# Gaining customer satisfaction through sustainable supplier development: The role of firm reputation and marketing communication

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ABSTRACT

Recent cases demonstrate that negative effects of sustainability-related scandals experienced by upstream suppliers can spill over to downstream firms. Thus, initiatives to help suppliers improve their sustainability performance are becoming increasingly essential for firms' risk management in relation to supply chains. Thus far, the literature has yet to provide significant evidence on how firms can generate value from sustainable supplier development initiatives. In this study, we conduct dynamic panel data analysis of a dataset of 768 firm–year observations collected from four secondary sources, and find that sustainable supplier development initiatives can contribute to firms' customer satisfaction, which further contributes to improved sales performance. Moreover, the relationship between sustainable supplier development initiatives and customer satisfaction is negatively moderated by firm reputation, yet positively moderated by the firm's advertising intensity. These results provide robust evidence that customer satisfaction is a valid mechanism that links sustainable supplier development initiatives with improved sales performance.

## 1. Introduction

Supplier development is widely applied to improve supplier capabilities, including cost, quality, delivery, flexibility, and service (Hu et al., 2018; Jin et al., 2019; Kannan and Tan, 2002; Li et al., 2018). Prior studies have provided ample evidence of positive relationships between supplier development practices and firm performance (e.g., Kotabe et al., 2003; Krause et al., 1998; Krause et al., 2007; Modi and Mabert, 2007; Wagner and Krause, 2009). The main argument used in these studies is that supplier development can contribute to firm performance through improved supplier performance.

As sustainability issues have gained salience in supply chain management, it has become clear that firms need to expand the scope of supplier development to include suppliers' social and environmental aspects (Wang et al., 2020). For example, in 2013, the Rana Plaza building collapse killed over 1,000 staff members from suppliers of JC Penney, Benneton, and Carrefour (O'Connor, 2014). In 2018, several fast fashion brands, including H&M, Next, and Tesco, were reported to have sourced viscose from a supplier that leaked

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toxic chemicals into rivers and the air in India and Indonesia, causing illness and even premature deaths in local communities (Poulter, 2018). These scandals, despite not occurring within the firms' premises, seriously damaged the firms' reputations and consumers' buying intentions. Empirical evidence shows serious spillover effects of such scandals, affecting suppliers' and retailers' stock prices (Lo et al., 2018).

To mitigate potential risks and scandals in supply chains, firms are increasingly implementing sustainable supplier development (SSD), which aims to develop suppliers' social and environmental management capabilities (Sancha et al., 2015). For example, Cisco (2019) requires its suppliers to complete the Cisco Contractor Safety Training program prior to commencing any activities on behalf of the company. Intel (2019) has also developed safety training for its contractors and suppliers to protect workers along the supply chain. Moreover, firms tend to publicize these efforts on their websites and in sustainability reports to demonstrate to stakeholders their commitments to developing sustainable supply chains. Instrumental stakeholder theory (Barnett, 2007; Jones, 1995) suggests that such investments in developing supplier sustainability can trigger positive responses from multiple groups of stakeholders, which can further improve firm performance. In particular, it is widely argued that firms can generate significant values from SSD initiatives, as one type of corporate social responsibility (CSR), via improved firm reputation and customer satisfaction (Luo and Bhattacharya, 2006). Thus far, these arguments have not undergone systematic and rigorous empirical testing. In other words, despite firms' increasing investments in SSD, existing literature has provided little evidence on whether, and to what extent, these efforts are appreciated by customers. This study aims to fill this gap by addressing the question: what is the influence of SSD initiatives on a firm's customer satisfaction?

The value-creation potential of SSD initiatives lies partly in eliciting positive responses from customers; hence, we argue that it is necessary to consider several factors that can influence how customers assess and respond to firms' behaviors. Toward this end, we draw upon the expectation confirmation theory, which seeks to explain customer satisfaction as a function of expectations, perceived performance, and confirmation/disconfirmation of beliefs (Oliver, 1980). First, customers tend to assess firms' actions and initiatives in regard to their extant image (reputation) via assessment of confirmation, disconfirmation, or surprises (Fornell, 1992). For firms that already enjoy a positive reputation among customers, it may be difficult to trigger positive responses from customers, who likely take the firms' SSD initiatives for granted. By contrast, firms that lack a high reputation may find it easier to positively surprise their customers through publicizing their investments in SSD. Second, firms' SSD initiatives may not be timely or adequately publicized to customers because firms vary significantly in signaling investments and initiatives to internal and external stakeholders (Schuler and Cording, 2006). As such, we argue that firms may be better able to generate value from SSD initiatives when they proactively publicize such initiatives to a wider range of stakeholders, including customers. Therefore, we explore two additional interrelated questions in this study: to what extent can the firm reputation and marketing communication efforts influence the relationship between SSD initiatives and customer satisfaction?

Through sampling 104 firms, we conduct a panel data analysis of 849 firm–year observations from four secondary data sources, including the American Customer Satisfaction Index (ACSI), Fortune World's Most Admired Company (MAC) index, Thomson Reuters ESG, and Compustat. The results indicate that SSD is positively associated with customer satisfaction, and this positive relationship is more salient for firms with poor reputation or high advertising intensity.

This study makes three major contributions to the literature on supplier development. First, the literature on SSD has thus far focused on exploring questions such as, "Does it pay to be green?" (Ambec and Lanoie, 2008) and "When does it pay to be green?" (Dixon-Fowler et al., 2013). This study uses instrumental stakeholder theory (Barnett, 2007; Jones, 1995), expectation confirmation theory (Oliver, 1980), and four data sources to explore the question of "how does it pay to be green?". In other words, our study advances this literature by empirically testing one mechanism that has been widely used to justify the positive link between SSD initiatives and firm sales performance. Second, the literature on supplier development has focused primarily on the immediate effects of various forms of supplier development initiatives on supplier performance and/or buyer performance (e.g., Modi and Mabert, 2007). Our study contributes to a more comprehensive understanding of the value-creation processes of supplier development initiatives by exploring customer satisfaction as an intermediate outcome of such initiatives. Third, our study has identified two contingencies that can influence the effects of SSD initiatives on customer satisfaction, which can guide firms to coordinate supply chain and marketing communication efforts to achieve multiple outcomes, including supply chain sustainability and sales performance, more efficiently and effectively. Finally, this study contributes to the literature on CSR by expanding its scope to include supply chain–related initiatives and empirically show that SSD initiatives can also trigger positive responses from customers. Our results thus suggest expanding the scope of CSR research to include upstream and downstream supply chain–oriented initiatives.

## 2. Theoretical background and hypotheses development

This section is organized as follows. The first subsection provides a succinct introduction to SSD, with a focus on its main antecedents, major practices, and performance implications. The second subsection uses the instrumental stakeholder theory as the main lens to discuss the effect of SSD initiatives on customer satisfaction and sales performance. The third and final subsection draws upon the expectation confirmation theory to discuss the contingency effect of firm reputation and marketing communication efforts on the relationship between SSD initiatives and customer satisfaction.

### 2.1. Sustainable supplier development

Firms are expected to create value for shareholders and simultaneously protect the natural environment and tackle complex social/ labor issues. Pressures exerted by multiple groups of stakeholders drive firms to integrate sustainability into their daily operations

(Kleindorfer et al., 2005). There is growing evidence that integrating sustainability into operations management can be beneficial for firm performance. For example, Jacobs et al. (2010) reported that adopting an environmental management system (e.g., ISO 14001) has positive effects on firms' operations and financial performance. Likewise, Lo et al. (2014) found that adopting an occupational health and safety management system (e.g., OHSAS 18001) can benefit firm performance. In contrast, breaching environmental or safety regulations can harm market value and operations performance (e.g., Lo et al., 2018; Pagell et al., 2019). Recently, the scope of sustainable operations management has been expanded to sustainable supply chain management (Giménez and Tachizawa, 2012; Seuring and Müller, 2008), including environmental (Lo et al., 2018) and social issues in supply chains (Soundararajan and Brammer, 2018; Tang, 2018).

There are at least two main forces driving the expanding scope of sustainable operations management to include supply chain partners. First, improving sustainability performance entails product, process, and value chain innovations (Mishra, 2017), the success of which relies upon supply networks (Kim and Zhu, 2018; Wuttke et al., 2018) and supplier involvement (Xiao et al., 2019). For example, involvement of suppliers in the research and development (R&D) stage can improve product design to reduce products' ecological footprints (Lee and Kim, 2011). Moreover, suppliers' capability to provide safe materials, machinery, and equipment can enhance firms' capability to provide a safer production process (Shikdar and Sawaqed, 2003).

Second, sustainability incidents related to suppliers can have spillover effects on firms, which drives firms to continually improve supply chain sustainability (Foerstl et al., 2010; Seuring and Müller, 2008). For example, Lo et al. (2018) found that firms' market value deteriorates when suppliers are involved in environmental incidents. Thus, supply chain researchers have long highlighted the need to consider sustainability issues in supplier selection and development (Seuring and Müller, 2008), and to monitor suppliers' sustainability performance to minimize the risk of negative effects caused by supplier sustainability incidents (Lo et al., 2014).

