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Sustainability diffusion in the Chinese semiconductor industry: A stakeholder salience perspective

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ABSTRACT

The semiconductor sector plays a crucial role in shaping national strategies and driving economic growth; however, it faces significant challenges prompting a shift towards sustainable development. This study aims to investigate whether sustainability initiatives of the focal firm can diffuse throughout the semiconductor supply chain, leveraging stakeholder salience theory and archival data from listed firms in China. Methodologically, we conduct a regression analysis using STATA 17.0 to examine the impact of the focal firm's sustainability disclosure on supply chain sustainability. Findings indicate a positive correlation between the focal company's sustainability disclosure and enhanced sustainability performance of its key suppliers and customers. This relationship is strengthened when the focal firm demonstrates significant market power, sustainability legitimacy, and urgency in addressing sustainability concerns. Our study contributes to the sustainable supply chain management literature by elucidating sustainability diffusion from a stakeholder salience perspective and offers practical insights for semiconductor managers and policymakers striving to foster sustainable practices within the sector.

1. Introduction

Major economies worldwide, including the United States, Europe, Japan, and recently Korea and China, have made significant efforts to expand semiconductor production and manufacturing capacities. According to the Semiconductor Industry Association (SIA), in 2021, the global semiconductor industry witnessed a remarkable 26% increase in sales, reaching a record-breaking annual total amount of \$555.9 billion (Ochonogor et al., 2023). However, this rapid growth has been accompanied by high consumption of energy and water resources, raising significant environmental concerns (Frost and Hua, 2017). As pointed out by Munga et al. (2015), there are up to 700 processing steps for semiconductor manufacturing, resulting in a cycle time of over two months. In the intricate processes of semiconductor manufacturing, inefficient use of water and energy inputs is a significant factor, contributing up to 30% of total company costs (Lu et al., 2023). For instance, producing an 8-inch wafer layer demands around 9.9 kWh of energy (TSMC, 2016). Chip fabrication also imposes threats to mineral reservoirs, involving rarefied gases, valuable metals, and rare earth elements (REEs), thereby exacerbating environmental strains linked to the

exhaustion of abiotic resources. Meanwhile, semiconductor manufacturing relies heavily on ultrapure water (UPW) for crucial surface cleaning, leading to substantial water loss and energy consumption (Frost and Hua, 2017; Klusewitz and Viegh, 2002). Furthermore, the use of nitrogen and phosphorous acids in wet cleaning processes contributes to water eutrophication, leading to water quality degradation around microelectronic plants (Villard et al., 2015). In addition to high energy consumption and water pollution, the semiconductor sector has also observed a significant increase in greenhouse gas (GHG) emissions (SIA, 2016). In 2010, the semiconductor manufacturing sector produced approximately 18 million metric tons of CO₂ equivalent emissions, with projections estimating an increase to 22 million metric tons by 2030. Additionally, the industry's use of fluorinated gases, including CF₄, C₂F₆, CHF₃, NF₃, and SF₆, contributes to emissions with high global warming potential (Environmental Protection Agency, 2017).

Given the substantial energy consumption, water usage, and greenhouse gas emissions associated with semiconductor manufacturing, there is an urgent need for sustainable development within the sector amid its rapid expansion. However, the pursuit of sustainability, energy conservation, and emission reduction in the semiconductor supply chain

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presents significant challenges. These challenges stem from the industry's inherent characteristics, the high complexity and precision required in semiconductor manufacturing processes, and the dynamic market demands for end-products (Lu et al., 2023; Chien et al., 2012; Rastogi et al., 2011). The sector is characterised by extensive fragmentation and specialised production, with each entity focusing on specific stages of the value chain. For instance, some semiconductor firms in the United States employ a "fabless" production model, outsourcing foundry and packaging operations while retaining in-house control over chip design. Consequently, the fragmented structure, along with substantial disparities between upstream and downstream segments in the semiconductor supply chain, poses obstacles to implementing consistent sustainability measures.

In existing green supply chain management literature, stakeholder theory (Freeman, 1984) offers a valuable perspective on how a focal company can enhance the environmental performance of its key collaborators, including both customer and supplier companies, through the exertion of influence (Song et al., 2023; Ahmed and Shafiq, 2022). Stakeholder theory posits that influential stakeholders are capable of compelling their supply chain partners to heed their requests (Gualandris et al., 2015). Specifically, this can be achieved through a focal company actively communicating its commitment to sustainability as well as the requirements it expects from business partners (Duan et al., 2021; Hahn et al., 2015). In response, a supply chain partner may make efforts to reduce emissions and enhance its own sustainability performance as an attempt to maintain the relationship with the focal firm (Wu et al., 2020). The magnitude of this influence intensifies when the focal firm and its proposition hold greater significance in the perception of its supply chain partners, aligning with Mitchell et al.'s (1997) theory of stakeholder identification and salience. In theory, firms occupying pivotal positions within the supply chain can take the lead in initiating sustainable development, energy conservation, and emission reduction activities. Through their influence on stakeholders and other participants in the supply chain, they can contribute to the overall sustainability of the entire network. However, empirical evidence supporting this is limited, particularly evidence derived from multi-level data such as supply chain triads or networks.

Unlike other industries, the semiconductor industry is highly capital-intensive and often requires substantial fixed production costs, creating influential and powerful players capable of exerting significant influence on others. Typically, an initial investment of USD 10 to 20 billion is required to establish a cutting-edge manufacturing plant (Haramboure et al., 2023). Additionally, following Moore's Law (Moore, 1998), the transistor count within a given wafer area tends to double every one to two years. To maintain a competitive edge, companies must continuously explore new generations of production technology and rapidly acquire and adapt expensive new tools and facilities to support these technologies. Thus, key semiconductor manufacturing companies play a pivotal role in shaping the industry's dynamics (Chien et al., 2012). The stakeholder salience theory suggests the potential for fostering sustainable development of the semiconductor industry through salient participants in the supply chain. The unique characteristics of this sector provide an ideal setting to empirically examine their leading role and impact. Recent studies have embraced environmental, social, and governance (ESG) metrics as indicators of sustainable performance among semiconductor firms (e.g., Wang et al., 2023; Lin et al., 2022; Egorova et al., 2022). These studies have assessed the impact of firms' ESG disclosure on stakeholders, including employees and communities (Lawal et al., 2017). However, empirical evidence on companies' ability to drive sustainable performance across the entire supply chain remains notably scarce. Therefore, drawing upon insights from supply chain management and the stakeholder theory, this study aims to explore how key enterprises in the semiconductor supply chain can contribute to the sustainable development of the supply chain.

Specifically, the research question we seek to explore is:

Does the sustainability disclosure of the focal firm improve the sustainability performance of the semiconductor supply chain?

To address this question, our study draws on stakeholder salience theory (Mitchell et al., 1997), which posits that stakeholders possessing power, legitimacy, and urgency are perceived as more significant by others. Building on this framework, we investigate whether a focal firm's ESG disclosure can enhance the sustainability performance of its key supply chain partners. We also examine the moderating roles of the focal firm's power (measured by market power), sustainability legitimacy (indicated by compliance with sustainability standards), and the urgency of sustainability issues (characterized by its environmental focus). Empirically, we utilize a comprehensive multi-year triadic panel dataset synthesized from various secondary databases to validate the proposed effects. Through this research, we aim to enrich the existing body of knowledge on sustainability diffusion in supply chain management from a stakeholder salience perspective, while also incorporating supply chain characteristics within the context of the semiconductor sector.

The structure of this paper is as follows: Section 2 thoroughly reviews the theoretical background of the study, and Section 3 develops hypotheses accordingly. Section 4 introduces the methods employed, followed by Section 5, where findings are reported. Section 6 offers a discussion of the study's results, contributions, and limitations, before Section 7 concludes the paper.

2. Literature review

2.1. ESG and environmental disclosure

Sustainability, as defined by the World Commission on Environment and Development (WCED, 1987, p. 8), refers to "development that meets present needs without compromising the ability of future generations to meet their needs." This research adopts an ESG lens to interpret sustainability, which is a key concept in contemporary sustainability research that highlights the importance of non-financial indicators for companies to advance sustainability across environmental, social, and governance dimensions (Ortas et al., 2015). The environmental dimension, linked to a firm's ecological footprint (OECD, 2001), involves implementing mechanisms and policies to boost energy efficiency and reduce pollution (Montabon et al., 2007; Aldieri et al., 2021a). The social dimension considers both internal stakeholders (e.g., employees) and external stakeholders such as the local community (Pullman et al., 2009). Governance focuses on guiding and managing the corporation to align with the interests of various stakeholders (Husted and de Sousa Filho, 2017). Recently, there has been a notable increase in corporate awareness of ESG issues (Ortas et al., 2015), accompanied by proactive efforts to strategically shape sustainability initiatives (Eccles et al., 2020). Consistent with existing literature (e.g., Sancha et al., 2023; Ahmed and Shafiq, 2022; Bellamy et al., 2020; Liu, 2020), we use ESG as an indicator for evaluating corporate sustainability performance.

Our research is closely linked to existing literature on ESG and environmental disclosure in operations and supply chain management. In the field of sustainability, establishing legitimate, responsible, and efficient corporate governance through environmental data disclosure is a focal point (Chen et al., 2015; Khosroshahi et al., 2021; Duan et al., 2021; Buell and Kalkanci, 2021; Wang et al., 2023). The impact of revealing environmental information has been explored, with growing evidence highlighting its importance to a company's performance, valuation, and reputation (Buell and Kalkanci, 2021; Duan et al., 2021; Aldieri et al., 2021b). Another research avenue investigates how a company's environmental information disclosure influences its stakeholders' environmental practices and performance (Song et al., 2023). An increasing number of companies are willingly engaging in environmental information disclosure, responding to demands from stakeholders (Mol, 2015), competitors (Villena and Dhanorkar, 2020), and

regulatory bodies (Reid and Toffel, 2009). Our study thus contributes to the literature by exploring how the environmental disclosure of focal companies affects the sustainable performance of their supply chain partners.

2.2. Buyer-supplier relationship and stakeholder salience theory

Within the supply chain network, the focal company shoulders dual responsibilities, functioning both as a supplier and a customer stakeholder (Song et al., 2023; Ahmed and Shafiq, 2022). This dual role underscores the importance of the buyer-supplier relationship (BSR) and stakeholder theory, which are the two most pertinent theoretical frameworks guiding the scope of this study. The BSR literature suggests that companies should employ a combination of contractual and relational strategies when managing their relationships with suppliers (Liu et al., 2009; Adhikary et al., 2020). Adopting the BSR perspective, studies have explored the enhancement of supply chain sustainability through a mix of contractual and relational approaches in managing supplier relationships (Pulles et al., 2014; Sharma et al., 2022). Contractual approaches encompass formal agreements, audits, and regulatory standards, while relational approaches aim to foster trust and reciprocity between customers and suppliers (Liu et al., 2009). However, both contractual and relational approaches have been shown to have limited impact on improving sustainable performance beyond the prescribed baseline criteria (Eckerd and Hill, 2012). Furthermore, they are susceptible to manipulation or misrepresentation by certain suppliers (Gualandris et al., 2015).

The stakeholder perspective, introduced by Freeman (1984), posits that stakeholders have the capacity to exert influence on various organisations, and this influence is underscored by the initial characterisation of stakeholders as constituencies affected either positively or negatively by the company's operations (Clarkson Centre for Business Ethics, 1999). Stakeholders, including employees, suppliers, customers, shareholders, public authorities, non-governmental entities, and the local community, have been categorised in various ways (Bansal and Roth, 2000). The stakeholder salience theory (Mitchell et al., 1997) enriches the stakeholder categorisation through three important attributes, namely, power, legitimacy, and urgency, which play crucial roles in a company's ability to influence others. These attributes form the basis of organisations' prioritisation of stakeholder claims, suggesting that stakeholders are perceived as salient as they accumulate these attributes.

Subsequent scholarly works have further explored and refined the stakeholder salience theory. Neville et al. (2011) identified weaknesses in Mitchell et al.'s (1997) original theory and refined it by emphasising that the legitimacy of a stakeholder's claim is more significant than the legitimacy of the stakeholder itself. They argued for focusing on moral legitimacy rather than pragmatic or cognitive legitimacy and explored the interactions between power, legitimacy, and urgency in determining stakeholder salience. Similarly, Wood et al. (2021) extended the original Mitchell, Agle, and Wood (MAW) framework, focusing solely on moral legitimacy and stakeholder interdependencies. Moreover, Raha et al. (2021) enhanced the original MAW framework by incorporating the collective influence of other stakeholders' salience and attributes, finding that urgency and power are dominant factors over legitimacy. To further develop the theoretical underpinnings of stakeholder salience attributes, Crane and Ruebottom (2011) integrated social identity into the theory, proposing that recognising stakeholders' social identities alongside their economic roles provides a more robust identification of stakeholders. Tashman and Raelin (2013) suggested considering the perceptions of both organisational and societal stakeholders to capture a more comprehensive understanding of which stakeholders and interests should be prioritised by firms. In the context of family firms, Mitchell et al. (2011) highlighted unique attributes of stakeholder salience, such as normative power, legitimacy based on heredity, and urgency linked to family ties and non-economic goals. These studies collectively illustrate

the evolution of the stakeholder salience theory while also highlighting the need for more empirical research to validate this theoretical framework in various settings (Neville et al., 2011; Wood et al., 2021).

