signal is a distinct property that governs whether its content is received. They qualify the diffusion view in the sustainable supply chain literature, which has implicitly assumed that a customer's environmental substance diffuses to suppliers: our results indicate that diffusion is conditional on the coherence of the information environment surrounding that substance, so that incoherent information can stall diffusion that the level alone would predict. Finally, the heterogeneity evidence challenges the sufficiency of a pure attention crowding-out account: because a signal-compensation incentive offsets and, in the most environmentally material settings, can reverse the dominant force, the attention-based prediction holds only within boundary conditions defined by the materiality of the contested dimension and the customer's exposure to environmental scrutiny. Taken together, these implications locate the study's conceptual contribution in the reconceptualization of an information signal as having both a level and a coherence, and in the extension of attention-based reasoning to inter-organizational networks, rather than in the empirical documentation alone.

8. Conclusions and Policy Implications

8.1. Conclusions

This study examines whether the ESG rating disagreement of customer firms is related to the environmental performance of their suppliers. The question sits at the intersection of two studies that have so far developed separately: the ESG rating disagreement literature and the supply chain ESG spillover literature. Using a matched customer–supplier panel of Chinese A-share listed firms over 2015 to 2023, we find that greater customer ESG rating disagreement is associated with weaker supplier environmental performance in the following year. A one-standard-deviation increase in disagreement is associated with a 0.0023 increase in supplier pollution emission intensity. The association is robust to alternative variable definitions, Heckman selection correction, propensity score matching, customer and customer–supplier pair fixed effects, and instrumental-variable estimation that does not rely on the more contestable instrument.

The evidence on channels and contingencies gives the result its interpretation. The association operates through three mutually reinforcing channels whose movements are consistent with weaker green supply chain management, tighter customer financing constraints, and lower quality of transmitted ESG information; the information channel is the strongest. It is concentrated among dependent suppliers, stable relationships, privately owned and pollution-intensive customers, small suppliers, and geographically close pairs. A decomposition by rating pillar points to disagreement over the environmental dimension as the primary driver. Read together, these findings indicate that the costs of ESG rating inconsistency are not confined to the rated firm and its investors but extend through supply chains to the environmental behavior of upstream partners.

8.2. Policy Implications

Based on the findings, this study proposes the following policy recommendations:

First, the results strengthen the case for accelerating the standardization and harmonization of ESG rating methodologies. China's three major stock exchanges issued sustainability reporting guidelines in 2024, an important step toward a more unified disclosure framework, but standardizing disclosure alone is insufficient if the agencies that interpret it continue to apply divergent methodologies. Policymakers should consider establishing baseline methodological standards for rating agencies, requiring transparency in their methodologies and data sources, and developing an oversight framework for ESG rating providers analogous to that for credit rating agencies. The urgency of such measures is underscored by our finding that the costs of disagreement reach beyond the capital market into the real economy through supply chains.

Second, the results point to the value of incorporating supply chain considerations into the design of green finance policy. Instruments such as green credit and green bonds in China primarily target the directly financed firm, yet the spillovers documented here suggest that their environmental impact is partly mediated by the firm's supply chain governance capacity. Their effectiveness could be amplified by linking eligibility to the extension of environmental standards along the supply chain, for example through green procurement requirements tied to green bond issuance or preferential credit for firms that operate certified green supply chain management programs.

Third, because the largest costs fall on small suppliers and on firms in high-dependence relationships, support for the green transition of small and medium-sized enterprises should account for their supply chain context. Capacity-building for such suppliers, including direct access to environmental management training, certification support, and financing that does not depend on a particular customer relationship, would reduce their exposure to disruptions in customer-driven governance.

8.3. Limitations and Future Research

This study has several limitations. First, ESG ratings are themselves measured with error, and the disagreement measure inherits this noise. Standardization and the use of multiple agencies attenuate the problem but cannot remove it. Second, the supply chain data cover only listed suppliers among the top-five disclosed partners. The sample therefore omits smaller and non-listed suppliers, which may bear even larger effects that our estimates cannot capture. Third, the mechanism proxies are imperfect: the text-based green supply chain measures reflect disclosure emphasis rather than verified governance practices, and the disclosure-quality measures reflect market-facing reporting rather than information directly received by suppliers. Fourth, the sample is confined to the Chinese market, so the external validity of the findings to other rating environments remains an open question. These limitations point to future work using broader supply chain data, direct measures of governance practices, and cross-country comparison.

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