Increasingly, some firms (e.g., Cisco and Intel) are providing training programs to suppliers to improve sustainability performance along the supply chain. These supplier development initiatives aim to improve suppliers' capabilities and performance (Krause et al., 2000) in sustainability (Liu et al., 2018). These initiatives are implemented to increase suppliers' environmental and social responsibility and economic sustainability (Sancha et al., 2015). SSD requires that firms commit financial, managerial, and technological resources (Dai et al., 2014; Handfield et al., 2000). Firms must also overcome barriers of socioeconomic differences, geographical and linguistic distances, and cultural differences between buyers and suppliers (Busse et al., 2016; Luo et al., 2015a).

The current literature provides some evidence on the effects of such initiatives on firms. For example, Yawar and Seuring's (2018) case study showed that socially oriented supplier development can enhance suppliers' capabilities to address social sustainability issues. Blome et al. (2014) identified a positive effect of SSD programs on supplier performance. Ağan et al. (2016) found a positive relationship between environmental supplier development and firms' financial performance. Although the extant studies suggest that SSD initiatives can be a source of competitive advantage (Chiou et al., 2011), the mechanisms that link SSD initiatives to firm performance are yet to be disentangled. This study aims to take an incremental step to fill this gap by exploring customer satisfaction as a mechanism that can link SSD initiatives to improved firm performance.

## 2.2. Sustainable supplier development and customer satisfaction

Customer satisfaction is the customer's overall evaluation of product or service quality based on the purchase and consumption experience (Fornell, 1992). Rising customer satisfaction can shift the demand curve upward and increase consumer spending (Fornell et al., 2010), bringing revenue growth to the firm and value for its shareholders (Fornell et al., 2016). Traditionally, product quality (e. g., Anderson and Sullivan, 1993; Forza and Filippini, 1998; Izogo and Ogba, 2015), supplier involvement (Tracey and Tan, 2001), and supply chain integration (Yu et al., 2013) are considered as essential factors of customer satisfaction. Given that firms generally have become more active in publicizing their CSR activities through CSR reports, corporate websites, advertising, and other channels (Du et al., 2010), the literature has started to explore the relationship between CSR initiatives and customer satisfaction in the contexts of large companies (Luo and Bhattacharya, 2006), banks (McDonald and Rundle-Thiele, 2008), hotels and restaurants (Lee and Heo, 2009), and industrial manufacturers (Saeidi et al., 2015). Instrumental stakeholder theory has been widely applied in these studies, and argues that developing stakeholder relationships governed by the norms of fairness, trustworthiness, loyalty, care, and respect will lead to improved financial performance (Jones et al., 2018). Given that SSD initiatives can be a manifestation of firms taking CSR, we draw upon this theory and related studies to extract arguments that explain why a firm's SSD initiatives may improve customer satisfaction.

There are growing expectations that firms—particularly multinational companies—should be responsible for the sustainability performance of their suppliers located in emerging and developing countries. As a response, SSD initiatives represent firms' efforts to take, at least partial, responsibility for the sustainability issues embedded in their supply chains (Giménez and Tachizawa, 2012). Although sustainable supply chain management is emerging as a norm in industries such as electronics and textiles (Lund-Thomsen and Lindgreen, 2014), firms committing substantial resources and efforts in extending sustainability along global supply chains are generally regarded as exemplars that are trustworthy, responsible, and respectable (Hartmann and Moeller, 2014). Such favorable responses from various groups of stakeholders with further strengthen the relational bonds, such as trust, respect, and cooperation, between the firm and its stakeholders. According to the instrumental stakeholder theory (Jones, 1995), such relational bonds can be a substantial source of competitive advantage, as they can reduce internal and external transaction costs and further create new market opportunities for the firms that have received wide recognition from the main groups of stakeholders (ibid).

Particularly when firms' SSD practices, as an extension of CSR, are known to customers, the customer trust gained from these initiatives will further increase customer satisfaction (Schuler and Cording, 2006). As sustainable development has become a consensus of humanity, the firm's CSR record can positively influence customer evaluation of and attitude toward the firm (Brown and

Dacin, 1997; Sen and Bhattacharya, 2001). In other words, when the firm has made efforts to contribute to social and/or environmental wellbeing, customers will tend to trust that the firm has taken due measures to assure the quality of its products, services, and processes (Sen and Bhattacharya, 2001). Such a positive attitude helps the customer identify with the firm's corporate identity (Bhattacharya and Sen, 2003) and enhances customer trust (Pivato et al., 2008), which occurs through a cognitive categorization process through which a customer positions him/herself as a member of an organization by enhancing similarities with members and differences with non-members (Martínez and del Bosque, 2013). This identification and trust can positively influence the quality of experience through satisfaction judgment (ibid). For example, Brammer and Millington (2005) reported that customers tend to assume that products from firms they trust are of high quality.

In addition, SSD initiatives can improve customer satisfaction by increasing the CSR feature of firms' products. McWilliams and Siegel (2000) argued that, for two identical products, an additional CSR attribute in one product can result in competitive advantage because of the extra value to customers. In other words, SSD initiatives, as a specific type of CSR, can be viewed as a product feature that adds value to customers (Peloza and Shang, 2011). For example, initiatives such as Fairtrade and UTZ are increasingly becoming part of customers' brand recognition. Empirical evidence also supports the proposition that customers derive greater perceived value and consequently higher satisfaction from a product offered by socially responsible firms (Luo and Bhattacharya, 2006). Based on this reasoning, we postulate that:

**H1a:** SSD initiatives are positively associated with firms' customer satisfaction.

The literature has construed customer satisfaction as a market-based asset that can create value and gain market performance for firms (Rubera and Kirca, 2017). Customer satisfaction can have positive effects on the factors that can increase customers' repurchase intension, word-of-mouth and loyalty (Fornell et al., 2016). Thus, in line with the proposition that an increased level of customer satisfaction can manifest in more sales gained, we extend H1a and hypothesize:

**H1b:** Customer satisfaction is positively associated with firms' sales performance.

### 2.3. Moderating effect of firm reputation and advertising intensity

As argued previously, our baseline hypothesis postulates a positive relationship between SSD initiatives and customer satisfaction. This aligns with instrumental stakeholder theory (Barnett, 2007; Jones, 1995), which proposes that CSR initiatives can contribute to improved firm–stakeholder relationships, as stakeholders tend to regard socially responsible firms as fair, trustworthy, and respectable (Jones et al., 2018). Further, in line with the CSR literature on the contingency effects of various factors (Du et al., 2010), we do not predict a simple, unconditional relationship between SSD initiatives and customer satisfaction. Instead, we submit to the view that the effect of such supply chain initiatives on market-end performance may be contingent on marketing communication factors that can influence how customers evaluate and respond to firms' actions (Kumar and Christodoulopoulou, 2014). Specifically, we apply the expectation confirmation theory (Oliver, 1980) to explore the extent to which firm reputation and advertising intensity can affect the relationship between SSD initiatives and customer satisfaction.

First, expectation confirmation theory posits that customer satisfaction is a result of the customer expectation (dis)confirmation process (Oliver, 1980). Customers tend to assess firms' actions and initiatives in light of their extant image (reputation) and seek confirmation or disconfirmation (Fornell, 1992). Customers have high expectations for firms with high reputation. Thus, the SSD initiatives of such firms mostly fails to exceed customers' expectations. As a result, firms that already have a high reputation may find it difficult to trigger positive responses from customers, who will very likely to take such firms' SSD initiatives for granted. In contrast, customers may not have the same high expectations for firms with low reputation, and such firms may generally find it easier to positively surprise customers by publicizing their investments in SSD. For example, Tony's Chocoloney, a small Dutch chocolate producer, earned wide recognition among customers and other stakeholders, when it is known to have committed substantial resources and efforts to its Open Supply Chain Initiative, aiming to eliminate modern slavery and child labor in its supply chains[1]. In other words, SSD initiatives by these firms may improve customers' evaluation of and attitude toward these firms because these initiatives will likely exceed customer expectations. From the perspective of instrumental stakeholder theory, SSD initiatives of firms with high reputations will have limited potential to trigger positive responses from stakeholders, including customers. Thus, we postulate that:

**H2:** Firm reputation negatively moderates the relationship between SSD initiatives and customer satisfaction.

Second, our baseline hypothesis has one important assumption: firms' SSD initiatives are known to their customers. This assumption is widely made in studies that propose a positive relationship between CSR and firm performance (Schuler and Cording, 2006). It is thus widely acknowledged that marketing communication plays an important role in materializing the business returns to CSR investments (Du et al., 2010). Firms tend to publicize SSD initiatives on their websites and in sustainability reports to signal their commitment to sustainable development, yet this may not always be the case. Customers may be unaware that a firm's supply chain is green and socially responsible if the firm has made no attempt to publicize this information to its main stakeholders (Pomering and

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[1] https://www.confectionerynews.com/Article/2021/01/11/Tony-s-Chocolonely-opens-its-supply-chain-platform-to-other-chocolate-makers.