The stakeholder salience framework has been widely adopted in sustainability-related studies. For instance, Erdiaw-Kwasie et al. (2017) proposed a model aimed at enhancing corporate social responsibility (CSR) through improved stakeholder salience and empowerment. They argued that empowering less influential stakeholders enables them to acquire critical attributes such as power, legitimacy, and urgency, which increases their relevance and influence in corporate decision-making and leads to better CSR practices and outcomes for the focal firm. Thijssens et al. (2015) conducted an empirical investigation to understand how environmental non-governmental organisations (NGOs) impact executive decisions about CSR reporting. They found that variations in environmental disclosures among corporations are primarily associated with the legitimacy of their environmental stakeholders, where power and urgency play indirect roles mediated by legitimacy. Ahmed and Shafiq (2022) explored the dual function of a purchasing firm as both a customer and a significant stakeholder, highlighting that a buyer firm's legitimacy significantly impacts a supplier's sustainability performance. This influence is amplified when both buyer and supplier share aligned priorities on sustainability dimensions. Additionally, the market power of the buyer enhances the effect of legitimacy, though power alone is ineffective without legitimacy.

Building on these studies, our paper extends the stakeholder salience framework in four key dimensions. First, while existing research primarily focuses on CSR, this study adopts a more comprehensive view of corporate sustainability. We examine how the sustainability claims of salient stakeholders, in the form of voluntary ESG disclosure, influence sustainable development of their key supply chain members beyond CSR. Second, we broaden the application of the stakeholder salience framework to the supply chain context, investigating network influences. Although stakeholder salience theory is relatively well-developed, its integration into supply chain management remains limited. The original stakeholder salience model identifies the stakeholder-firm dyad as the primary unit of analysis, treating stakeholders as single identifiable entities that can exert or receive influence. However, previous studies indicated that stakeholders often act in coalitions rather than as individuals (Khurram and Pestre, 2015). This coalition behaviour highlights the potential for salient stakeholders to impact the entire supply chain through their sustainability initiatives. We therefore explore how the focal company influences both upstream suppliers and downstream customers, thereby affecting the sustainable development of the entire supply chain. Third, as prior studies highlight, relying solely on formal contractual approaches proves insufficient for ensuring robust supplier involvement and achieving targeted performance (Eckerd and Hill, 2012; Trapp and Sarkis, 2016). The inadequacy of formal contracts points to the need for a more nuanced understanding of how key companies implicitly influence their supply chain partners through their own behaviours, a concept well-explained by the stakeholder theory. Thus, the synergy between stakeholder salience theory and the BSR literature becomes apparent, as they mutually reinforce each other in explaining how a focal company can enhance the sustainability performance of its supply chain collaborators. Last, to examine stakeholder salience across diverse contexts has been strongly advocated by scholars (Khurram and Pestre, 2015). For example, Tang and Tang (2012) suggested that firms in emerging economies have greater flexibility in countering stakeholder power, emphasising the impact of national context on stakeholder attributes and salience. Therefore, it is necessary to investigate the stakeholder salience framework within the Chinese semiconductor industry, an emerging sector that offers a rich context for understanding these dynamics.

3. Hypothesis development

3.1. Focal company ESG disclosure and supply chain sustainability performance

Information asymmetry poses a pervasive challenge between supply chain participants, particularly in the semiconductor industry, where sustainability concerns are heightened due to the sector's energy-intensive processes and complex supply chains (Song et al., 2023; Ciliberti et al., 2011). The semiconductor industry often faces unique sustainability challenges, such as high greenhouse gas emissions and substantial resource demands, making clear environmental communication essential for aligning sustainability goals across the supply chain (Frost and Hua, 2017; Klusewitz and Viegh, 2002; Villard et al., 2015). Corporations often have imperfect information regarding stakeholder expectations for sustainable performance (Wilhelm et al., 2016; Kraude and Narasimhan, 2024). Consequently, initiatives led by the focal company, notably environmental disclosure efforts, assume a pivotal role in articulating its environmental expectations as a stakeholder to both suppliers and customers. In preparation for involvement in resource-intensive yet uncertain sustainable activities, such as emission reduction, supply chain partners require clear signals that these are in line with the industry trends and stakeholder demands (Song et al., 2023; Gong et al., 2019). Consequently, environmental disclosure emerges as an instrumental mechanism, operating as an environmental commitment claim by focal companies to their supply chain partners and contributing significantly to mitigating the prevalent challenge of information asymmetry.

Studies suggest that a focal company's environmental disclosure leads to an increase in suppliers' carbon emissions, as firms may attempt to reduce their own emissions by shifting environmentally burdensome activities to their suppliers, a phenomenon commonly referred to as carbon outsourcing (Mi et al., 2017). While environmental disclosure might induce opportunistic partners to engage in carbon outsourcing, in normal situations, such disclosure is more likely to signal the companies' dedication to environmental responsibility (Hahn et al., 2015). A company's environmental disclosure should serve as a robust declaration of its commitment to sustainability, influencing both upstream and downstream partners, especially when the company holds a significant position within the supply chain. Consequently, environmental information disclosure from a focal company can effectively communicate expectations for environmental performance improvement to its partner companies. We thus posit that the focal firm's ESG disclosure contributes to an enhancement in the sustainable performance of supply chain partners, driven by stakeholder influence and pressure. As a more influential company underscores its climate commitment through ESG disclosure, its supply chain partners are motivated to invest in substantial environmental initiatives to improve sustainable performance and satisfy the important stakeholder (Song et al., 2023). Therefore, we propose that.

Hypothesis 1 (H1). There exists a positive association between the focal company's sustainability disclosure and the sustainability performance of its supply chain partners (including both suppliers and customers).

3.2. The moderating role of power

A core determinant fostering the salience of stakeholders is their power, which is conceptualised as the situation where "one social actor, A, can get another social actor, B, to do something that B would not otherwise have done" (Mitchell et al., 1997: 865). Mitchell et al. (1997) clarified the function of power in stakeholder salience within the framework of resource dependence theory. Subsequently, researchers have extended the theoretical foundation of power (Driscoll and Starik, 2004), proposing that the explanation for stakeholder power can also be

reflected through the lens of social network theory (Wasserman, 1994). In the semiconductor industry, market power is especially concentrated among a few key players due to high capital and technology barriers, giving these firms considerable influence over their supply chain (Haramboure et al., 2023; Chien et al., 2012). As a stakeholder becomes more centrally positioned in the network, it enhances its connections to other entities and gains the authority to either grant or restrict opportunities for others in the network (Driscoll and Starik, 2004). In a supply chain, a focal firm with greater market power possesses the capability to regulate the access of its supply chain partners to the market, thereby exerting direct influence over them (Ahmed and Shafiq, 2022; Gu et al., 2024). In instances where firms exhibiting substantial market power prioritise sustainability, imitation tends to emerge among other entities within the industry (Oliver, 1997). As a result, firms with market power can influence industry practices and establish standards within the sector (Ahmed and Shafiq, 2022). The pressure for sustainability exerted by the focal company holds considerable influence, particularly in light of the uplifted switching costs faced by its supply chain partners (Wilhelm and Villena, 2021). Consequently, stakeholders with significant market power have the capacity to exert pressure on other firms, compelling not only attention to their concerns but also compliance with their requests (Song et al., 2023).

Apart from direct pressure, companies with high market power can indirectly encourage and motivate other entities in the industry to embrace sustainable practices. Giachetti and Torrisi (2018) observed that companies tend to imitate the practices of other companies, particularly those of the market leader. Hence, the adoption of sustainable practices by a firm with market power can lead to imitation by other participants in the supply chain. Due to both direct and indirect influences, ESG disclosure by a focal company with market power is more likely to lead to the adoption of sustainability practices and consequently the enhancement of sustainability performance by other entities in the supply chain. We therefore propose that.

Hypothesis 2 (H2). The positive association between the focal company's sustainability disclosure and its supply chain partners' sustainability performance is stronger when the focal company has higher market power.

3.3. The moderating role of legitimacy

Legitimacy, defined as the "generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574), plays a critical role in stakeholder salience theory. In the highly regulated semiconductor industry, where environmental impacts and sustainability practices are closely scrutinised, achieving legitimacy is essential for companies aiming to influence their supply chains (Lee and Kim, 2011). Given resource constraints, addressing the immediate needs of all stakeholders is often impractical, prompting companies to prioritise those with higher legitimacy (Mitchell et al., 1997). Requests from stakeholders possessing high legitimacy are more readily justifiable to others, and neglecting these demands can be perceived as an act of irresponsibility (Ahmed and Shafiq, 2022).

Furthermore, prioritising the claims of stakeholders with high legitimacy has the potential to enhance a company's standing and credibility (Czinkota et al., 2014). For example, in the semiconductor industry, where firms often face rigorous environmental regulations, being recognised as a partner by a company with established sustainability standards can signify a company's proficiency in environmental stewardship. Conversely, requests from a stakeholder lacking legitimacy may be viewed as hypocritical and opportunistic, potentially undermining collaboration within the supply chain (Ahmed and Shafiq, 2022). Consequently, research suggests that stakeholders with more legitimate requests tend to experience increased efficacy in advancing

sustainability activities within the supply chain (Crespin-Mazet and Dontenwill, 2012; Ahmed and Shafiq, 2022). Groups with higher legitimacy assert more robust claims compared to other stakeholders (Mitchell et al., 1997).

In this study, we propose that a firm's sustainability claim is considered legitimate when its sustainability performance undergoes credible evaluation and certification by a third party, specifically through environmental management accreditation. Existing studies contend that external verification of firms' sustainability practices leads to a higher level of legitimacy than self-reported assessments (Mahoney et al., 2013). Given that both environmental disclosure and environmental management accreditation can signify a company's commitment to sustainability, the combination of these two indicators can yield a more robust claim than each in isolation. When a company obtains environmental management accreditation, its supply chain partners are more likely to recognise its environmental disclosure as a substantial assertion of sustainability commitment. In conclusion, stakeholders possessing high legitimacy can enhance the impact of their sustainability disclosure, prompting their supply chain partners to undertake more robust actions and enhance sustainability performance (Mahoney et al., 2013). Accordingly, we posit the following hypothesis.

Hypothesis 3 (H3). The positive association between the focal company's sustainability disclosure and its supply chain partners' sustainability performance is stronger when the focal company has high legitimacy.

3.4. The moderating role of urgency

Urgency, according to Mitchell et al. (1997: 867), represents "the degree to which stakeholder claims call for immediate attention." This conceptualisation imparts a dynamic dimension to the stakeholder salience framework, providing strong support for the prioritisation of stakeholder claims. In the semiconductor industry, where rapid technological advancements are paired with significant environmental challenges, urgency in sustainability practices is particularly crucial (Frost and Hua, 2017). Semiconductor firms, due to their high resource and energy demands, are often under pressure to address sustainability concerns promptly, as delays can lead to regulatory penalties and damage to their reputation. In the context of this study, urgency is characterised as the focal company's sustainability commitment, reflected by the amount of resources that the firm dedicates to sustainability. When a firm strategically places a strong emphasis on recognising and addressing sustainability issues, its supply chain partners are not only inclined to perceive its sustainability disclosure as credible but also feel a greater imperative to align their practices quickly. The attention to sustainability initiatives reinforces the authenticity of the disclosure claim and at the same time enhances the clarity and resonance associated with it. The sincerity of the disclosure claim is further augmented, as the focal company's demonstrable attention to sustainability activities serves as a tangible manifestation of its unwavering dedication to sustainability stewardship (Song et al., 2023). Supply chain partners perceiving this commitment are thus more likely to interpret the disclosed information with strong significance and urgency, fostering a shared understanding of the firm's sustainability objectives.

Moreover, beyond the immediate implications, a company's recognition as being sustainability-focused becomes a strategic resource that will evolve into firm-specific assets and form an organisational culture with sustainability as an integral part of it (Richey Jr et al., 2014; Chan et al., 2012; Arabiun et al., 2023). In the semiconductor sector, where product cycles and technological demands are particularly fast-paced, this urgency can enhance the timeliness and relevance of sustainability goals, motivating supply chain partners to accelerate organisational learning, adjust their operations, and reconfigure their resource base to meet the requirements promptly (Molling et al., 2023). Therefore, we propose.

Hypothesis 4 (H4). The positive association between the focal company's sustainability disclosure and the sustainability performance of its supply chain partners is stronger when the focal company's sustainability disclosure exhibits a high level of urgency.

4. Dataset description and methods

4.1. Data

Our study empirically verifies the proposed hypotheses, combining data from several data ventures. Appendix A provides comprehensive details on the data collection and matching processes. Initially, we identified Chinese semiconductor firms listed on the Shanghai and Shenzhen Stock Exchanges from 2009 to 2023. Using Cninfo, a designated information disclosure platform by the China Securities Regulatory Commission (CSRC), we compiled a comprehensive list of 132 focal firms operating within the semiconductor sector. We then consulted the China Stock Market & Accounting Research (CSMAR) and Wind Database, widely used databases in management studies of publicly listed companies in China (Meng et al., 2024; Yang et al., 2021; Zhang and Kong, 2022), to verify the business scope of all firms. Using the keyword "semiconductor," we cross-referenced companies in the initial list to confirm that they were indeed actively engaged in semiconductor-related business activities, which resulted in a final sample of 155 firms. Appendix B shows the industry distribution of these focal firms.

Subsequently, we matched the focal firms with their upstream and downstream supply chain partners from 2009 to 2023. For each focal firm in the sample, we identified its top five suppliers and customers, gathering critical information from CSMAR, including the percentage of a supplier's revenue derived from the focal firm and the amount and proportion of customer spending on the focal firm's offerings. Initially, this process yielded a list of 2768 contractual ties. However, since our dependent and independent variables require financial and accounting data for each customer and supplier, we limited the sample to companies listed on China's stock market. This resulted in a final list of 90 focal firm-supplier dyads and 92 customer-focal firm dyads. Financial data were winsorized at the 1% and 99% quantiles. Companies designated as Special Treatment (ST) or *ST were excluded from the sample to minimise potential influences of abnormal performance. ESG information for the sample firms was then obtained from the Bloomberg database, which extensively collects corporate ESG data from diverse sources, including company sustainability reports, official websites, news articles, senior administration interviews, and regulatory filings, and is widely used in existing studies (e.g., Bellamy et al., 2020; Gualandris et al., 2021; Wang et al., 2023).

4.2. Measurement and variables

4.2.1. Dependent variables

We used a distinct proxy, *environmental governance performance*, to measure the sustainability performance of the focal firm's supply chain partners. While acknowledging the potential for firms to emphasise environmental protection rhetorically rather than through genuine action, we assume that the disclosure of more detailed green information indicates a higher likelihood of a firm actively prioritising efforts in green activities and sustainability. To capture the environmental protection governance of supply chain partners, we examined information disclosure in their annual reports, CSR reports, and environmental reports across ten primary categories. These categories include environmental protection concept, environmental protection goals, environmental protection management systems, environmental education and training, specific environmental protection initiatives, environmental emergency mechanisms, environmental honours or rewards, tri-synchronization, waste reduction and governance, and clean production. In each category, firms that did not report any relevant

information received a score of 0, while those reporting in any category received a score of 1. Scores were then aggregated to derive a final mark for each company, providing a comprehensive representation of the firm's environmental protection performance. Appendix C presents details on the construction of the dependent variable.

4.2.2. Independent variable

The key independent variables in this study are the focal firm's *ESG dummy* and *ESG Environment dummy*, operationalised using the Bloomberg ESG Rating disclosure and its specific Environmental Component disclosure for a given year. The Bloomberg ESG Rating, which ranges from 0 to 100, is based on annually revealed corporate ESG scores worldwide in environmental, social, and governance components, starting from 2006 (e.g., Gualandris et al., 2021; Wang et al., 2023). Bloomberg obtains information on firms' ESG practices and performance through direct interactions, including meetings, phone interviews, and surveys with firms, in addition to data from corporate sustainability reports, regulatory filings, websites, and news articles. The comprehensive nature of the Bloomberg ESG Rating offers a rich dataset across various dimensions of corporate sustainability, serving as a valuable indicator of a firm's sustainability practices and commitment. The rating also benefits from the expertise of professionals who have developed their skills over time, enhancing the accuracy and reliability of the scores in assessing firms. Studies have confirmed these ratings' robust measurement properties (Gualandris et al., 2021).

4.2.3. Moderating variables

The moderating variables in this study are closely aligned with stakeholder salience, inspired by Mitchell et al.'s seminal work (1997) and later developments by Neville et al. (2011), Mitchell et al. (2011), Thijssens et al. (2015) and Erdiaw-Kwasie et al. (2017). In this research, we specifically focus on the focal firm's power, legitimacy, and urgency and follow prior works to operationalise these aspects of salience (Ahmed and Shafiq, 2022; Tong et al., 2023).

Power. According to Neville et al. (2011), actor A holds power over actor B if A possesses resources that B needs. In studies of buyer-supplier relationships, the relational effects of exercising power have been explored. Based on Chen et al. (2016), a company's market power is typically used as an indicator of power, and a buyer's power can be proxied by (1) the volume or size of the relationship (relative to the supplier's total sales) and (2) the buyer firm's market share, which indicates a lack of available substitutes in the market. In this study, we employed the first operationalisation to approximate the role of buyer market power, measured as the total transaction volume relative to the total sales of the supply chain partner. This market power proxy captures the focal firm's influence over its partners. The second operationalisation was used as an alternative measure in the robustness test to ensure consistency.

Legitimacy. The firm's legitimacy, particularly that related to sustainability, is measured through its adherence to codes of conduct and specific benchmarks. Following Ye et al. (2020), we used ISO14001 certification in a given year as a proxy for the firm's sustainability legitimacy. Existing literature has measured legitimacy using surveys, expert ratings, or compliance with specific criteria and codes (Mooi and Frambach, 2009). Since stakeholder perceptions of legitimacy are often difficult to obtain directly, the degree to which the focal firm aligns with established codes and sustainability benchmarks serves as a valuable proxy.

Urgency. To measure the level of urgency with which the focal firm addresses sustainability issues, we used "environmental focus," which reflects the resources dedicated to environmental protection practices (Richey Jr et al., 2014; Chan et al., 2012). Text analysis was conducted on the annual reports of focal companies to identify the frequency of relevant terms associated with environmental focus. We developed a dictionary of environmental urgency terms (Appendix D), inspired by Thijssens et al. (2015), to count the frequency of these terms and

aggregated them for each firm. This method allows us to capture the proactive measures taken by the focal firm to address environmental concerns and highlights the urgency with which they prioritise sustainability practices.

4.2.4. Control variables

We also considered firm-level control variables that may systematically influence the relationship between the local firm ESG disclosure and the sustainable performance of its supply chain partners. First, we incorporated firm size (*Size*) and firm age (*Age*) to control for inherent characteristics. *Size* is measured as the logarithm of total assets. Larger firms may benefit more from economies of scale, which can provide stronger incentives and richer resources for investing in sustainability initiatives. *Age*, represented as the logarithm of the years since establishment, captures organisational maturity. Consistent with Wang and Qian (2011), as firms mature, they may develop greater capacity to acquire resources and information, which can potentially lead to more proactivity in embracing sustainability.

Second, we controlled for financial attributes, including Return on Assets (*ROA*) and sales growth (*Growth*). *ROA* is calculated as the ratio of net profit to total assets and is a commonly used metric to assess a firm's financial health and operational efficiency (Ben-Jebara and Modi, 2021). *Growth* is measured by the annual sales growth rate and serves as a critical indicator of a company's operational status, reflecting its financial performance. Including these financial variables helped control for potential financial influences on the relationship between focal firm ESG disclosure and the sustainable performance of supply chain partners.

Last, we included organisational attributes as control variables in our analysis, specifically state ownership (*SOE*), inventory turnover (*Inventory turnover*), and supply chain concentration (*SC concentration*). State-owned enterprises (*SOEs*) are often subject to greater government regulations, including environmental mandates, which may incentivise them to adopt sustainability practices more rigorously than non-state-owned firms. *Inventory turnover* reflects a firm's efficiency in converting operational input into output, which can also influence its engagement in social or community practices. Similarly, supply chain concentration is important in resource dependence and power imbalance, potentially affecting a firm's strategic decisions (Jiang et al., 2023). Detailed descriptions of all variables are summarised in Appendix E. To ensure robustness in our analysis, we winsorized all financial variables at the 1% and 99% levels, mitigating the influence of extreme outliers on our results.

4.3. Descriptive statistics

The correlation matrix of the variables and the descriptive statistics of the sample are presented in Table 1. Over the sample period, the average environmental governance score was 1.266. Notably, there was considerable variation in the adoption of environmental protection and governance practices across different companies and years within the sample, as reflected in the high standard deviations. The focal firm ESG dummy and ESG environment dummy variables both had values around 0.160, suggesting that only about one-sixth of the focal firms disclosed their ESG ratings.

4.4. Model specification

To address potential unobserved heterogeneity issues in the data, we performed High-Dimensional Fixed Effects regressions (REGHDFE) using STATA 17.0 to test the proposed hypotheses. REGHDFE has been widely utilised in accounting, finance, and economic research, as it helps mitigate biases arising from unobserved heterogeneity and omitted variables (Xu, 2018). The baseline model is expressed in Equation (1) below:

$$Environment\ governance_{SCit} = \beta_0 + \beta_1 Focal\ firm\ ESG\ dummy_{Fit} + \beta_2 ESG\ Environment\ dummy_{Fit} + \beta_3 Controls_{SCit} + \beta_4 year_t + \beta_5 industry_{SCi} + \epsilon_{it} \tag{1}$$

Each variable above is given a subscript of SC or F, where SC represents variables from the supply chain partner firm’s data and F represents variables from the focal firm’s data. The dependent variable *Environment governance* refers to sustainability performance of supply chain partner company i at time t, focusing on its environmental protection and governance related practices. *Focal firm ESG dummy* refers to the Bloomberg ESG disclosure of the focal firm, while *ESG Environment dummy* refers to the Bloomberg ESG Environmental disclosure of the focal firm, *Controls_{SCit}* is a vector of sustainability-related firm characteristics (control variables) that are explained above. Industry and year fixed effects are captured by *industry_i* and *year_t*, and *industry_i* is clarified by the CSRC 3-digit industry code.

Equations (2)–(4) include the moderators:

$$Environment\ governance_{SCit} = \beta_0 + \beta_1 Focal\ firm\ ESG\ dummy_{Fit} + \beta_2 ESG\ Environment\ dummy_{Fit} + \beta_3 Market\ sales\ ratio_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} + \beta_3 Focal\ firm\ ESG\ dummy_{Fit} * ESG\ Environment\ dummy_{Fit} * Market\ sales\ ratio_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} \tag{2}$$

$$Environment\ governance_{SCit} = \beta_0 + \beta_1 Focal\ firm\ ESG\ dummy_{Fit} + \beta_2 ESG\ Environment\ dummy_{Fit} + \beta_3 ISO14001_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} + \beta_3 Focal\ firm\ ESG\ dummy_{Fit} * ESG\ Environment\ dummy_{Fit} * ISO14001_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} \tag{3}$$

$$Environment\ governance_{SCit} = \beta_0 + \beta_1 Focal\ firm\ ESG\ dummy_{Fit} + \beta_2 ESG\ Environment\ dummy_{Fit} + \beta_3 Environment\ Focus_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} + \beta_3 Focal\ firm\ ESG\ dummy_{Fit} * ESG\ Environment\ dummy_{Fit} * Environment\ Focus_{Fit} + \beta_4 Controls_{SCit} + \beta_5 year_t + \beta_6 industry_{SCi} + \epsilon_{it} \tag{4}$$

where *Market sales ratio* is used as a proxy of power and is measured by the total transaction volume relative to the total sales of the supply chain partner, *ISO14001* is used as a proxy of legitimacy, and *Environment Focus* is used as a proxy for environmental urgency. Details of the variable description can be found in [Appendix E](#).