Dolnicar, 2009). Considering that firms vary significantly in publicize their investments and initiatives to internal and external stakeholders, we argue that advertising can be used as a proxy for measuring the proactivity of firms in reaching out to stakeholders—particularly customers. For example, Heineken tends to include some of its main sustainability-related initiatives and achievements in its commercial advertisements.[2]

As an essential tool of marketing communication, advertising is a cost-effective means for firms to promote an organization, product or service to customers; it aims to differentiate a firm's products or services from those of competitors (Nelson, 1974). Advertising intensity is a proxy of a firm's tendency to invest for differentiation. Previous studies have highlighted the role of advertising in promoting firms' CSR practices. For example, McWilliams and Siegel (2000) showed that advertising helps convey information about firms' CSR, which increases consumers' awareness of products' additional CSR attributes. In line with the literature on the use of advertising to boost the effect of CSR initiatives on market performance (e.g., Pomering and Dolnicar, 2009; Rahman et al., 2017; Rhou et al., 2016), we argue that advertising can increase customer awareness of firms' SSD initiatives. As a result, the positive effect of SSD initiatives on customer satisfaction can be strengthened by intensive advertising. Thus, we postulate that:

**H3**: Firm advertising intensity positively moderates the relationship between SSD initiatives and customer satisfaction.

## 3. Methods

### 3.1. Sample

This study sampled United States (US) listed firms and tested hypotheses via secondary data from four databases. Customer satisfaction (as the dependent variable) data were collected from the ACSI, which covers more than 300 companies in 43 industries in 10 economic sectors at the time we collected the data (http://www.theacsi.org/about-acsi). The data collection process began with the list of companies in the ACSI database. The ACSI dates back to 1994 (Fornell et al., 1996); however, firms may be delisted for reasons such as mergers and acquisitions, company defunction, and industry aggregation. To maintain practicality and usability of the data for panel data analysis and mitigate against survival bias, only companies with consecutive ACSI records from 2008 to 2016 were selected as sample firms, reducing the potential sample size from 350 to 195 companies. In addition, we included only industries with a two-digit SIC code smaller than 60 because the industries of finance (SIC 60), service (SIC 70), and public administration (SIC 90) are of a special nature. This reduced the sample firm number to 123.

We then searched for the names of these firms in the MAC list to collect firms' reputation data. The use of MAC data has several advantages. MAC data are obtained via a longitudinal survey that provides comparable historical data, the results are reliable in terms of quality and number of respondents (McGuire et al., 1988), and it is a well-established and widely used measurement of reputation. This facilitates comparison with prior studies (e.g., Chun, 2005; Fan et al., 2018). We also collected sustainable supply chain management and marketing policy data from the Thomson Reuters ESG database. ESG records the CSR policy data of listed firms. The policy data were collected from over 400 data points and provided objective measures. This database has been used in previous literature of management science (Eccles et al., 2014; Garefalakis et al., 2020), strategic management (Cheng et al., 2014; Luo et al., 2015b), business ethics (Aouadi and Marsat, 2016), and marketing (Sun et al., 2019). Finally, we collected financial data from the Compustat database.

After consolidating the data from the four databases, we developed a panel dataset of 109 firms from 2008 to 2016, with 788 firm–year observations. The sample size was reduced to 104 firms with 768 observations because of the first-difference treatments to control for firm-specific confounding factors (see Section 3.3). Among these 104 firms, 60 firms had initiated at least one SSD in the research window. The remaining 44 firms with no SSD were used as control firms, providing benchmarks. The databases used and data collection steps were summarized in Appendix A and Appendix B. The names of final samples (104 firms) were listed in Appendix C.

### 3.2. Variables and measurements

#### 3.2.1. Customer satisfaction

The key dependent variable was customer satisfaction, which was operationalized as the ACSI score. This index solicits customers' views on their entire service experience by distributing questionnaires via email. Each year, the index surveys around 500,000 customers about the products and services they use most. Potential respondents are asked specific questions regarding their purchases, use of goods and services from the company, and brand of goods. The survey results served as inputs to an econometric model to generate the ACSI score for the companies. The ACSI score ranges from 0 to 100. This measurement has been widely used in previous marketing literature (e.g., Anderson et al., 2004; Fornell et al., 2006; Rego et al., 2013).

#### 3.2.2. Sales performance

We hypothesized that a consequence of increased customer satisfaction would be improved sales performance (Gómez et al., 2004). We followed previous literature to measure the variable as sales-to-assets ratio (SOA) (Wiengarten et al., 2017). The measurement occurred in an output/input efficiency manner, with sales as the output and assets as the input. Thus, it accounted for the effects of firm
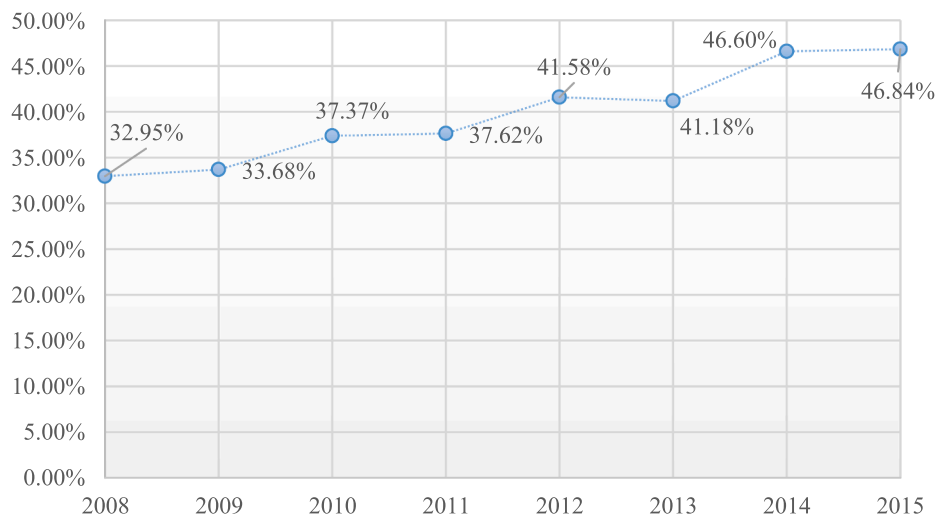
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**Fig. 1.** Percentage of firms with SSD in each year.

size and investment on sales performance.

### 3.2.3. Sustainable supplier development

Unless otherwise stated, the independent variables had a one-year lag relative to the dependent variable to mitigate against reverse causality concerns (Wiengarten et al., 2019). We also used SSD with no time lagged and two-year lagged independent variables as sensitivity analyses (details provided in Section 4.1). We measured SSD by assessing whether the firm had worked with suppliers to develop its environmental, societal, and governance practices (data code in the Thomson Reuters ESG database: SOTDDP030). The development program included evaluating supplier sustainability performance and training for suppliers' personnel on sustainability issues (Lu et al., 2012; Sancha et al., 2015). A firm (*i*) who provided such a development program in year *t* was coded "1," and "0" otherwise. Thomson Reuters ESG database collects this variable by identifying ESG practices from firms' announcements and media reports (Refinitiv, 2020). The data record training or collaboration programs with suppliers to increase their sustainability. Firm announcements and media reports are widely used in the operations management literature to measure CSR-related events (e.g., Lo et al., 2014, 2018). For example, Apple was coded "1" in 2016 because its environmental responsibility report stated: "In 2016, we implemented an energy training program and conducted training for 19 supplier sites, trainees from these supplier sites applied their skills and identified and implemented additional energy efficiency projects." Measuring such a training program in a binary manner is consistent with the previous literature (e.g., Guo et al., 2020).

Of the 768 observations, 305 included such programs and 463 did not. Development activities were found most in the industry group of SIC 37 (transportation equipment: 53 observations [17.38%]), followed by SIC 20 (food and kindred products: 51 observations [16.72%]), SIC 53 (general merchandise stores: 33 observations [10.82%]), SIC 48 (communications: 23 observations [7.54%]), SIC 49 (electric, gas, and sanitary services: 23 observations [7.54%]), SIC 36 (electronic and other electrical equipment and components: 23 observations [7.54%]), and SIC 58 (eating and drinking places: 23 observations [7.54%]). Fig. 1 illustrates the percentage of firms with SSD in each year. The figure shows an increasing trend of initiating SSD in our research window.

### 3.2.4. Firm reputation

We used the MAC list as a proxy of firm reputation (e.g., Chun, 2005; Fan et al., 2018). The annual survey of MAC asked respondents to rate a company's reputation according to nine aspects: (1) innovation, (2) people management, (3) use of corporate assets, (4) social responsibility, (5) quality of management, (6) financial soundness, (7) long-term investment value, (8) quality of products/services, and (9) global competitiveness (Fortune, 2019). The reputational score was calculated for firms on the list. However, only 504 of 768 observations were on the list. Using the score for measurement would shrink the sample size (35%); therefore, we followed prior studies to measure firm reputation by indicating whether the firm was on the list (Fan et al., 2018). Firms on the list were considered highly ranked and reputable firms in their respective industry. A firm *i* on the list in year *t* was coded "1," and "0" otherwise (Fan et al., 2018). This dummy measure divided our sample into two groups: those with high and those with low reputation levels.

### 3.2.5. Advertising intensity

The advertising effort of firms was operationalized as the advertising expenditure of the firm (Andras and Srinivasan, 2003). We scaled the advertising expenditure by number of employees because larger firms tend to have additional advertising expenditures. We standardized this variable according to four-digit SIC industry mean and observation year before inserting it into the models to assess its moderating effect. The data were collected from Computstat.