5. Results

5.1. Estimation results

To test the potential effect of the focal firm’s ESG disclosure on the sustainability performance of suppliers and customers (H1), we performed the REGHDFE based on Equation (1), and the results are shown in [Table 2](#). Two proxies are used to measure focal firm ESG disclosure, ESG dummy (Models 1, 2 and 3) and ESG Environment dummy (Models 4, 5, and 6). Models 1, 2, and 3 report the coefficients of focal firm ESG disclosure on supplier and customer environmental governance performance with different control variables. As shown, the focal firm ESG disclosure has a significant positive effect on supply chain partners’ sustainability performance ($b = 0.913, p < 0.05; b = 1.094, p < 0.05; b = 1.105, p < 0.05$, respectively). Similarly, Models 4, 5, and 6 show that the focal firm ESG disclosure is positively correlated with suppliers’ and customers’ sustainability performance as measured by environmental governance performance ($b = 0.931, p < 0.05; b = 1.156, p < 0.05; b = 1.168, p < 0.01$, respectively). We therefore find statistical support for

Table 1
Descriptive statistics and correlation matrix.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Environment governance	1.266	2.204	1									
2. Focal firm ESG dummy	0.159	0.367	0.043	1								
3. Focal firm ESG Environment dummy	0.164	0.371	0.096	0.565 _c	1							
4. Size	7.542	1.531	0.603 _c	-0.148 _a	-0.166 _b	1						
5. Age	2.319	0.423	0.313 _c	0.137 _a	0.086	0.283 _c	1					
6. Growth	0.172	0.474	-0.059	-0.019	-0.018	0.034	0.101	1				
7. ROA	0.049	0.089	-0.085	0.211 _c	0.190 _b	-0.043	-0.053	-0.078	1			
8. SOE	0.149	0.358	0.215 _c	0.062	0.045	0.161 _b	0.102	-0.046	0.147 _a	1		
9. Inventory turnover	4.684	3.383	-0.208 _c	-0.022	-0.029	-0.180 _b	-0.021	0.074	0.067	-0.188 _b	1	
10. SC concentration	0.322	0.197	-0.243 _c	0.175 _b	0.131 _a	-0.463 _c	0.230 _c	-0.001	-0.13	-0.064	-0.108	1

Note(s): All p-values are two-tailed.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

Table 2
Baseline model.

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance
Focal firm ESG dummy	0.913 ^b (0.4540)	1.094 ^b (0.4593)	1.105 ^b (0.4507)			
Focal firm ESG Environment dummy				0.931 ^b (0.4443)	1.156 ^b (0.4508)	1.168 ^c (0.4424)
Size	0.929 ^c (0.1025)	0.720 ^c (0.1394)	0.622 ^c (0.1428)	0.934 ^c (0.1027)	0.723 ^c (0.1390)	0.625 ^c (0.1423)
Age	-0.240 (0.4814)	-0.017 (0.4874)	0.052 (0.4792)	-0.182 (0.4758)	0.053 (0.4812)	0.123 (0.4730)
ROA	-3.050 ^a (1.6487)	-2.743 ^a (1.6330)	-2.372 (1.6100)	-3.017 ^a (1.6464)	-2.692 (1.6272)	-2.320 (1.6040)
SOE	-0.817 (0.5188)	-0.537 (0.5320)	-0.390 (0.5256)	-0.746 (0.5139)	-0.438 (0.5281)	-0.290 (0.5217)
Inventory turnover		0.088 ^a (0.0506)	0.083 ^a (0.0497)		0.091 ^a (0.0504)	0.086 ^a (0.0495)
SC concentration		-2.379 ^b (1.1971)	-3.294 ^c (1.2350)		-2.434 ^b (1.1942)	-3.350 ^c (1.2318)
Growth			-0.789 ^b (0.3289)			-0.790 ^b (0.3276)
_cons	-6.615 ^c (1.4855)	-6.148 ^c (1.5354)	-5.397 ^c (1.5389)	-6.819 ^c (1.4927)	-6.408 ^c (1.5377)	-5.659 ^c (1.5403)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.593	0.614	0.631	0.594	0.617	0.634
adj. R ²	0.516	0.533	0.551	0.517	0.537	0.554

Note(s): This table reports the results based on REGHDFE estimation.

Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

H1, and the result is consistent with Song et al. (2023).

To verify the proposed moderating effects of stakeholder salience factors, we added interaction terms of $\beta_3 \text{Focal firm ESG dummy}_{Fit} | \text{ESG Environment dummy}_{Fit} * \text{Market sales ratio}_{Fit}$, $\text{Focal firm ESG dummy}_{Fit} | \text{ESG Environment dummy}_{Fit} * \text{ISO14001}_{Fit}$, and $\text{Focal firm ESG dummy}_{Fit} | \text{ESG Environment dummy}_{Fit} * \text{Environment Focus}_{Fit}$ to Equations (2)–(4), respectively. The results are summarised in Tables 3–5. As can be seen in Table 3, the focal firm’s market power amplifies the positive effect of its ESG disclosure on its supply chain partners’ sustainability performance, with or without considering the control variables. According to Table 4, the interaction term between focal firm ESG disclosure and ISO14001 certification is positively related to supply chain partners’ sustainability performance, and the presence of control variables does not affect the strength and direction of the effect. As shown in Table 5, the coefficients of interaction term $\text{Focal firm ESG dummy}_{Fit} * \text{Environment Focus}_{Fit}$ in all the regression models are positive at 5% or 10% significant level. This suggests that the positive impact of the focal firm’s ESG disclosure on suppliers’ or customer’s sustainability performance is enhanced by the urgency the focal firm exhibits in addressing environmental issues. Therefore, our study provides statistical support for H2, H3 and H4.

5.2. Robustness tests

We used alternative approaches to test the robustness of our empirical results. First, we used different measurements for the moderating variables in the regressions. In addition to the measures explained earlier, we calculated the ratio of the firm’s annual sales to the total sales of all firms within the same three-digit China Securities Regulatory Commission (CSRC) industry code as a proxy for the focal firm’s market share. A higher market share indicates stronger bargaining power and greater market dominance over its supply chain partners, leading to

fewer alternatives in the market (Ahmed and Shafiq, 2022). For legitimacy, we used the *Emission Standard*, which indicates whether a firm meets the emission standard in a given year (Ye et al., 2020). It equals 1 if the firm meets the standard, and 0 if not. For the urgency of addressing sustainability issues, we used “Green Investor” as an alternative indicator, which shows whether a firm is selected by a green investor (Heinkel et al., 2001). Since green investors provide financial support and monitor firm performance, firms are under greater pressure to focus on sustainability projects and strategic decisions. The dummy variable “Green Investor” equals 1 if the firm receives green funding, and 0 if not.

To further assess the robustness of the estimation results, we also applied the Poisson method in Equations (2)–(4). The Poisson method is a widely used estimation method in economics, accounting, and management research when the dependent variable is count data. Tables 6–8 report the estimation results on the alternative moderators with Poisson estimation shown in Models (4), (5), and (6). The results in the robustness tests are consistent with those of the main analysis. Specifically, the positive association between the focal company’s sustainability disclosure and the sustainable performance of its supply chain partners is strengthened when the focal company has great market power, high legitimacy, and when the environmental commitment exhibits a high level of urgency.

5.3. Endogeneity

In practice, listed firms voluntarily decide whether to disclose the details of their major supply chain partners, which may potentially lead to sample selection issues. For instance, firms with better ESG performance may have greater incentives to disclose information about their suppliers and customers. Additionally, when investigating the causal relationship between a focal firm’s ESG transparency and its supply chain partners’ sustainability performance, endogeneity issues may

Table 3
Moderation effect: Power (market power).

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance
Focal firm ESG dummy*Market power	0.345 ^b (0.1596)	0.311 ^a (0.1601)	0.330 ^b (0.1572)			
Focal firm ESG Environment dummy*Market power				0.182 ^a (0.1066)	0.185 ^a (0.1059)	0.193 ^a (0.1040)
Size	0.876 ^c (0.1008)	0.689 ^c (0.1400)	0.588 ^c (0.1433)	0.892 ^c (0.1012)	0.692 ^c (0.1404)	0.593 ^c (0.1438)
Age	-0.024 (0.4715)	0.196 (0.4840)	0.271 (0.4754)	0.078 (0.4806)	0.315 (0.4915)	0.394 (0.4834)
ROA	-3.347 ^b (1.6521)	-3.048 ^a (1.6545)	-2.686 (1.6284)	-3.123 ^a (1.6571)	-2.827 ^a (1.6513)	-2.456 (1.6274)
SOE	-0.672 (0.5118)	-0.451 (0.5340)	-0.300 (0.5270)	-0.527 (0.5210)	-0.279 (0.5420)	-0.122 (0.5357)
Inventory turnover		0.078 (0.0513)	0.072 (0.0504)		0.088 ^a (0.0511)	0.083 (0.0502)
SC concentration		-0.021 ^a (0.0120)	-0.030 ^a (0.0124)		-0.021 ^a (0.0120)	-0.031 ^b (0.0124)
Growth			-0.816 ^b (0.3313)			-0.802 ^b (0.3323)
_cons	-6.572 ^c (1.4805)	-6.106 ^c (1.5465)	-5.336 ^c (1.5477)	-6.876 ^c (1.5129)	-6.435 ^c (1.5722)	-5.693 ^c (1.5729)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.594	0.608	0.627	0.589	0.606	0.624
adj. R ²	0.518	0.526	0.545	0.512	0.524	0.541

Note(s): This table reports the results based on REGHDFE estimation.

Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.0$.

^c $p < 0.01$.

Source: Authors self-calculation.

arise if unobserved firm characteristics or common environmental factors simultaneously influence both the dependent and independent variables. To address these concerns, we followed [Gu et al. \(2024\)](#) and [He et al. \(2022\)](#) by employing the Heckman two-stage model to mitigate sample selection bias.

In the first stage, we used a probit model with a dummy variable indicating whether the firm discloses its ESG score as the dependent variable. Control variables, including firm and industry characteristics, were also included. The probit regression results and the inverse Mills ratio (IMR) were then calculated. In the second stage, the IMR estimated in the first stage was incorporated into the baseline model for estimation. The results are presented in [Table 9](#). Columns (1), (3), and (5) show the results of the first-stage regressions of the Heckman two-stage model, and based on these results, we estimated the IMR. In the second stage, the estimated IMRs are included in the baseline model to represent the focal firm's ESG dummy. The estimated coefficients of the focal firm's ESG dummy, presented in Columns (2), (4), and (6), are significantly positive after addressing sample selection bias, which is consistent with the baseline results.

5.4. Hypothesis validation

Empirical results have provided support for all four hypotheses that our study proposed, and the results are considered robust across various scenarios. [Table 10](#) summarizes the hypotheses and their validation status.

6. Discussion

Using secondary data from the Chinese semiconductor industry, our study provides empirical evidence that sustainability programmes should be initiated by influential players in the sector and then diffused

throughout the supply chain through their influence, enabled by power, legitimacy, and urgency. This result aligns with practices in other sectors, such as manufacturing, where large players like Nike take proactive measures to combat child labour throughout their supply chain via initiatives like the Nike Code of Conduct and partnerships with entities like the Fair Labor Association (FLA). Similarly, IKEA has incorporated the IWAY Forestry Standard into its supplier code of conduct to delineate the minimum criteria for all wood products it sources, exerting influence on the sustainable practices of upstream suppliers. Our study, in conjunction with existing practices across various sectors, shows that when a focal company assumes a salient position in the supply chain, its sustainability demands are more likely to be prioritised by its suppliers and customers. This stems from supply chain partners' desire to prevent potential risks and penalties imposed by the focal company, including the possibility of losing business (for suppliers) and facing shortages of raw material supplies (for customers) ([Dai et al., 2021](#)).

6.1. Theoretical implications

Empirically, consistent with prior research (e.g., [Ahmed and Shafiq, 2022](#); [Song et al., 2023](#)), our study validates the applicability of stakeholder salience theory to the semiconductor supply chain with regard to sustainability. The results confirm that the market power of the focal firm can amplify the positive impact of its ESG disclosure on the sustainability performance of its supply chain partners. Further, ISO14001 certification, as a way of demonstrating the sustainability legitimacy of the focal company, is found to enhance the favorable effect of its ESG disclosure on supply chain sustainability performance. Additionally, the level of urgency the focal firm exhibits in adopting sustainability practices also strengthens the positive impact of its ESG disclosure on the sustainability performance of its suppliers and customers. To the best of our knowledge, this is one of the first attempts to fully operationalise

Table 4
Moderation effect: Legitimacy (ISO14001).

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance
Focal firm ESG dummy*ISO14001	1.219 ^a (0.7120)	2.007 ^b (0.7621)	1.875 ^b (0.7431)			
Focal firm ESG Environment dummy*ISO14001				1.219 ^a (0.7120)	2.007 ^b (0.7621)	1.875 ^b (0.7431)
Size	0.849 ^c (0.1424)	0.608 ^c (0.1809)	0.408 ^b (0.1954)	0.849 ^c (0.1424)	0.608 ^c (0.1809)	0.408 ^b (0.1954)
Age	-0.019 (0.5453)	0.348 (0.5591)	0.567 (0.5515)	-0.019 (0.5453)	0.348 (0.5591)	0.567 (0.5515)
ROA	-3.629 (3.7889)	-4.678 (3.7739)	-5.363 (3.6809)	-3.629 (3.7889)	-4.678 (3.7739)	-5.363 (3.6809)
SOE	-0.959 (0.6329)	-0.811 (0.6464)	-0.927 (0.6305)	-0.959 (0.6329)	-0.811 (0.6464)	-0.927 (0.6305)
Inventory turnover		0.065 (0.0608)	0.061 (0.0592)		0.065 (0.0608)	0.061 (0.0592)
SC concentration		-0.039 ^b (0.0185)	-0.053 ^c (0.0190)		-0.039 ^b (0.0185)	-0.053 ^c (0.0190)
Growth			-0.947 ^b (0.4035)			-0.947 ^b (0.4035)
_cons	-7.249 ^c (1.7670)	-6.518 ^c (1.8519)	-5.028 ^b (1.9092)	-7.249 ^c (1.7670)	-6.518 ^c (1.8519)	-5.028 ^b (1.9092)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	105	103	103	105	103	103
R ²	0.622	0.651	0.674	0.622	0.651	0.674
adj. R ²	0.520	0.543	0.568	0.520	0.543	0.568

Note(s): This table reports the results based on REGHDFE estimation.

Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

stakeholder salience theory in the context of the semiconductor supply chain to explain the diffusion effect of the focal company's sustainability commitment. Therefore, it contributes to the literature in two important ways.

First, our study broadens the application of stakeholder salience theory to the supply chain, particularly with a focus on sustainability diffusion along the semiconductor supply chain. As a widely adopted framework for explaining how stakeholders shape organisations' CSR strategies, the use of stakeholder salience theory has largely been restricted within the CSR domain and stakeholder-firm dyads (Thijssens et al., 2015; Erdiaw-Kwasie et al., 2017). Our study takes a comprehensive perspective on sustainability and applies the theory to supply chain triads/networks. Prior studies have acknowledged the challenge companies face in ensuring that their suppliers share their sustainability values and comply with their standards (Meqdadi et al., 2019; Marttinen and Kähkönen, 2022). In response, studies have confirmed the role of power (Meqdadi et al., 2019), supplier development initiatives (Pimenta et al., 2021), coercive and collaborative mechanisms (Mena and Schoenherr, 2023), and sustainability standards characteristics (stringency, governance, and media coverage) (Castka and Corbett, 2016) in driving sustainability diffusion in the supply chain. However, these studies assume that the focal company is always motivated to extend its sustainability practices or standards to its supply chain and has initiatives ready for sustainability diffusion. In reality, this is not always the case, as companies, especially those operating in multiple geographical areas, often find it difficult to extend their influence beyond their tier-1 suppliers, and sustainability-related standards vary significantly across the globe (Villena and Gioia, 2020). In worse cases, companies improve their environmental performance by transferring emissions to their suppliers (Song et al., 2023). However, our study shows that instead of formally requiring supply chain members to comply with their own sustainability standards, influential companies with power, legitimacy,

and urgency can disseminate sustainability to the supply chain by disclosing their own sustainability-related information, such as ESG data.

Second, our study incorporates industrial and supply chain characteristics into the discussion of stakeholder salience and sustainability diffusion in the semiconductor sector. The semiconductor industry exhibits characteristics of fixed-cost-driven geographical concentration and significant disparities between the upstream and downstream supply chains, making coordinated sustainability efforts extremely challenging. As Wilhelm et al. (2016) point out, supply chain characteristics, such as complexity, play a crucial role in determining how companies extend their sustainability strategies upstream. Therefore, it is an optimal context in which to leverage the internal mechanisms of the supply chain, such as the relative salience of players, to make joint progress towards sustainability. Our study thus adds to the sustainability diffusion literature by showing that in situations of high concentration and significant heterogeneity, internal mechanisms, such as power imbalance, legitimacy, and urgency, can be leveraged alongside external factors like policy.

6.2. Managerial implications

Apart from significant theoretical contributions, our study also offers practical implications for semiconductor practitioners and policy-makers. China faces unique geographical challenges, such as acute water scarcity and stringent carbon emission reduction goals, which significantly influence sustainability dynamics in the semiconductor sector. As China plans substantial advancements in semiconductor development, achieving sustainable growth becomes paramount. However, due to the global dispersion of supply chains and varying sustainability regulations across regions, the uniform adoption of sustainability standards presents challenges. At the same time, control mechanisms, such as contracts,

Table 5
Moderation effect: Urgency (environment focus).

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance	Environment governance
Focal firm ESG dummy *Environment Focus	0.555 ^a (0.3191)	0.573 ^a (0.3172)	0.589 ^a (0.3113)			
Focal firm ESG Environment dummy *Environment Focus				0.575 ^a (0.3138)	0.618 ^b (0.3117)	0.635 ^b (0.3059)
Size	0.925 ^c (0.1030)	0.718 ^c (0.1410)	0.621 ^c (0.1443)	0.930 ^c (0.1032)	0.721 ^c (0.1407)	0.623 ^c (0.1439)
Age	-0.256 (0.4884)	-0.018 (0.4970)	0.048 (0.4886)	-0.212 (0.4814)	0.027 (0.4897)	0.095 (0.4813)
ROA	-3.008 ^a (1.6550)	-2.714 (1.6483)	-2.340 (1.6253)	-2.979 ^a (1.6529)	-2.675 (1.6441)	-2.299 (1.6208)
SOE	-0.634 (0.5151)	-0.400 (0.5351)	-0.250 (0.5289)	-0.569 (0.5166)	-0.320 (0.5362)	-0.168 (0.5299)
Inventory turnover		0.087 ^a (0.0511)	0.082 (0.0502)		0.089 ^a (0.0509)	0.084 ^a (0.0500)
SC concentration		-0.023 ^a (0.0121)	-0.032 ^b (0.0124)		-0.023 ^a (0.0120)	-0.032 ^b (0.0124)
Growth			-0.795 ^b (0.3321)			-0.797 ^b (0.3311)
_cons	-6.472 ^c (1.4884)	-5.976 ^c (1.5480)	-5.219 ^c (1.5519)	-6.646 ^c (1.4914)	-6.162 ^c (1.5470)	-5.408 ^c (1.5500)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.589	0.607	0.624	0.590	0.609	0.626
adj. R ²	0.512	0.524	0.542	0.514	0.527	0.545

Note(s): This table reports the results based on REGHDFE estimation.

Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

Table 6
Robustness test: Alternative Power (Market Power).

DV: Environment governance	(1)	(2)	(3)	(4)	(5)	(6)
	REGHDFE	REGHDFE	REGHDFE	Poisson	Poisson	Poisson
Focal firm ESG dummy*Market power	0.349 ^b (0.1719)	0.312 ^a (0.1725)	0.335 ^a (0.1693)	0.474 ^c (0.1427)	0.465 ^c (0.1583)	0.495 ^c (0.1419)
Size	0.876 ^c (0.1010)	0.689 ^c (0.1403)	0.587 ^c (0.1436)	0.382 ^c (0.0412)	0.250 ^c (0.0705)	0.155 ^b (0.0765)
Age	-0.020 (0.4725)	0.201 (0.4850)	0.276 (0.4764)	0.857 ^b (0.3416)	1.043 ^c (0.3767)	1.183 ^c (0.3847)
ROA	-3.335 ^b (1.6559)	-3.034 ^a (1.6583)	-2.674 (1.6321)	-4.987 ^c (1.2897)	-4.711 ^c (1.3458)	-4.081 ^c (1.2774)
SOE	-0.673 (0.5128)	-0.452 (0.5351)	-0.300 (0.5281)	-0.996 ^b (0.4290)	-0.911 ^b (0.4490)	-0.950 ^b (0.4655)
Inventory turnover		0.078 (0.0515)	0.072 (0.0505)		0.044 ^a (0.0247)	0.033 (0.0255)
SC concentration		-0.021 ^a (0.0120)	-0.030 ^b (0.0124)		-0.015 ^b (0.0074)	-0.023 ^c (0.0079)
Growth			-0.817 ^b (0.3321)			-0.985 ^c (0.3243)
_cons	-6.591 ^c (1.4843)	-6.119 ^c (1.5502)	-5.351 ^c (1.5512)	-6.683 ^c (1.1409)	-6.253 ^c (1.1901)	-5.502 ^c (1.1876)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.593	0.607	0.625			
adj. R ² /Pseudo R ²	0.516	0.524	0.543	0.429	0.434	0.453

Note(s): Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

Table 7
Robustness test: Alternative Legitimacy (Emission Standard).

DV: Environment governance	(1)	(2)	(3)	(4)	(5)	(6)
	REGHDFE	REGHDFE	REGHDFE	Poisson	Poisson	Poisson
Focal firm ESG dummy*Emission Standard	0.913 ^b (0.4540)	1.094 ^b (0.4593)	1.105 ^b (0.4507)	1.068 ^c (0.2426)	1.167 ^c (0.2564)	1.135 ^c (0.2508)
Size	0.929 ^c (0.1025)	0.720 ^c (0.1394)	0.622 ^c (0.1428)	0.435 ^c (0.0436)	0.268 ^c (0.0724)	0.192 ^b (0.0775)
Age	-0.240 (0.4814)	-0.017 (0.4874)	0.052 (0.4792)	0.758 ^b (0.3404)	1.015 ^c (0.3742)	1.095 ^c (0.3786)
ROA	-3.050 ^a (1.6487)	-2.743 ^a (1.6330)	-2.372 (1.6100)	-3.260 ^c (0.9560)	-3.290 ^c (1.0421)	-2.441 ^b (0.9623)
SOE	-0.817 (0.5188)	-0.537 (0.5320)	-0.390 (0.5256)	-1.166 ^c (0.4207)	-0.965 ^b (0.4306)	-0.953 ^b (0.4393)
Inventory turnover		0.088 ^a (0.0506)	0.083 ^a (0.0497)		0.046 ^a (0.0261)	0.038 (0.0266)
SC concentration		-0.024 ^b (0.0120)	-0.033 ^c (0.0124)		-0.020 ^c (0.0075)	-0.027 ^c (0.0080)
Growth			-0.789 ^b (0.3289)			-0.749 ^c (0.2813)
_cons	-6.615 ^c (1.4855)	-6.148 ^c (1.5354)	-5.397 ^c (1.5389)	-7.011 ^c (1.1453)	-6.537 ^c (1.1933)	-5.819 ^c (1.2073)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.593	0.614	0.631			
adj. R ² /Pseudo R ²	0.516	0.533	0.551	0.430	0.441	0.454

Note(s): Standard errors in parentheses.

^a p < 0.1.

^b p < 0.05.

^c p < 0.01.

Source: Authors self-calculation.

Table 8
Robustness test: Alternative Urgency (Green Investor).

DV: Environment governance	(1)	(2)	(3)	(4)	(5)	(6)
	REGHDFE	REGHDFE	REGHDFE	Poisson	Poisson	Poisson
Focal firm ESG dummy*Green investor dummy	1.255 ^b (0.5059)	1.263 ^b (0.5036)	1.313 ^c (0.4937)	1.127 ^c (0.2498)	1.139 ^c (0.2616)	1.117 ^c (0.2563)
Size	0.945 ^c (0.1023)	0.739 ^c (0.1399)	0.640 ^c (0.1428)	0.442 ^c (0.0444)	0.280 ^c (0.0733)	0.206 ^c (0.0782)
Age	-0.398 (0.4888)	-0.154 (0.4973)	-0.094 (0.4878)	0.659 ^a (0.3376)	0.892 ^b (0.3697)	0.964 ^c (0.3740)
ROA	-3.143 ^a (1.6364)	-2.864 ^a (1.6303)	-2.486 (1.6043)	-3.274 ^c (0.9630)	-3.215 ^c (1.0321)	-2.374 ^b (0.9507)
SOE	-0.524 (0.5118)	-0.286 (0.5316)	-0.127 (0.5247)	-0.791 ^a (0.4180)	-0.693 (0.4370)	-0.655 (0.4495)
Inventory turnover		0.081 (0.0505)	0.076 (0.0496)		0.045 ^a (0.0260)	0.036 (0.0266)
SC concentration		-0.023 ^a (0.0119)	-0.032 ^c (0.0123)		-0.019 ^b (0.0075)	-0.025 ^c (0.0079)
Growth			-0.816 ^b (0.3278)			-0.751 ^c (0.2784)
_cons	-6.229 ^c (1.4725)	-5.718 ^c (1.5332)	-4.930 ^c (1.5350)	-6.565 ^c (1.1340)	-6.074 ^c (1.1815)	-5.379 ^c (1.1938)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
N	153	151	151	153	151	151
R ²	0.599	0.616	0.634			
adj. R ² /Pseudo R ²	0.524	0.536	0.554	0.431	0.439	0.452

Note(s): Standard errors in parentheses.

^a p < 0.1.

^b p < 0.05.

^c p < 0.01.

Source: Authors self-calculation.

have been shown to have weak effects beyond tier-1 suppliers (Villena and Gioia, 2020). Therefore, our study recommends that major semiconductor companies adopt a proactive approach by implementing comprehensive sustainability disclosure practices. This involves not

only publicising detailed ESG reports that highlight energy usage, waste management strategies, and greenhouse gas emissions but also integrating these disclosures into strategic planning and decision-making processes. By doing so, these firms can set clear expectations for their

Table 9
Heckman two-stage model.

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Focal firm ESG dummy	Environment governance	Focal firm ESG dummy	Environment governance	Focal firm ESG dummy	Environment governance
Focal firm ESG dummy		1.100 ^a (0.5758)		1.356 ^b (0.5758)		0.838 ^a (0.4657)
Size		0.816 ^c (0.1468)		0.985 ^c (0.1919)	0.506 ^c (0.1333)	1.146 ^c (0.2499)
Age		1.040 ^b (0.4981)		-0.481 (0.9758)	0.230 (0.4466)	1.149 (0.5014)
ROA		-3.319 (3.8207)		-1.875 (5.3962)	6.289 (4.2509)	0.634 (4.658)
SOE		-0.140 (0.5017)		-0.757 (0.8927)	-0.079 (0.4493)	-0.211 (0.4963)
ISO14001	0.889 ^b (0.3554)		0.889 ^b (0.3554)		1.094 ^b (0.4593)	
Market power	-0.006 (0.0263)		0.004 (0.0362)		0.009 (0.0411)	
_cons	-0.826 ^c (0.1708)	-8.967 ^c (1.8439)	0.792 ^c (0.847)	-7.490 ^c (2.7644)	-6.615 ^c (1.4855)	-11.561 ^c (2.9972)
Year effect	No	Yes	Yes	Yes	Yes	Yes
Industry effect	No	Yes	Yes	Yes	Yes	Yes
N	149	105	149	105	105	105
R ² /Pseudo R ²	0.061	0.349	0.170	0.607	0.302	0.346
Mean VIF		1.10		1.98		2.14

Note(s): Standard errors in parentheses.

^a $p < 0.1$.

^b $p < 0.05$.

^c $p < 0.01$.

Source: Authors self-calculation.

Table 10
Summary of hypotheses validation.

Hypothesis	Statement	Validation Status
H1	There exists a positive association between the focal company's environmental disclosure and the sustainable performance of its supply chain partners.	Confirmed
H2	The positive association between the focal company's environmental disclosure and its supply chain partners' sustainable performance is stronger when the focal company has high market power.	Confirmed
H3	The positive association between the focal company's environmental disclosure and its supply chain partners' sustainable performance is stronger when the focal company has high legitimacy.	Confirmed
H4	The positive association between the focal company's environmental disclosure and the sustainable performance of its supply chain partners is strengthened when the focal company's environmental commitment exhibits a high level of urgency.	Confirmed

suppliers and customers, effectively communicating the importance of sustainability across the entire supply chain.

In addition to transparent reporting, large firms should actively engage their supply chain partners in collaborative sustainability initiatives. For example, they can establish joint sustainability goals with tier-1 suppliers that align with national sustainability objectives. By co-developing projects focused on energy efficiency improvements, waste reduction, or innovative recycling programs, firms can drive change that benefits not only their operations but also those of their suppliers. Furthermore, investing in training and capacity-building programs for suppliers can enhance their ability to meet sustainability standards. This could include workshops on best practices for enhancing overall sustainability performance within the supply chain.

For managers of smaller semiconductor firms, our findings highlight the importance of leveraging the sustainability disclosures of larger,

more influential firms. These smaller players should systematically monitor and analyse the ESG practices of their larger partners to identify industry trends and benchmark their own practices against established standards. By utilising this information, they can strategically align their operations with the sustainability expectations of their key stakeholders to enhance competitiveness. Additionally, smaller firms are encouraged to seek out niche markets or clients that prioritise sustainability, allowing them to differentiate themselves in a crowded market. They should also consider forming collaborative networks with other small to medium enterprises (SMEs) to share resources and knowledge, thus strengthening their collective ability to adopt sustainability practices.

Policymakers play a critical role in supporting the transition towards sustainable practices in the semiconductor industry. To effectively drive sustainability throughout the sector, targeted policies should focus on incentivising influential organisations like Huawei and YMTC to disclose their sustainability metrics comprehensively. For instance, tax incentives could be offered to firms that report not only their own sustainability efforts but also require their suppliers to meet certain ESG criteria. This would encourage large companies to take responsibility for the sustainability performance of their entire supply chain. Moreover, policymakers should consider establishing public-private partnerships aimed at developing sustainability training programmes tailored for SMEs in the semiconductor sector. These programmes could provide the necessary resources and expertise for smaller firms to enhance their sustainability efforts without overburdening their limited resources.

6.3. Limitation and future research

While adding significant value to existing literature and practice, this study has some limitations that suggest avenues for future research. First, the study is based on a relatively small sample size, constrained by limited data availability. Expanding the sample size in future studies would enhance the generalisability of the findings. Employing methods such as survey research and broadening the geographical or sectoral scope could also improve the generalisability of the results. Second, our study operationalises the three mechanisms of stakeholder

salience—legitimacy, power, and urgency—primarily following established proxies from existing literature. Future studies could develop measures that are more specifically tailored to their research contexts. Additionally, exploring the mechanisms through which ESG disclosures influence supplier behaviour across different cultural and regulatory environments, as well as conducting longitudinal studies to track the long-term impact of sustainability disclosures on supply chain performance, would provide valuable insights that enrich existing knowledge. Comparative analysis across various industries with differing supply chain complexities could also extend the generalisability of our findings.

Another limitation of this study is the absence of an in-depth examination of potential mediating mechanisms underlying the observed relationship between the focal firm's ESG disclosure and supply chain sustainability performance. Future research should explore these mediating mechanisms more thoroughly to identify the variables that elucidate hidden dynamics and pathways.

7. Conclusion

This study offers critical insights into sustainability diffusion within the semiconductor supply chain by applying the stakeholder salience theory. It examines how the power, legitimacy, and urgency of key industry players—and their claims, expressed through ESG disclosures—impact the sustainable performance of their supply chain

partners. Our findings validate that when influential companies disclose their own sustainability-related information, they catalyse improved sustainability performance across both upstream and downstream supply chain participants. This influence is magnified when these focal firms demonstrate substantial market power, possess recognised legitimacy through certifications like ISO14001, and exhibit a pronounced urgency towards addressing sustainability issues.

By extending the stakeholder salience theory to a supply chain network context, particularly within a capital-intensive and fragmented sector like semiconductors, this research advances the understanding of how internal industry dynamics can support sustainability goals. Unlike direct mandates, which may be challenging to diffuse across geographically dispersed tiers, our study shows that proactive ESG disclosure serves as a model for sustainability that resonates with partners, facilitating voluntary compliance.

CRediT authorship contribution statement

Shuang Tian: Writing – review & editing, Writing – original draft, Conceptualization. **Miao Wang:** Methodology, Formal analysis, Data curation. **Lin Wu:** Writing – review & editing, Writing – original draft. **Ajay Kumar:** Writing – review & editing. **Kim Hua Tan:** Writing – review & editing.

Appendix

Appendix A

Data collection and matching steps

Data screening steps	Period	Change	Number of sample firms	Database used
1 Started with the listed firms operating in the semiconductor sector	from 2009 to 2023		132 firms	Cninfo website
2 Verify focal firm list	from 2009 to 2023	Double check the main business of all listed firms to complement the initial focal firm list	Add 23 firms	CSMAR and Wind
3 Supply chain partner matching with CSMAR	from 2009 to 2023	Match the focal firm with their top five suppliers and customers in China's stock markets	2768 supply chain dyads	CSMAR
4 Select the firms listed in China's stock market	from 2009 to 2023	Remove the unlisted firm samples	90 focal firm–supplier dyads, and 92 customer–focal firm dyads	CSMAR
4 ESG rating matching	from 2009 to 2023	Match the ESG data for sample firms	No change	Bloomberg
5 Financial & accounting data matching	from 2009 to 2023	Match the financial & accounting data for sample firms, missing data are left as blank	No change	CSMAR, wind Authors and self-calculation

Appendix B

The distribution of focal firm samples by industry

CSRC code	Industry	Frequency	Percentage (%)
C26	Raw chemical materials and chemical products	10	5.49
C30	Non-metallic mineral	12	6.59
C35	Special equipment manufacturing	5	2.75
C36	Automobile manufacturing	9	4.95
C38	Electric machines and apparatuses manufacturing	12	6.59
C39	Computer, communication, and other electrical device manufacturing	123	67.58
E50	Construction Decoration and Other Construction	3	1.65
I65	Software and IT Services	8	4.40
Total		182	100.00

Appendix C

Dependent variable construction

Category	Description
1 environmental protection concept	Assign a value of 1 if any of a company's environmental protection concept, environmental policy, environmental management organisation structure, circular economy development model, green development has been mentioned in a given year, otherwise 0.
2 environmental protection goal	Assign a value of 1 if a company achieved its past environmental protection goals or disclose its future environmental protection goals in a given year, otherwise 0.
3 environmental protection management system	Assign a value of 1 if a company has used a series of management systems such as relevant environmental management systems, regulations and responsibilities formulation in a given year, otherwise 0.
4 environmental protection education and training	Assign a value of 1 if a company has participated in any environmental protection education and training in a given year, otherwise 0.
5 environmental protection special action	Assign a value of 1 if a company has participated in special environmental protection and other social welfare activities in a given year, otherwise 0.
6 environmental protection emergency mechanism	Assign a value of 1 if a company has established the emergency mechanism for major events related to environment, or taken emergency measures and treatment of pollutants in a given year, otherwise 0.
7 environmental protection honor or reward	Assign a value of 1 if a company has received the honors or rewards in environmental protection in a given year, otherwise 0.
8 tri-synchronization,	Assign a value of 1 if a company has the safety and environmental protection of the project synchronized in design, construction and usage stages of in a given year, otherwise 0.
9 waste reduction and governance	Assign a value of 1 if a company has the waste emission reduction and governance in a given year, otherwise 0.
10 clean production	Assign a value of 1 if a company has conducted cleaner production in a given year, otherwise 0.

Data source: CSMAR based on annual report, CSR report and environmental report.

Appendix D

Dictionary of urgency terms

Keywords

Safety production, exceeding standards, ozone layer, dust removal, atmospheric, low-carbon, carbon dioxide, prevention and control of waste gas, waste water, waste residue, dust, wind power boiler filtration, environmental protection, methane recovery, emission reduction, degradation, noise reduction, energy conservation, purification, sustainable development, renewable, air, waste, waste recycling, greening, green energy, consumption, energy emissions, exhaust pollution, habitat destruction, clean fuel, ecological biomass water treatment, acidic solar energy, natural gas, soil desulfurization, denitrification, tail gas, temperature chamber gas pollution, sewage harmless, paperless species consumption, circulating smoke, smoke, liquefied gas, toxic organic matter waste heat reuse, noise, heavy metals, natural resources

Appendix E

Summary of variables

Variable*	Description	Source
Dependent variable		
Environment governance	A firm's environmental protection governance based on the text analysis on ten main categories, details are shown in Appendix C .	Author's own calculation based on data collected from CSMAR
Independent variable		
Focal firm ESG dummy	Dummy variable equals 1 if a focal firm has the ESG score in a given year, otherwise 0	Author's own calculation based on data collected from Bloomberg
Focal firm ESG Environment dummy	Dummy variable equals 1 if a focal firm has the ESG Environment score in a given year, otherwise 0	Author's own calculation based on data collected from Bloomberg
Moderating variable		
Market power	the total transaction volume relative to the total sales of the supply chain partner	Author's own calculation based on CSMAR data
ISO14001	Dummy variable equals 1 if a firm passes ISO14001 in a given year, otherwise 0	CSMAR
Environment Focus	A firm's attention on environment protection performance (Dictionary of terms are shown in Appendix D).	Author's own calculation based on annual financial report: count of environment protection keywords/count of phrases
Control variable		
Size	A natural logarithmic transformation to the firm's employee numbers: Ln (1+n)	CSMAR
Age	A natural logarithmic transformation to the firm's establishing years: Ln (1+n)	CSMAR
Growth	Sales annual growth rate	CSMAR
ROA	Return on assets	CSMAR
SOE	Dummy variable equals 1 if the firm has the state ownership	CSMAR
Inventory turnover	Inventory turnover	CSMAR
SC concentration	Supply chain concentration: (top five suppliers purchases + top five customers sales)/2	
Alternative measures		

(continued on next page)

Appendix E (continued)

Variable*	Description	Source
Market sales ratio	the ration of firm's sales to the CSRC 3-digit industry sales	Author's own calculation based on CSMAR data
Emission Standard	Dummy variable equals 1 if a firm meets the waste discharge standard, otherwise 0	CSMA
Green Investor	Dummy variable equals 1 if a firm was invested by the green fund, otherwise 0	Author's manual collection

Note(s): All financial data are winsorized at 1% and 99% quantiles.

Data availability

Data will be made available on request.