**Table 1**
Description of variables.

| Variable | Measurement | Data source | Reference |
|---|---|---|---|
| Customer satisfaction | ACSI score | ACSI | Rego et al. (2013) |
| Sales performance | Sales-to-assets: sales/assets | Compustat | Wiengarten et al. (2017) |
| SSD | A firm who provided such a development program in year $t$ is coded "1," and "0" otherwise | Thomson Reuters ESG database | Guo et al. (2020) |
| Firm reputation | A firm on the list of MAC in year $t$ is coded "1," and "0" otherwise | World MAC list | Fan et al. (2018) |
| Advertising intensity | Advertising expenditure/number of employees | Compustat | Andras and Srinivasan (2003) |
| Marketing resource efficiency | SG&A expenditure | Compustat | Modi and Mishra (2011) |
| Firm performance | Return on equity: net income/shareholders' equity | Compustat | Richard (2000) |
| Firm age | Natural logarithm of years between year $t$ and initial public offering year | Compustat | Kieschnick and Moussawi (2018) |
| Firm size | Natural logarithm of firm sales | Compustat | Fan et al. (2020) |
| Quality management system | A firm with a quality management system is coded "1," and "0" otherwise | Thomson Reuters ESG database | Lo et al. (2014) |

$$Advertising\ intensity_{it} = \frac{Advertising\ expenditure_{it}}{Number\ of\ employees_{it}} \tag{1}$$

### 3.2.6. Control variables

We also included several control variables to increase the robustness of analysis. The lagged dependent variables (*lagged customer satisfaction* and *SOA*) were controlled for because preceding customer satisfaction and sales performance can affect subsequent performances. The inclusion of the lagged dependent variables is consistent with dynamic panel data analysis conducted in prior studies (e.g., Lam et al., 2016; Vandaie and Zaheer, 2015). This controls for the confounding effects of serial autocorrelation in panel data. *Firm size* (measured as annual sales) and *firm performance* (measured as return on equity) were controlled because larger and more profitable firms may have additional resources to maintain customer satisfaction (Lo et al., 2014). *Firm age* was controlled for because older firms may accumulate more knowledge on customer service (Fan and Zhou, 2018). We also included dummy variables on whether the firm had a *quality management system* (e.g., ISO 9001 and six sigma) to control for the firm's efforts to maintain product and service quality (Lo et al., 2014). The quality management system variable was collected from the Thomson Reuters's ESG database. We controlled marketing resource efficiency in an output/input approach because firms may use marketing resources differently. Specifically, we followed the operations management and marketing literature (e.g., Modi and Mishra, 2011; Narasimhan et al., 2006) to use selling, general, and administrative (SG&A) expenditure to measure marketing resources. We then captured the marketing resources efficiency by ratio of sales (output) to SG&A (input). We standardized this variable according to four-digit SIC industry mean and observation year. Finally, we included the year of observation to mitigate against the confounding effects of time-specific effects. We performed natural logarithm transformation to firm size and firm age to correct for their exponential distributions and skewness. The regression model for our base hypothesis (H1a) was specified as:

$$Customer satisfaction_{it} = \alpha + \beta_1 Sustainable supplier development (SSD)_{it-1} + \beta_2 Reputation_{it-1} + \beta_3 Advertising intensity_{it-1}$$
$$+ \beta_4 Sustainable supplier development_{it-1} * Reputation_{it-1} + \beta_5 Sustainable supplier development_{it-1} * Advertising intensity_{it-1}$$
$$+ \beta_{6\ n} Control variables_{it-1} + u_{it} \tag{2}$$

where $i$ represents the $i^{th}$ firms and $t$ represents the year of observation. Control variables indicate a vector of the aforementioned control variables. The measurement, data sources, and references of the variables are summarized in Table 1.

### 3.3. Analysis

Despite the inclusion of control variables to mitigate against the risk of alternative explanations for regression results, it is necessary to account for endogeneity issues that may lead to inconsistent estimates and biased inferences. Endogeneity concerns arise because of the possibility that an explanatory (or endogenous) variable correlates with the error terms, which violates the assumption of error term independence. This concern is receiving increased attention from marketing and operations management journals (Ketokivi and McIntosh, 2017; Ullah et al., 2018). This study could encounter endogeneity issues because the key independent variable, *sustainable supplier development*, was observational in nature and endogenous to firm characteristics. Specifically, it was possible that unobservable confounding variables (e.g., firms' supply chain management policy and the quality of top management) could affect *sustainable supplier development* and the dependent variable of *customer satisfaction*.

We mitigated these endogeneity concerns via delicate research design. First, we performed first-difference to our variables to eliminate the effects of omitted time-invariant (fixed-effect) firm-level confounding factors, including firm structure, policy, and industry. The first-difference treatment reduced the sample size from 788 to 768. In the robustness analysis, we replaced the technique by including an industry dummy variable to control for the industry time-invariant factors. The results yielded similar conclusions to those from the primary analysis (details provided in Section 4.1.3). Second, we capitalized on our panel data structure and used the

**Table 2**

Descriptive statistics and correlations.

| | Variables | Mean | Std dev. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Customer satisfaction | 77.306 | 5.861 | | | | | | | | | | |
| 2 | SSD | 0.397 | 0.490 | 0.22 | | | | | | | | | |
| 3 | Lagged customer satisfaction | 77.414 | 5.967 | 0.88 | 0.21 | | | | | | | | |
| 4 | Firm performance | 0.659 | 4.691 | −0.05 | −0.04 | −0.05 | | | | | | | |
| 5 | Sales performance | 1.037 | 0.766 | 0.18 | 0.04 | 0.18 | 0.07 | | | | | | |
| 6 | Firm age | 3.710 | 0.567 | −0.06 | −0.08 | −0.06 | −0.01 | −0.09 | | | | | |
| 7 | Firm size | 4.129 | 1.342 | 0.08 | 0.32 | 0.07 | 0.00 | 0.43 | −0.25 | | | | |
| 8 | Quality management system | 0.228 | 0.420 | 0.28 | 0.25 | 0.28 | −0.04 | −0.10 | −0.16 | 0.15 | | | |
| 9 | Firm reputation | 0.783 | 0.413 | 0.06 | 0.17 | 0.08 | −0.03 | 0.23 | −0.09 | 0.46 | 0.11 | | |
| 10 | Advertising intensity | 0.091 | 0.605 | 0.15 | 0.06 | 0.16 | −0.03 | −0.15 | 0.05 | −0.09 | 0.13 | −0.01 | |
| 11 | Marketing resource efficiency | 0.115 | 0.601 | 0.03 | 0.04 | 0.03 | −0.05 | 0.21 | −0.06 | 0.10 | −0.03 | 0.12 | −0.02 |

$N = 768$.

**Table 3**

GMM analysis of SSD and customer satisfaction.

| | Dependent variable: customer satisfaction in year $t$ | | Dependent variable: SOA in year $t$ |
|---|---|---|---|
| Independent variables (in year $t − 1$) | Model 1 | Model 2 | Model 3 |
| SSD | 1.161[**] | 3.018[***] | |
| | (0.59) | (0.34) | |
| Customer satisfaction | 0.264[***] | 0.271[***] | 0.007[***] |
| | (0.04) | (0.02) | (0.00) |
| Firm performance | 0.012 | 0.014 | −0.002 |
| | (0.03) | (0.01) | (0.00) |
| Sales performance | −2.977[***] | −1.678[***] | 0.031 |
| | (0.88) | (0.36) | (0.03) |
| Firm age | −7.936[***] | −7.281[***] | −0.032 |
| | (1.87) | (0.61) | (0.07) |
| Firm size | 7.601[***] | 5.563[***] | −0.016 |
| | (1.24) | (0.53) | (0.01) |
| Quality management system | 1.986[***] | 1.541[***] | −0.012 |
| | (0.39) | (0.09) | (0.05) |
| Firm reputation | 0.015 | 0.988[***] | −0.095[***] |
| | (0.29) | (0.12) | (0.01) |
| Advertising intensity | −0.366 | −0.136 | 0.008 |
| | (0.45) | (0.11) | (0.02) |
| Marketing resource efficiency | −3.242[***] | −2.000[***] | 0.189[***] |
| | (0.54) | (0.18) | (0.04) |
| SSD * firm reputation | | −4.032[***] | |
| | | (0.29) | |
| SSD * advertising intensity | | 1.021[***] | |
| | | (0.14) | |
| AR(1) $p$-value | 0.000 | 0.000 | 0.078 |
| AR(2) $p$-value | 0.365 | 0.219 | 0.880 |
| Chi$^2$ $p$-value | 0.000 | 0.000 | 0.000 |
| Hansen test $p$-value | 0.709 | 0.226 | 0.392 |

Standard errors in parentheses.

[***] $p < 0.01$.

[**] $p < 0.05$.

[*] $p < 0.1$; $N = 768$.

generalized method of moments (GMM) estimator to mitigate against the effects of time-variant confounding factors.