References

- Adhikary, A., Sharma, A., Diatha, K.S., Jayaram, J., 2020. Impact of buyer-supplier network complexity on firms' greenhouse gas (GHG) emissions: an empirical investigation. *Int. J. Prod. Econ.* 230, 107864. <https://doi.org/10.1016/j.ijpe.2020.107864>.
- Ahmed, M.U., Shafiq, A., 2022. Toward sustainable supply chains: impact of buyer's legitimacy, power and aligned focus on supplier sustainability performance. *Int. J. Oper. Prod. Manag.* 42 (3), 280–303. <https://doi.org/10.1108/UOPM-08-2021-0540>.
- Aldieri, L., Brahmi, M., Chen, X., Vinci, C.P., 2021a. Knowledge spillovers and technical efficiency for cleaner production: an economic analysis from agriculture innovation. *J. Clean. Prod.* 320, 128830. <https://doi.org/10.1016/j.jclepro.2021.128830>.
- Aldieri, L., Brahmi, M., Bruno, B., Vinci, C.P., 2021b. Circular economy business models: the complementarities with sharing economy and eco-innovations investments. *Sustainability* 13 (22), 12438. <https://doi.org/10.3390/su132212438>.
- Arabtun, A., Dehkordi, A.M., Hosseini, E., Brahmi, M., 2023. A framework for strategic analysis in dynamic and complex environments. In: *Exploring Business Ecosystems and Innovation Capacity Building in Global Economics*. IGI Global, pp. 26–47. <https://doi.org/10.4018/978-1-6684-6766-4.ch002>.
- Bansal, P., Roth, K., 2000. Why companies go green: a model of ecological responsiveness. *Acad. Manag. J.* 43 (4), 717–736. <https://doi.org/10.2307/1556363>.
- Bellamy, M.A., Dhanorkar, S., Subramanian, R., 2020. Administrative environmental innovations, supply network structure, and environmental disclosure. *J. Oper. Manag.* 66 (7–8), 895–932. <https://doi.org/10.1002/joom.1114>.
- Ben-Jebara, M., Modi, S.B., 2021. Product personalization and firm performance: an empirical analysis of the pharmaceutical industry. *J. Oper. Manag.* 67 (1), 82–104. <https://doi.org/10.1002/joom.1109>.
- Buell, R.W., Kalkanci, B., 2021. How transparency into internal and external responsibility initiatives influences consumer choice. *Manag. Sci.* 67 (2), 932–950. <https://doi.org/10.1287/mnsc.2020.3588>.
- Castka, P., Corbett, C., 2016. Adoption and diffusion of environmental and social standards: the effect of stringency, governance, and media coverage. *Int. J. Oper. Prod. Manag.* 36 (11), 1504–1529. <https://doi.org/10.1108/IJOPM-01-2015-0037>.
- Chan, R.K., He, H., Chan, H., Wang, W.C., 2012. Environmental orientation and corporate performance: the mediation mechanism of green supply chain management and moderating effect of competitive intensity. *Ind. Market. Manag.* 41 (4), 621–630. <https://doi.org/10.1016/j.indmarman.2012.04.009>.
- Chen, L., Feldmann, A., Tang, O., 2015. The relationship between disclosures of corporate social performance and financial performance: evidences from GRI reports in manufacturing industry. *Int. J. Prod. Econ.* 170, 445–456. <https://doi.org/10.1016/j.ijpe.2015.04.004>.
- Chen, J., Zhao, X., Lewis, M., Squire, B., 2016. A multi-method investigation of buyer power and supplier motivation to share knowledge. *Prod. Oper. Manag.* 25, 417–431. <https://doi.org/10.1111/poms.12421>.
- Chien, C.F., Wu, C.H., Chiang, Y.S., 2012. Coordinated capacity migration and expansion planning for semiconductor manufacturing under demand uncertainties. *Int. J. Prod. Econ.* 135 (2), 860–869. <https://doi.org/10.1016/j.ijpe.2011.10.024>.
- Ciliberti, F., De Haan, J., De Groot, G., Pontrandolfo, P., 2011. CSR codes and the principal-agent problem in supply chains: four case studies. *J. Clean. Prod.* 19 (8), 885–894. <https://doi.org/10.1016/j.jclepro.2010.09.005>.
- Clarkson Centre for Business Ethics, 1999. *Principles of Stakeholder Management*. Clarkson Centre for Business Ethics, Joseph L. Rotman School of Management, University of Toronto.
- Crane, A., Ruebottom, T., 2011. Stakeholder theory and social identity: rethinking stakeholder identification. *J. Bus. Ethics* 102, 77–87. <https://doi.org/10.1007/s10551-011-1191-4>.
- Crespin-Mazet, F., Dentenwill, E., 2012. Sustainable procurement: building legitimacy in the supply network. *J. Purch. Supply Manag.* 18 (4), 207–217. <https://doi.org/10.1016/j.pursup.2012.01.002>.
- Czinkota, M., Kaufmann, H.R., Basile, G., 2014. The relationship between legitimacy, reputation, sustainability and branding for companies and their supply chains. *Ind. Market. Manag.* 43 (1), 91–101. <https://doi.org/10.1016/j.indmarman.2013.10.005>.
- Dai, R., Liang, H., Ng, L., 2021. Socially responsible corporate customers. *J. Financ. Econ.* 142 (2), 598–626. <https://doi.org/10.1016/j.jfineco.2020.01.003>.
- Driscoll, C., Starik, M., 2004. The primordial stakeholder: advancing the conceptual consideration of stakeholder status for the natural environment. *J. Bus. Ethics* 49, 55–73. <https://doi.org/10.1023/B:BUSI.0000013852.62017.0e>.
- Duan, Y., Hofer, C., Aloysius, J.A., 2021. Consumers care and firms should too: on the benefits of disclosing supplier monitoring activities. *J. Oper. Manag.* 67 (3), 360–381. <https://doi.org/10.1002/joom.1129>.
- Eccles, R.G., Johnstone-Louis, M., Mayer, C., Strohle, J.C., 2020. The Board's role in sustainability. *Harv. Bus. Rev.* 98 (5), 48–51.
- Eckerdt, S., Hill, J.A., 2012. The buyer-supplier social contract: information sharing as a deterrent to unethical behaviors. *Int. J. Oper. Prod. Manag.* 32 (2), 238–255. <https://doi.org/10.1108/01443571211208641>.
- Erdaaw-Kwasie, M.O., Alam, K., Shahiduzzaman, M., 2017. Towards understanding stakeholder salience transition and relational approach to 'better' corporate social responsibility: a case for a proposed model in practice. *J. Bus. Ethics* 144, 85–101. <https://doi.org/10.1007/s10551-015-2805-z>.
- Environmental Protection Agency, 2017. TRI chemical list for RY2017. from. <https://www.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals>. (Accessed 20 December 2023).
- Egorova, A.A., Grishunin, S.V., Karminsky, A.M., 2022. The impact of ESG factors on the performance of information technology companies. *Procedia Comput. Sci.* 199, 339–345. <https://doi.org/10.1016/j.procs.2022.01.041>.
- Freeman, E.E., 1984. *Stakeholder management: framework and philosophy in: EE freeman strategic management. A Stakeholder Approach*. Pisman.
- Frost, K., Hua, L., 2017. A spatially explicit assessment of water use by the global semiconductor industry. In: 2017 IEEE Conference on Technologies for Sustainability. SusTech), November, pp. 1–5. <https://doi.org/10.1109/SusTech.2017.8333525>.
- Giachetti, C., Torrisi, S., 2018. Following or running away from the market leader? The influences of environmental uncertainty and market leadership. *Eur. Manag. Rev.* 15 (3), 445–463. <https://doi.org/10.1111/emre.12130>.
- Gong, M., Gao, Y., Koh, L., Sutcliffe, C., Cullen, J., 2019. The role of customer awareness in promoting firm sustainability and sustainable supply chain management. *Int. J. Prod. Econ.* 217, 88–96. <https://doi.org/10.1016/j.ijpe.2019.01.033>.
- Gualandris, J., Klassen, R.D., Vachon, S., Kalchschmidt, M., 2015. Sustainable evaluation and verification in supply chains: aligning and leveraging accountability to stakeholders. *J. Oper. Manag.* 38, 1–13. <https://doi.org/10.1016/j.jom.2015.06.002>.
- Gualandris, J., Longoni, A., Luzzini, D., Pagell, M., 2021. The association between supply chain structure and transparency: a large-scale empirical study. *J. Oper. Manag.* 67 (7), 803–827. <https://doi.org/10.1002/joom.1150>.
- Gu, J., Shi, X., Wang, J., Xu, X., 2024. Examining the impact of market power discrepancy between supply chain partners on firm financial performance. *Int. J. Prod. Econ.* 268, 109100. <https://doi.org/10.1016/j.ijpe.2023.109100>.
- Hahn, R., Reimsbach, D., Schiemann, F., 2015. Organizations, climate change, and transparency: reviewing the literature on carbon disclosure. *Organ. Environ.* 28 (1), 80–102. <https://doi.org/10.1177/1086026615575542>.
- Haramboure, A., Lalanne, G., Schwellnus, C., Guilhoto, J., 2023. Vulnerabilities in the semiconductor supply chain. <https://doi.org/10.1787/18151965>.
- He, F., Du, H., Yu, B., 2022. Corporate ESG performance and manager misconduct: evidence from China. *Int. Rev. Financ. Anal.* 82, 102201. <https://doi.org/10.1016/j.irfa.2022.102201>.
- Heinkel, R., Kraus, A., Zechner, J., 2001. The effect of green investment on corporate behavior. *J. Financ. Quant. Anal.* 36 (4), 431–449. <https://doi.org/10.2307/2676219>.
- Husted, B.W., de Sousa-Filho, J.M., 2017. The impact of sustainability governance, country stakeholder orientation, and country risk on environmental, social, and governance performance. *J. Clean. Prod.* 155, 93–102. <https://doi.org/10.1016/j.jclepro.2016.10.025>.
- Jiang, S., Yeung, A.C.L., Han, Z., Huo, B., 2023. The effect of customer and supplier concentrations on firm resilience during the COVID-19 pandemic: resource dependence and power balancing. *J. Oper. Manag.* 69 (3), 497–518. <https://doi.org/10.1002/joom.1236>.
- Khosroshahi, H., Azad, N., Jabbarzadeh, A., Verma, M., 2021. Investigating the level and quality of the information in the environmental disclosure report of a corporation considering government intervention. *Int. J. Prod. Econ.* 235, 108071. <https://doi.org/10.1016/j.ijpe.2021.108071>.
- Khurram, S., Pestre, F., 2015. Taking stock of the stakeholder salience tradition: renewing the research agenda. In: *Academy of Management Proceedings* (Vol. 2015,