The endogeneity issue arises from correlation concern between the endogenous variable (i.e., SSD) and the error term. This concern is caused by unobservable omitted control variables. The GMM method is suitable for panel datasets to use time-lagged endogenous variables as instrumental variables to decouple endogenous variables and error terms. The GMM estimators address the endogeneity issue through internal data transformation, where a variable's historical value is subtracted from its current value (Roodman, 2009). The use of a lagged value of an endogenous variable overcomes the difficulty of seeking a strict exogenous instrumental variable when applying other instrument variable estimators (e.g., two-stage least squares) (Wiengarten et al., 2017). The estimator can provide consistent results in large, even unbalanced, panel datasets (Sodero et al., 2013). The techniques have been used in operations management studies on various topics, such as information system assimilation (Sodero et al., 2013), social media use (Guo et al., 2020; Lam et al., 2016), and occupational health and safety (Wiengarten et al., 2017).

Our GMM analysis used the two- and three-year lagged values of the dependent variable, the baseline independent variable (*sustainable supplier development*), and the direct effect of moderators as the instruments. The lagged values of interaction terms were
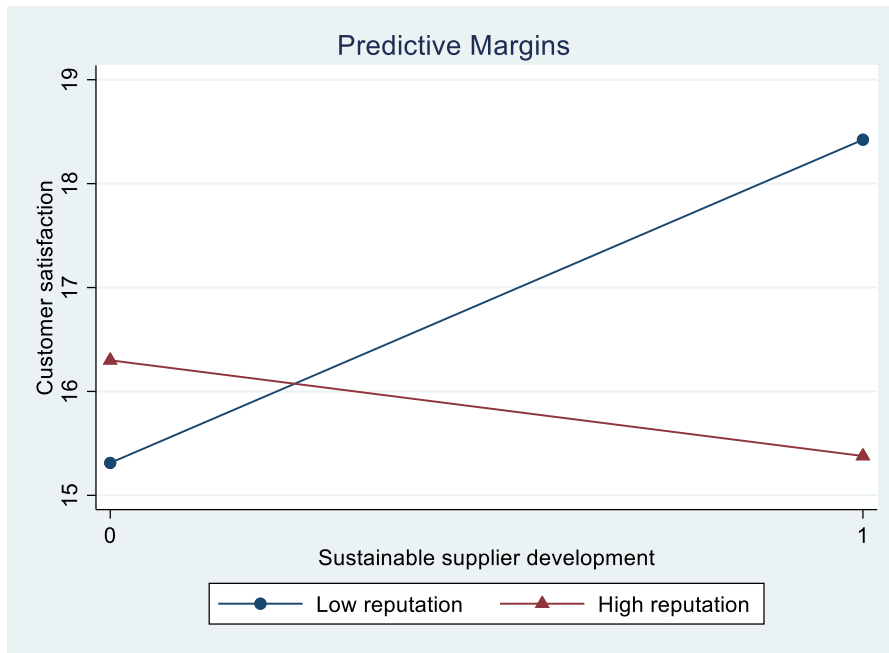
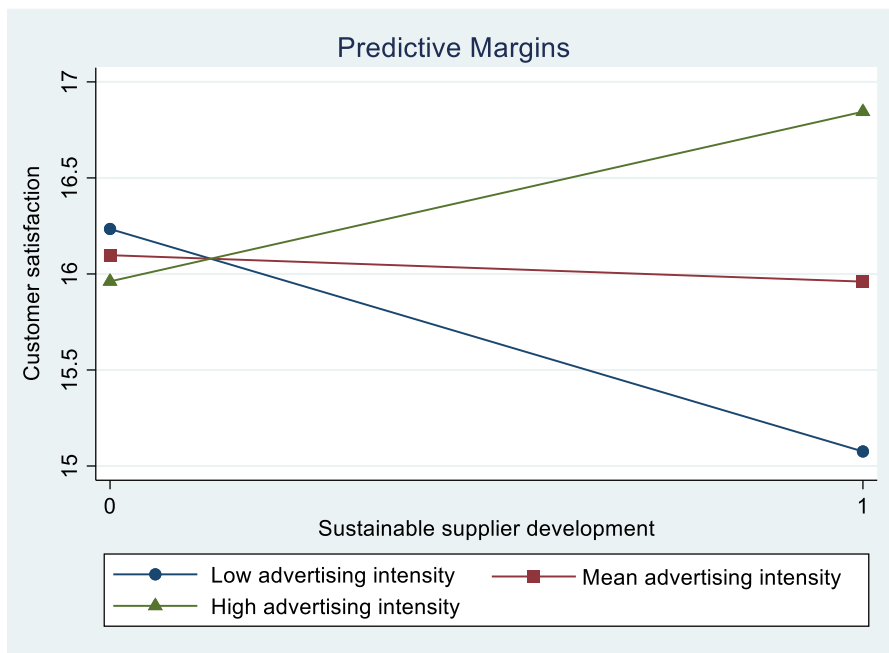**Fig. 2.** Moderating effect of reputation.



**Fig. 3.** Moderating effect of advertising intensity.

further added to the models when examining the moderation hypotheses. A valid instrument is a restricted exogenous variable that should correlate with endogenous variables, while not correlating with the dependent variable. We performed the Arellano and Bond test and the Hansen test to examine whether the instruments used were valid. Our Arellano and Bond test suggested that AR(1) was significant ($p < 0.01$), while AR(2) was non-significant ($p > 0.1$), which indicated that the error terms of the two periods were not correlated. In addition, the Hansen test was non-significant ($p > 0.1$), which suggested that the number of instruments included in the models was not causing serious over-identification problems (Wiengarten et al., 2017).

## 4. Results

Table 2 displays the descriptive statistics and correlations of the variables. The maximum variation inflation factor among variables was 1.53, which suggests that multicollinearity was not a serious concern for this study. The correlation between *sustainable supplier development (SSD)* and *customer satisfaction* was significantly positive (Pearson correlation coefficient = 0.22, $p < 0.01$). This unconditional result offered preliminary support to H1a. Model 1 of Table 3 presents the primary hypothesis testing result for H1a by considering control variables and instruments in the GMM model. We incorporated all control variables and *SSD* in Model 1. The coefficient of *SSD* was significantly positive (coefficient = 1.161, $p < 0.05$). Thus, firms initiating SSD programs had a higher customer satisfaction score change than did firms without or cancelled SSD programs, which supported H1a. In Model 3 of Table 3, we replaced the dependent variable as SOA and examined the effect of *customer satisfaction* on *sales performance*. The coefficient of customer satisfaction was significantly positive (coefficient = 0.007, $p < 0.01$). Thus, firms with a higher customer satisfaction score had increased firm sales performance, which supported H1b.

The interaction term between *SSD* and *firm reputation* was included in Model 2 of Table 3 to test H2. The coefficient of this interaction term was significantly negative (-4.032, $p < 0.001$). Fig. 2 illustrates that *firm reputation* negatively moderated the slope of *SSD*. The slope of SSD was reduced by $-4.032$ (from 3.018 to $-1.014$) for firms with high reputations. Thus, H2 was supported.

The interaction term between *SSD* and *advertising intensity* was included in Model 2 of Table 3 to examine H3. The coefficient of the interaction terms was significantly positive (coefficient = 1.021, $p < 0.01$). Fig. 3 illustrates the moderating effects of *advertising intensity*—high advertising intensity was defined as one standard deviation above the mean. Holding other variables constant, when moving advertising intensity from the mean to the high level (8.833–26.061, or standardized value 0–1), the slope of *SSD* increased by 1.021 (from 3.018 to 4.039). These results indicated that advertising positively moderated the slope of SSD. Thus, H3 was supported.

### 4.1. Robustness analysis

The primary analysis adopted several measures to increase validity and address endogeneity concerns. Specifically, we applied a one-year lag for the independent variables (year $t − 1$) compared with the dependent variable ($t$) to address reverse causality concerns (Wiengarten et al., 2017). We mitigated against the concern of confounding effects from: (1) observable factors by including control variables (Lu and Shang, 2017), (2) unobservable time-invariant factors by applying first-difference (Lam et al., 2016), and (3) unobservable time-variant factors by applying GMM estimator (Wiengarten et al., 2017). However, the potential measurement errors of independent and dependent variables could also raise endogeneity concerns; thus, we used alternative measurements of dependent and independent variables for robustness checks.

#### 4.1.1. Sustainable supplier development and corporate social responsibility performance

Table 3 shows that *SSD* was associated with higher *customer satisfaction*. An explanation for this is that SSD increases the CSR performance of program-initiating firms. We then first tested whether SSD could lead to higher CSR performance. Specifically, we replaced the dependent variable with two CSR performance indicators—environmental and social scores collected from the ESG database. The instruments of lagged dependent variables were changed accordingly. The environmental and social scores collected from ESG were widely used in the previous literature to measure CSR performance (e.g., Cheng et al., 2014; Luo et al., 2015b). The environmental score reflects firms' resource and emission reduction and green production innovations, while the social score reflects firms' social welfare activities (Luo et al., 2015b). The results of this analysis are presented in the appendix Table D1 (CSR performances as dependent variables). The coefficients of SSD in Models 1 (6.589, $p < 0.01$) and 2 (6.537, $p < 0.01$) of Table D1 were significantly positive. These results indicated an association between SSD and higher environmental performance (Model 1) and social performance (Model 2).

#### 4.1.2. Sustainable supplier development and sales performance

Based on H1b, increased customer satisfaction may affect firms' sales performance. We then tested whether SSD could lead to higher sales performance (SOA) directly. The appendix Table E1 presents the results with sales performance as the dependent variables. The coefficients of SSD in Models 1 (0.034, $p < 0.05$) of Table E1 were significantly positive. The coefficients of customer satisfaction were also significantly positive (0.004, $p < 0.1$). These results indicated that SSD can consequently improve firm sales. In summary, these analyses supported our arguments and main results.

#### 4.1.3. Alternative independent variables

The main analysis included all SSD observations. However, there can be inherent differences between first-time supplier development programs and repeated programs (Harris and Bromiley, 2007). We argue that firms with limited experience may not implement supplier development programs effectively. Thus, we removed observations with repeated SSD, leaving only observations with first-time or no SSD, and reran the analysis. The appendix Table F1 presents the results. The coefficient of SSD remained significantly positive (1.136, $p < 0.01$). Thus, this additional analysis did not reject our H1a.

SSD had a one-year lag to the dependent variable of customer satisfaction in the main analysis, based on the assumption that consumers react to SSD initiatives within one year. However, information about a firm conducting SSD might reach customers sooner or later. We thus performed sensitivity analyses using SSD with no time lag and a two-year lag. The appendix Table G1 shows the result. The analyses did not capture a significant effect when using SSD with no time lag (Model 1). These results support the proposition that SSD initiatives are generally not communicated to stakeholders in a timely manner. That is, it takes time before communications about

SSD initiatives reach stakeholders. However, the coefficient of SSD with a two-year lag remained significantly positive (1.065, $p <$ 0.01) (Model 2). Thus, the longer time gap between independent and dependent variables did not falsify H1a.

Finally, the main analysis used a general indicator to measure whether the firm conducted SSD in a year. However, the scope of SSD included environmental and social dimensions, and the content included supplier evaluation and training in sustainability issues (Lu et al., 2012; Sancha et al., 2015). Thus, we used alternative indicators for SSD to reflect this scope and content. Specifically, we developed a scale for *sustainable supplier evaluation* that coded "2″ for firms that conducted supplier evaluations in both environmental and occupational health and safety (OHS—proxy for social dimension) (Fan et al., 2014), "1" for firms that evaluated either environmental or OHS practices, and "0" for firms that did not evaluate these two dimensions. We used a similar approach to develop *sustainable supplier training* (i.e., "2" = both environmental and OHS, "1" = either environmental or OHS, "0" = neither environmental nor OHS). These results are presented in the appendix Table H1. The coefficients of sustainable supplier evaluation (2.805, $p < 0.01$) and sustainable supplier training (5.131, $p < 0.01$) were significantly positive. These analyses indicated that our H1a remained supported in different scopes and contents of SSD.

### 4.1.4. Alternative estimation method

Our primary analysis took a first-difference estimator to control for time-invariant effects, such as industry environment and firm structure. The assumption was that effects that did not change yearly would be strictly different from the analysis models. Including the dummy variable of industry is another approach to control for industry time-invariant factors, which allows sample firms to be compared within the industry group (Wiengarten et al., 2017). Thus, we replaced the first-difference estimator with the dummy variable of industry to conduct a robustness check. Specifically, we included the dummy variables of the firm's four-digit SIC code into the model and reran the analysis. The analysis result is presented in the appendix Table I1. The coefficient of SSD remained significantly positive (0.180, $p < 0.01$). Therefore, our H1a was not falsified by the alternative approach to control for fixed industry effects. The conclusion was not biased by the first-difference technique.

## 5. Discussion and conclusions

SSD is strategically important to mitigate against supply chain sustainability risks. Thus far, existing literature has provided limited insight into whether and how such supplier development initiatives create value for firms, besides mitigating sustainability-related risks. To address this gap, this study explored customer satisfaction as a potential path of value creation of SSD initiatives. We sampled 104 firms and examined the relationship between SSD initiatives and customer satisfaction. The results indicated that firms that conduct SSD are rewarded with higher levels of customer satisfaction. In addition, this research discovered that SSD is more effective in boosting customer satisfaction when firm reputation is low or advertising intensity is high. Our additional analyses showed that the findings were robust when using alternative dependent and independent variables. In this section, we elaborate on the theoretical and managerial implications of our findings.

### 5.1. Contributions to the supplier development literature

Our results generally align with the supplier development literature that has explored the effects of supplier development initiatives and programs on maintaining capable supply bases (Modi and Mabert, 2007). Our findings show that firms can improve customer satisfaction if they make efforts to develop a more sustainable supply chain, which confirms the values of supplier development programs to improve supply chain competitive advantage. This study makes at least two main contributions to the literature on supplier development.

First, our study advances the supplier development literature by exploring how SSD initiatives create value for firms. Traditional supplier development programs focus mostly on conventional supplier performance metrics, such as product quality, cost, delivery, and innovation (Handfield et al., 2000; Krause and Scannell, 2002). However, governments, non-government organizations, consumers, and the media have started to devote substantial attention to sustainability issues in global supply chains (Fan et al., 2014). Firms are under increased pressure to develop supply chains that offer good social and environmental performance. It is imperative for firms to expand the scope of supplier development to include environmental and social sustainability. There is an emerging stream of research on SSD, yet most studies thus far have focused on evaluation models (Akman, 2015; Bai and Sarkis, 2010; Dou et al., 2014; Fu et al., 2012) or antecedents (Blome et al., 2014) of SSD. Our study used two theoretical lenses (instrumental stakeholder theory and expectation confirmation theory) and four data sources to explore how SSD initiatives create value for firms. More specifically, our results advance the literature by empirically testing and confirming a mechanism that has been widely used to justify the positive link between SSD and firm performance. Our study focused on customers as the main group of stakeholders. Future research can explore whether and to what extent SSD initiatives can trigger positive responses from other main groups of stakeholders, such as governmental agencies, non-governmental organizations, and the media.

Second, the literature on supplier development (e.g., Modi and Mabert, 2007) has mostly focused on the immediate effects of various forms of supplier development initiatives (i.e., they have implicitly or explicitly explored the supplier development–supplier performance–firm performance link). This study explored an additional link (supplier development–customer satisfaction–firm

performance). Therefore, this study deepens understandings of the value creation of supplier development. However, because of the idiosyncratic nature (particularly social desirability) of sustainability, our results may not be adequately generalizable to other traditional forms of supplier development that focus on product quality, cost, delivery, and flexibility. Still, we encourage future research to explore whether and to what extent traditional forms of supplier development programs and initiatives can contribute to customer satisfaction as well. Moreover, it would be interesting to conduct a comparative study of various forms of supplier development initiatives in boosting customer satisfaction.

### 5.2. Contributions to the corporate social responsibility literature

This research enriches the literature on the relationship between CSR and customer satisfaction in two ways. First, our findings align with prior empirical reports that firm CSR performance contributes positively to customer satisfaction (e.g., Chung et al., 2015; Galbreath and Shum, 2012; Lee and Heo, 2009; Luo and Bhattacharya, 2006). CSR attributes are viewed as part of product quality, which affects consumption experience and the repurchase intentions of customers (Pérez and Del Bosque, 2015). Our findings highlight that customers are likely to respond positively to firm CSR efforts—not only efforts related to internal operations, but also efforts to create sustainable supply chains. Besides SSD initiatives that are focused on upstream supply chains, firms also implement downstream initiatives, such as green distribution and reverse logistics, that are focused on closing the loop. Future research can explore whether and to what extent these external initiatives can contribute to firms' customer satisfaction as well.

Second, our study contributes to the CSR literature by showing that the relationship between SSD initiatives (as one type of CSR) and customer satisfaction can be significantly influenced by firm reputation and advertising intensity. More specifically, we found that SSD initiatives can generate greater customer satisfaction for firms with low reputations. This occurs because customers have lower expectations of firms with low reputations, and SSD initiatives can fulfil customers' needs for CSR and exceed their expectations of the firm. Further, we find that advertising intensity positively moderates the relationship between SSD initiatives and customer satisfaction, respectively. Future studies can explore whether the moderating effects of these marketing variables hold for other CSR initiatives.

### 5.3. Contributions to operations–marketing interface literature

Our research also contributes to the literature on the operations–marketing interface. Supplier development has mainly been studied in the operations and supply chain management (OSCM) literature, while customer satisfaction is a market-based construct that has received greater focus from marketing scholars. Our findings align with the literature that suggests that OSCM practices should incorporate a marketing perspective to achieve market-based outcomes (e.g., Chan et al., 2012; Lee and Lam, 2012; Liu et al., 2012). As such, our results further indicate that the operations–marketing interface may be a very promising research domain. We encourage future research to explore potential synergies between OSCM and marketing strategies in boosting firm performance. For example, it would be interesting to explore whether sustainable supply chain management (Golicic and Smith, 2013) and customer relationship management (Mithas et al., 2005) can jointly contribute to customer satisfaction, which is key to sustainable competitive advantage.