- No. 1, P. 15028). Briarcliff Manor, NY 10510: Academy of Management. <https://doi.org/10.3917/mana.222.0141>.
- Klusewitz, G., Viegh, M.C., 2002. Water usage reduction in a semiconductor fabricator. In: 13th Annual IEEE/SEMI Advanced Semiconductor Manufacturing Conference. Advancing the Science and Technology of Semiconductor Manufacturing. ASMC 2002 (Cat. No. 02CH37259), pp. 340–346. <https://doi.org/10.1109/ASMC.2002.1001630>.
- Kraude, R., Narasimhan, R., 2024. How does the stakeholder exposure of vertical integration influence environmental performance? *Int. J. Prod. Econ.* 267, 109066. <https://doi.org/10.1016/j.ijpe.2023.109066>.
- Lawal, E., May, G., Stahl, B., 2017. The significance of corporate social disclosure for high-tech manufacturing companies: focus on employee and community aspects of sustainable development. *Corp. Soc. Responsib. Environ. Manag.* 24 (4), 295–311. <https://doi.org/10.1002/csr.1397>.
- Lee, K.H., Kim, J.W., 2011. Integrating suppliers into green product innovation development: an empirical case study in the semiconductor industry. *Bus. Strat. Environ.* 20 (8), 527–538. <https://doi.org/10.1002/bse.714>.
- Liu, Y., Luo, Y., Liu, T., 2009. Governing buyer–supplier relationships through transactional and relational mechanisms: evidence from China. *J. Oper. Manag.* 27 (4), 294–309. <https://doi.org/10.1002/csr.1397>.
- Liu, Z., 2020. Unraveling the complex relationship between environmental and financial performance—A multilevel longitudinal analysis. *Int. J. Prod. Econ.* 219, 328–340. <https://doi.org/10.1016/j.ijpe.2019.07.005>.
- Lin, Y.S., Chien, C.F., Chou, D., 2022. UNISON decision framework for hybrid optimization of wastewater treatment and recycle for Industry 3.5 and cleaner semiconductor manufacturing. *Resour. Conserv. Recycl.* 182, 106282. <https://doi.org/10.1016/j.resconrec.2022.106282>.
- Lu, W.M., Lo, S.F., Hung, S.W., Yo, J., 2023. Semiconductor industry supply chain productivity changes: incorporating corporate green performances. *Manag. Decis. Econ.* 44 (8), 4232–4247. <https://doi.org/10.1002/mde.3945>.
- Mahoney, L.S., Thorne, L., Cecil, L., LaGore, W., 2013. A research note on standalone corporate social responsibility reports: signaling or greenwashing? *Crit. Perspect. Account.* 24 (4–5), 350–359. <https://doi.org/10.1016/j.cpa.2012.09.008>.
- Marttinen, K., Kähkönen, A.K., 2022. Fostering firms' ability to cascade sustainability through multi-tier supply chains: an investigation of power sources. *Int. J. Oper. Prod. Manag.* 42 (8), 1146–1172. <https://doi.org/10.1108/IJOPM-11-2021-0739>.
- Mena, C., Schoenherr, T., 2023. The green contagion effect: an investigation into the propagation of environmental practices across multiple supply chains tiers. *Int. J. Prod. Res.* 61 (14), 4808–4825. <https://doi.org/10.1080/00207543.2020.1834160>.
- Meng, M., Fan, S., Li, X., Lei, J., 2024. Digital transformation and strategic risk taking dataset for China's public-listed companies. *Data Brief* 54, 110511.
- Meqdadi, O.A., Johnsen, T.E., Johnsen, R.E., 2019. Power and diffusion of sustainability in supply networks: findings from four in-depth case studies. *J. Bus. Ethics* 159, 1089–1110. <https://doi.org/10.1007/s10551-018-3835-0>.
- Mi, Z., Meng, J., Guan, D., Shan, Y., Song, M., Wei, Y.M., Liu, Z., Hubacek, K., 2017. Chinese CO₂ emission flows have reversed since the global financial crisis. *Nat. Commun.* 8 (1), 1–10. <https://doi.org/10.1038/s41467-017-01820-w>.
- Mitchell, R.K., Agle, B.R., Wood, D.J., 1997. Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Acad. Manag. Rev.* 22 (4), 853–886. <https://doi.org/10.5465/amr.1997.9711022105>.
- Mitchell, R.K., Agle, B.R., Chrisman, J.J., Spence, L.J., 2011. Toward a theory of stakeholder salience in family Firms. *Bus. Ethics Q.* 21 (2), 235–255. <https://doi.org/10.5840/beq201121215>.
- Mol, A.P., 2015. Transparency and value chain sustainability. *J. Clean. Prod.* 107, 154–161. <https://doi.org/10.1016/j.jclepro.2013.11.012>.
- Molling, G., Hidalgo, G., Santini, M., Monticelli, J.M., de Matos, C.A., 2023. Coopetition and innovation in high-tech firms: what we can learn from analysis of the semiconductor industry's patents. *World Patent Inf.* 72, 102157. <https://doi.org/10.1016/j.wpi.2022.102157>.
- Montabon, F., Sroufe, R., Narasimhan, R., 2007. An examination of corporate reporting, environmental management practices and firm performance. *J. Oper. Manag.* 25 (5), 998–1014. <https://doi.org/10.1016/j.jom.2006.10.003>.
- Moore, G.E., 1998. Cramming more components onto integrated circuits. *Proc. IEEE* 86 (1), 82–85.
- Mooi, E.A., Frambach, R.T., 2009. A stakeholder perspective on buyer–supplier conflict. *J. Market. Channel* 16 (4), 291–307. <https://doi.org/10.1080/10466690903187932>.
- Munga, J.N., Dauzère-Pérés, S., Yugma, C., Vialletelle, P., 2015. A mathematical programming approach for optimizing control plans in semiconductor manufacturing. *Int. J. Prod. Econ.* 160, 213–219. <https://doi.org/10.1016/j.ijpe.2014.11.004>.
- Neville, B.A., Bell, S.J., Whitwell, G.J., 2011. Stakeholder salience revisited: refining, redefining, and refueling an underdeveloped conceptual tool. *J. Bus. Ethics* 102, 357–378. <https://doi.org/10.1007/s10551-011-0818-9>.
- Ochogor, K.N., Osho, G.S., Anoka, C.O., Ojumu, O., 2023. The COVID-19 pandemic and supply chain disruption: an analysis of the semiconductor industry's resilience. *International Journal of Technical & Scientific Research Engineering* 6 (1), 7–18.
- OECD, 2001. *Sustainable Development: Critical Issues*. Organisation for Economic Cooperation and Development, Paris.
- Ortas, E., Álvarez, I., Jaussaud, J., Garayar, A., 2015. The impact of institutional and social context on corporate environmental, social and governance performance of companies committed to voluntary corporate social responsibility initiatives. *J. Clean. Prod.* 108, 673–684. <https://doi.org/10.1016/j.jclepro.2015.06.089>.
- Pimenta, H.C.D., Ball, P., Salonitis, K., 2021. Supply chain environmental and social sustainability practice diffusion: bibliometrics, content analysis and conceptual framework. *Corp. Soc. Responsib. Environ. Manag.* 28 (6), 1870–1890. <https://doi.org/10.1002/csr.2165>.
- Pulles, N.J., Veldman, J., Schiele, H., Sierksma, H., 2014. Pressure or pamper? The effects of power and trust dimensions on supplier resource allocation. *J. Supply Chain Manag.* 50 (3), 16–36. <https://doi.org/10.1111/jscm.12049>.
- Pullman, M.E., Maloni, M.J., Carter, C.R., 2009. Food for thought: social versus environmental sustainability practices and performance outcomes. *J. Supply Chain Manag.* 45 (4), 38–54. <https://doi.org/10.1111/j.1745-493X.2009.03175.x>.
- Rastogi, A.P., Fowler, J.W., Carlyle, W.M., Araz, O.M., Maltz, A., Büke, B., 2011. Supply network capacity planning for semiconductor manufacturing with uncertain demand and correlation in demand considerations. *Int. J. Prod. Econ.* 134 (2), 322–332. <https://doi.org/10.1016/j.ijpe.2009.11.006>.
- Raha, A., Hajdini, I., Windsperger, J., 2021. A multilateral stakeholder salience approach: an extension of the stakeholder identification and salience framework. *Ind. Market. Manag.* 97, 1–9. <https://doi.org/10.1016/j.indmarman.2021.06.008>.
- Reid, E.M., Toffel, M.W., 2009. Responding to public and private politics: corporate disclosure of climate change strategies. *Strat. Manag. J.* 30 (11), 1157–1178. <https://doi.org/10.1002/smj.796>.
- Richey Jr, R.G., Musgrove, C.F., Gillison, S.T., Gabler, C.B., 2014. The effects of environmental focus and program timing on green marketing performance and the moderating role of resource commitment. *Ind. Market. Manag.* 43 (7), 1246–1257. <https://doi.org/10.1016/j.indmarman.2014.06.014>.
- Sancha, C., Gutierrez-Gutierrez, L., Tamayo-Torres, I., Gimenez Thomsen, C., 2023. From corporate governance to sustainability outcomes: the key role of operations management. *Int. J. Oper. Prod. Manag.* 43 (13), 27–49. <https://doi.org/10.1108/IJOPM-01-2022-0043>.
- Semiconductor Industry Association, 2016. *SIA Factbook*, vol. 2016. Retrieved December 20, 2023, from <http://go.semiconductors.org/2016-sia-factbook-0-0>.
- Sharma, A., Pathak, S., Borah, S.B., Adhikary, A., 2022. Collaboration strategies in buyer-supplier relational (BSR) networks and sustainable firm performance: a trade-off story. *Int. J. Prod. Econ.* 253, 108558. <https://doi.org/10.1016/j.ijpe.2022.108558>.
- Song, S., Lian, J., Skowronski, K., Yan, T., 2023. Customer base environmental disclosure and supplier greenhouse gas emissions: a signaling theory perspective. *J. Oper. Manag.* <https://doi.org/10.1002/joom.1272>. ahead-of-print.
- Suchman, M.C., 1995. Managing legitimacy: strategic and institutional approaches. *Acad. Manag. Rev.* 20 (3), 571–610. <https://doi.org/10.5465/amr.1995.9508080331>.
- Tashman, P., Raelin, J., 2013. Who and what really matters to the firm: moving stakeholder salience beyond managerial perceptions. *Bus. Ethics Q.* 23 (4), 591–616. <https://doi.org/10.5840/beq201323441>.
- Tang, Z., Tang, J., 2012. Stakeholder–firm power difference, stakeholders' CSR orientation, and SMEs' environmental performance in China. *J. Bus. Ventur.* 27 (4), 436–455. <https://doi.org/10.1016/j.jbusvent.2011.11.007>.
- Thijssens, T., Bollen, L., Hassink, H., 2015. Secondary stakeholder influence on CSR disclosure: an application of stakeholder salience theory. *J. Bus. Ethics* 132, 873–891. <https://doi.org/10.1007/s10551-015-2623-3>.
- Tong, X., Linderman, K., Zhu, Q., 2023. Managing a portfolio of environmental projects: focus, balance, and environmental management capabilities. *J. Oper. Manag.* 69 (1), 127–158. <https://doi.org/10.1002/joom.1201>.
- Trapp, A.C., Sarkis, J., 2016. Identifying robust portfolios of suppliers: a sustainability selection and development perspective. *J. Clean. Prod.* 112, 2088–2100. <https://doi.org/10.1016/j.jclepro.2014.09.062>.
- TSMC (Taiwan Semiconductor Manufacturing Co., Ltd.), 2016. Corporate social responsibility policy report. from https://www.tsmc.com/download/csr/2016_tsmc_csr/english/pdf/e_ch5.pdf. (Accessed 20 December 2023).
- Villard, A., Lelah, A., Brissaud, D., 2015. Drawing a chip environmental profile: environmental indicators for the semiconductor industry. *J. Clean. Prod.* 86, 98–109. <https://doi.org/10.1016/j.jclepro.2014.08.061>.
- Villena, V.H., Dhanorkar, S., 2020. How institutional pressures and managerial incentives elicit carbon transparency in global supply chains. *J. Oper. Manag.* 66 (6), 697–734. <https://doi.org/10.1002/joom.1088>.
- Villena, V.H., Gioia, D.A., 2020. A more sustainable supply chain. *Harv. Bus. Rev.* 98 (2), 84–93.
- Wang, Q., Huang, N., Chen, Z., Chen, X., Cai, H., Wu, Y., 2023. Environmental data and facts in the semiconductor manufacturing industry: an unexpected high water and energy consumption situation. *Water Cycle* 4, 47–54. <https://doi.org/10.1016/j.watcyc.2023.01.004>.
- Wang, H., Qian, C., 2011. Corporate philanthropy and corporate financial performance: the roles of stakeholder response and political access. *Acad. Manag. J.* 54 (6), 1159–1181. <https://doi.org/10.5465/amj.2009.0548>.
- Wasserman, S., 1994. *Advances in social network analysis: research in the social and behavioral sciences*. Sage.
- Weed, W.S., 1987. World commission on environment and development. Our common future 17 (1), 1–91. [https://doi.org/10.1016/S0378-777X\(85\)80040-8](https://doi.org/10.1016/S0378-777X(85)80040-8).
- Wilhelm, M., Villena, V.H., 2021. Cascading sustainability in multi-tier supply chains: when do Chinese suppliers adopt sustainable procurement? *Prod. Oper. Manag.* 30 (11), 4198–4218. <https://doi.org/10.1111/poms.13516>.

- Wilhelm, M., Blome, C., Wieck, E., Xiao, C.Y., 2016. Implementing sustainability in multi-tier supply chains: strategies and contingencies in managing sub-suppliers. *Int. J. Prod. Econ.* 182, 196–212. <https://doi.org/10.1016/j.ijpe.2016.08.006>.
- Wood, D.J., Mitchell, R.K., Agle, B.R., Bryan, L.M., 2021. Stakeholder identification and salience after 20 years: progress, problems, and prospects. *Bus. Soc.* 60 (1), 196–245. <https://doi.org/10.1177/0007650318816>.
- Wu, Y., Zhang, K., Xie, J., 2020. Bad greenwashing, good greenwashing: corporate social responsibility and information transparency. *Manag. Sci.* 66 (7), 3095–3112. <https://doi.org/10.1287/mnsc.2019.3340>.
- Xu, G., 2018. The costs of patronage: evidence from the British empire. *Am. Econ. Rev.* 108 (11), 3170–3198. <https://www.jstor.org/stable/26528325>.
- Yang, Y., Orzes, G., Jia, F., Chen, L., 2021. Does GRI sustainability reporting pay off? An empirical investigation of publicly listed firms in China. *Bus. Soc.* 60 (7), 1738–1772.
- Ye, Y., Yeung, A.C., Huo, B., 2020. Maintaining stability while boosting growth? The long-term impact of environmental accreditations on firms' financial risk and sales growth. *Int. J. Oper. Prod. Manag.* 40 (12), 1829–1856. <https://doi.org/10.1108/IJOPM-05-2019-0407>.
- Zhang, D., Kong, Q., 2022. Do energy policies bring about corporate overinvestment? Empirical evidence from Chinese listed companies. *Energy Econ.* 105, 105718.