### 5.4. Managerial implications

SSD programs entail substantial investments, yet the outcomes are not always clear. With limited evidence of the positive case, managers may be reluctant to invest in SSD. However, our findings show that managers can expect such investment to trigger positive reactions from customers, especially for firms that are less reputable. This empirical evidence can help operations managers justify SSD initiatives to powerful stakeholders (e.g., senior management teams and boards of directors and creditors).

Our findings also offer implications for developing an integrative action plan for SSD initiatives. The literature on supply chain sustainability has provided some guidance for managers to initiate effective development programs from an operations perspective, in terms of how to implement initiatives effectively (Giménez and Tachizawa, 2012). However, managers should not ignore the important role of marketing strategies. Managers should develop supply chain strategies alongside marketing communication strategies to make SSD initiatives a source of competitive advantage. Firms should prepare sufficient marketing communication resources and use them efficiently. Specifically, firms can intensify advertising to demonstrate their commitment to developing sustainable supply chains. Customer awareness of these initiatives would be increased through advertising efforts, which is vital for improving satisfaction. In addition, firms should efficiently use marketing channels and resources to deliver the message effectively.

Although SSD initiatives are primarily implemented to mitigate sustainability-related risks in upstream supply chains, they can be effective in boosting customer satisfaction. As such, our study shows the necessity of breaking down functional silos in modern organizations. Cross-functional collaborations between functional departments, such as supply chain management and marketing, can be very fruitful and even necessary for sustainable competitive advantage. For example, marketing departments can collect information about customers' main concerns for supply chain sustainability, and such information should be used to design SSD initiatives, which will very likely meet customer demands in a more efficient and effective manner.

*5.5. Limitations and future research directions*

This study has several limitations that warrant further research. First, the value creation of SSD initiatives, like other CSR initiatives, resides in firm–stakeholder interactions. This study explored two salient firm-related factors—firm reputation and advertising intensity—that can influence the relationship between SSD initiatives and customer satisfaction. However, we omitted customer-related factors that can influence customers' sense-making and/or response to firms' actions (e.g., moral values of customers) (Schuler and Cording, 2006). In particular, our findings were based on analysis of US firms; however, it is questionable whether our conclusions can be extended to other countries where customers may have different values and cognitive models for assessing firms' actions. Previous studies show that customers in developing countries (e.g., China) may not value a firm's CSR efforts highly (Tian et al., 2011); thus, the effects of SSD on customer satisfaction may diminish in such countries. Future research could investigate this topic in the context of developing countries to consider different customer value frames and cognitive models.

Second, for SSD initiatives to trigger positive responses from customers, information on initiatives must be timely and adequately communicated (Schuler and Cording, 2006). In this study, we used advertising intensity as a proxy to reflect firms' level of communication of product- and process-related information. We encourage future research to collect data that can accurately measure firms' advertising expenditure directly related to communicating CSR initiatives, including SSD initiatives.

Third, our model did not differentiate between do-no-harm and do-good SSD initiatives, although the CSR literature is gradually recognizing the differences between these categories (Crilly et al., 2016). It is very likely that do-no-harm and do-good SSD initiatives will have different effects in triggering positive customer responses. Thus, we encourage future research to apply a more nuanced view of SSD initiatives.

Finally, this study adopted a binary measure for SSD initiatives, which restricted the variation of the independent variable. Future research may develop scales to measure SSD in a continuous manner.

**CRediT authorship contribution statement**

**Di Fan:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Chengyong Xiao:** Conceptualization, Writing – review & editing. **Xiao Zhang:** Writing – original draft, Methodology, Data curation. **Yujuan Guo:** Resources, Data curation.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Acknowledgement**

**Appendix**

See Tables A–I.

**Table A**
Databases used.

| Databases | Used for | Data sources |
|---|---|---|
| American Customer Satisfaction Index | ACSI score | https://www.theacsi.org/ |
| Fortune's World Most Admired Companies | Firm reputation | https://fortune.com/worlds-most-admired-companies/ |
| Thomson Reuters Refinitiv ESG database | CSR policy data | Subscribed by the first author's institution. |
| Compustat database | Firm background and financial data | Subscribed by the first author's institution. |

**Note:** Firm name was used as the foreign key for linking the above databases.

**Table B**
Data collection steps.

| | Data collection steps | Number of firms discarded | Number of firms included |
|---|---|---|---|
| 1 | Initial firm list obtained from ACSI | | 350 |
| 2 | Selected firms with consecutive ACSI records from 2008 to 2016 | 155 | 195 |
| 3 | Selected firms with SIC code smaller than 60 | 32 | 123 |
| 4 | Kept firms with available CSR policy data (from ESG database) and financial data (from Compustat database) | 14 | 109 |
| 5 | First-difference treatment | 5 | 104 |

**Note:** Software used for data processing and analysis: Microsoft Excel and STATA 16.0.

**Table C**
Sample firms.

| Firm Name | Ticker | SIC code | Firm Name | Ticker | SIC code |
|---|---|---|---|---|---|
| ANHEUSER-BUSCH INBEV | BUD | 20 | ATMOS ENERGY CORP | ATO | 49 |
| CAMPBELL SOUP CO | CPB | 20 | CMS ENERGY CORP | CMS | 49 |
| COCA-COLA CO | KO | 20 | CENTERPOINT ENERGY INC | CNP | 49 |
| CONAGRA BRANDS INC | CAG | 20 | CONSOLIDATED EDISON INC | ED | 49 |
| DR PEPPER SNAPPLE GROUP INC | DPS | 20 | DTE ENERGY CO | DTE | 49 |
| GENERAL MILLS INC | GIS | 20 | DOMINION ENERGY INC | D | 49 |
| HERSHEY CO | HSY | 20 | DUKE ENERGY CORP | DUK | 49 |
| KELLOGG CO | K | 20 | EDISON INTERNATIONAL | EIX | 49 |
| KRAFT FOODS GROUP INC | KRFT | 20 | ENTERGY CORP | ETR | 49 |
| NESTLE SA | 3NSRGY | 20 | EVERSOURCE ENERGY | ES | 49 |
| PEPSICO INC | PEP | 20 | EXELON CORP | EXC | 49 |
| TYSON FOODS INC | TSN | 20 | FIRSTENERGY CORP | FE | 49 |
| HANESBRANDS INC | HBI | 23 | NEXTERA ENERGY INC | NEE | 49 |
| VF CORP | VFC | 23 | NISOURCE INC | NI | 49 |
| NEW YORK TIMES CO | NYT | 27 | PG&E CORP | PCG | 49 |
| CLOROX CO | CLX | 28 | PPL CORP | PPL | 49 |
| COLGATE-PALMOLIVE CO | CL | 28 | PEPCO HOLDINGS INC | POM | 49 |
| PROCTER & GAMBLE CO | PG | 28 | PUBLIC SERVICE ENTRP GRP INC | PEG | 49 |
| UNILEVER PLC | UL | 28 | SEMPRA ENERGY | SRE | 49 |
| NIKE INC | NKE | 30 | SOUTHERN CO | SO | 49 |
| HP INC | HPQ | 35 | XCEL ENERGY INC | XEL | 49 |
| APPLE INC | AAPL | 36 | SUPERVALU INC | SVU | 51 |
| ELECTROLUX AB | ELUXY | 36 | STAPLES INC | SPLS | 51 |
| NOKIA CORP | NOK | 36 | HOME DEPOT INC | HD | 52 |
| WHIRLPOOL CORP | WHR | 36 | LOWE'S COS INC | LOW | 52 |
| FIAT CHRYSLER AUTOMOBILES NV | FCAU | 37 | COSTCO WHOLESALE CORP | COST | 53 |
| FORD MOTOR CO | F | 37 | DILLARDS INC | DDS | 53 |
| GENERAL MOTORS CO | GM | 37 | DOLLAR GENERAL CORP | DG | 53 |
| HONDA MOTOR CO LTD | HMC | 37 | OLD COPPER CO INC | CPPRQ | 53 |
| DAIMLER AG | DDAIF | 37 | KOHL'S CORP | KSS | 53 |
| NISSAN MOTOR CO LTD | NSANY | 37 | MACY'S INC | M | 53 |
| TOYOTA MOTOR CORP | TM | 37 | SEARS HOLDINGS CORP | SHLDQ | 53 |
| VOLKSWAGEN AG | VWAGY | 37 | TARGET CORP | TGT | 53 |
| UNITED PARCEL SERVICE INC | UPS | 42 | WALMART INC | WMT | 53 |
| AMERICAN AIRLINES GROUP INC | AAL | 45 | KROGER CO | KR | 54 |
| DELTA AIR LINES INC | DAL | 45 | WHOLE FOODS MARKET INC | WFM | 54 |
| FEDEX CORP | FDX | 45 | GAP INC | GPS | 56 |
| SOUTHWEST AIRLINES | LUV | 45 | NORDSTROM INC | JWN | 56 |
| UNITED AIRLINES HOLDINGS INC | UAL | 45 | TJX COS INC | TJX | 56 |
| DISNEY (WALT) CO | DIS | 48 | BEST BUY CO INC | BBY | 57 |
| AT&T INC | T | 48 | RESTAURANT BRANDS INTL INC | QSR | 58 |
| TIME WARNER INC | TWX | 48 | BRINKER INTL INC | EAT | 58 |
| LUMEN TECHNOLOGIES INC | LUMN | 48 | MCDONALD'S CORP | MCD | 58 |
| COMCAST CORP | CMCSA | 48 | DARDEN RESTAURANTS INC | DRI | 58 |
| DISH NETWORK CORP | DISH | 48 | STARBUCKS CORP | SBUX | 58 |
| TWENTY-FIRST CENTURY FOX INC | TFCFA | 48 | WENDY'S CO | WEN | 58 |
| SPRINT CORP | S.4 | 48 | YUM BRANDS INC | YUM | 58 |
| DEUTSCHE TELEKOM | DTEGY | 48 | AMAZON.COM INC | AMZN | 59 |
| TIME WARNER CABLE INC | TWC | 48 | BARNES & NOBLE INC | BKS | 59 |
| VERIZON COMMUNICATIONS INC | VZ | 48 | CVS HEALTH CORP | CVS | 59 |
| AMEREN CORP | AEE | 49 | RITE AID CORP | RAD | 59 |
| AMERICAN ELECTRIC POWER CO | AEP | 49 | WALGREENS BOOTS ALLIANCE INC | WBA | 59 |

**Table D**
GMM analysis of SSD and CSR performance.

| Independent variables (in year $t - 1$) | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | DV: Environmental score | | | DV: Social score | | |
| | Coef. | SE | p | Coef. | SE | p |
| SSD | 6.589 | 1.806 | 0.000 | 6.537 | 1.898 | 0.001 |
| Lag environmental score | 0.185 | 0.025 | 0.000 | | | |
| Lag social score | | | | 0.263 | 0.043 | 0.000 |
| Customer satisfaction | 0.065 | 0.133 | 0.627 | 0.094 | 0.168 | 0.574 |
| Firm performance | 0.626 | 0.127 | 0.000 | 0.144 | 0.137 | 0.294 |
| Sales performance | 15.067 | 2.043 | 0.000 | 7.342 | 2.308 | 0.001 |
| Firm age | 43.758 | 6.941 | 0.000 | 38.449 | 8.025 | 0.000 |
| Firm size | −12.330 | 4.292 | 0.004 | −2.880 | 4.856 | 0.553 |
| Quality management system | 3.128 | 1.604 | 0.051 | 7.181 | 2.169 | 0.001 |
| Firm reputation | −0.680 | 1.084 | 0.530 | −3.405 | 1.162 | 0.003 |
| Advertising intensity | −1.722 | 1.060 | 0.104 | 4.351 | 1.465 | 0.003 |
| Marketing resource efficiency | 3.247 | 1.500 | 0.030 | −1.035 | 1.152 | 0.369 |
| Year | Included | | | Included | | |
| Chi$^2$ | | | 0.000 | | | 0.000 |

$N = 584$; DV = dependent variable.

**Table E**
GMM analysis of SSD and sales performance.

| Independent variables (in year $t - 1$) | Model 1 DV: SOA | | |
|---|---|---|---|
| | Coef. | SE | p |
| SSD | 0.034 | 0.013 | 0.012 |
| Customer satisfaction | 0.004 | 0.002 | 0.087 |
| Firm performance | −0.009 | 0.002 | 0.000 |
| Sales performance | −0.128 | 0.023 | 0.000 |
| Firm age | 0.944 | 0.411 | 0.022 |
| Firm size | −0.138 | 0.072 | 0.055 |
| Quality management system | 0.020 | 0.029 | 0.492 |
| Firm reputation | −0.128 | 0.015 | 0.000 |
| Advertising intensity | −0.193 | 0.054 | 0.000 |
| Marketing resource efficiency | 0.054 | 0.007 | 0.000 |
| Year | Included | | |
| Chi$^2$ | | | 0.000 |

$N = 702$.

**Table F**
GMM analysis of first-time SSD and customer satisfaction.

| Independent variables (in year $t - 1$) | Model 1 DV: Customer satisfaction | | |
|---|---|---|---|
| | Coef. | SE | p |
| SSD | 1.136 | 0.175 | 0.000 |
| Customer satisfaction | 0.396 | 0.024 | 0.000 |
| Firm performance | 0.030 | 0.010 | 0.003 |
| Sales performance | −3.581 | 0.344 | 0.000 |
| Firm age | −10.762 | 0.848 | 0.000 |
| Firm size | 5.316 | 0.428 | 0.000 |
| Quality management system | 0.559 | 0.144 | 0.000 |
| Firm reputation | 0.178 | 0.140 | 0.204 |
| Advertising intensity | 0.245 | 0.143 | 0.087 |
| Marketing resource efficiency | −0.624 | 0.075 | 0.000 |
| Year | Included | | |
| Chi$^2$ | | | 0.000 |

$N = 503$.

**Table G**
GMM analysis of SSD (year $t - 2$) and customer satisfaction.

| Independent variables | Dependent variable: customer satisfaction in year $t$ | | | | | |
| | Model 1 | | | Model 2 | | |
| | Coef. | SE | $p$ | Coef. | SE | $p$ |
|---|---|---|---|---|---|---|
| SSD | 0.087 | 0.364 | 0.811 | 1.065 | 0.193 | 0.000 |
| Lagged customer satisfaction | 0.233 | 0.026 | 0.000 | 0.251 | 0.028 | 0.000 |
| Firm performance | −0.022 | 0.027 | 0.428 | 0.002 | 0.019 | 0.938 |
| Sales performance | −2.778 | 0.730 | 0.000 | −1.214 | 0.666 | 0.068 |
| Firm age | −4.775 | 1.090 | 0.000 | −8.984 | 1.314 | 0.000 |
| Firm size | 2.299 | 0.562 | 0.000 | 5.792 | 0.837 | 0.000 |
| Quality management system | 2.418 | 0.364 | 0.000 | 1.414 | 0.402 | 0.000 |
| Firm reputation | 0.725 | 0.136 | 0.000 | 0.285 | 0.149 | 0.056 |
| Advertising intensity | −1.738 | 0.501 | 0.001 | −1.620 | 0.421 | 0.000 |
| Marketing resource efficiency | −0.067 | 0.280 | 0.811 | −0.322 | 0.296 | 0.277 |
| N | 865 | | | 754 | | |
| Year | Included | | | Included | | |
| Chi$^2$ | | | 0.000 | | | 0.000 |

Data of control variables at $t - 1$; data of SSD in Model 1 is in year $t$ (no lag to DV) and Model 2 is in year $t - 1$ (two-year lag to DV).

**Table H**
GMM analysis of SSD categories and customer satisfaction.

| Dependent variable: customer satisfaction in year $t$ | | | | | | |
| Independent variables (in year $t - 1$) | Model 1 | | | Model 2 | | |
| | Coef. | SE | $p$ | Coef. | SE | $p$ |
|---|---|---|---|---|---|---|
| Sustainable supplier evaluation | 2.805 | 0.876 | 0.001 | | | |
| Sustainable supplier training | | | | 5.131 | 0.945 | 0.000 |
| Lagged customer satisfaction | 0.684 | 0.058 | 0.000 | 0.532 | 0.107 | 0.000 |
| Firm performance | −0.200 | 0.083 | 0.016 | −0.151 | 0.090 | 0.093 |
| Sales performance | 3.358 | 1.613 | 0.037 | 3.552 | 2.039 | 0.082 |
| Firm age | −9.670 | 1.926 | 0.000 | −8.141 | 2.216 | 0.000 |
| Firm size | 5.945 | 1.538 | 0.000 | 2.014 | 0.958 | 0.035 |
| Quality management system | −0.460 | 1.265 | 0.716 | 0.263 | 1.926 | 0.891 |
| Firm reputation | 0.015 | 0.331 | 0.964 | −0.897 | 0.459 | 0.051 |
| Advertising intensity | −4.041 | 1.367 | 0.003 | −4.631 | 2.583 | 0.073 |
| Marketing resource efficiency | −0.485 | 0.552 | 0.380 | −4.857 | 1.888 | 0.010 |
| Year | Included | | | Included | | |
| Chi$^2$ | | | 0.000 | | | 0.000 |

$N = 873$.

**Table I**
Robustness analysis of fixed industry effects.

| Dependent variable: customer satisfaction in year $t$ | | | |
| Independent variables | Model 1 | | |
| | Coef. | SE | $p$ |
|---|---|---|---|
| SSD | 0.180 | 0.053 | 0.001 |
| Lagged customer satisfaction | 0.889 | 0.006 | 0.000 |
| Firm performance | −0.069 | 0.018 | 0.000 |
| Sales performance | 0.229 | 0.043 | 0.000 |
| Firm age | −0.110 | 0.067 | 0.102 |
| Firm size | 0.111 | 0.023 | 0.000 |
| Quality management system | 0.607 | 0.134 | 0.000 |
| Firm reputation | −0.966 | 0.063 | 0.000 |
| Advertising intensity | 0.243 | 0.022 | 0.000 |
| Marketing resource efficiency | 0.011 | 0.032 | 0.735 |
| Year | Included | | |
| Industry (four-digit SIC) | Included | | |
| Chi$^2$ | | | 0.000 |

$N = 788$.

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