Supply chain sustainability and performance of firms
A meta-analysis of the literature
Govindan, Kannan; Rajeev, A.; Padhi, Sidhartha S.; Pati, Rupesh K.

Published in:
Transportation Research Part E: Logistics and Transportation Review

DOI:
10.1016/j.tre.2020.101923

Publication date:
2020

Document version
Final published version

Document license
CC BY

Citation for published version (APA):
Govindan, K., Rajeev, A., Padhi, S. S., & Pati, R. K. (2020). Supply chain sustainability and performance of firms: A meta-analysis of the literature. Transportation Research Part E: Logistics and Transportation Review, 137, [101923]. https://doi.org/10.1016/j.tre.2020.101923

Terms of use
This work is brought to you by the University of Southern Denmark through the SDU Research Portal. Unless otherwise specified it has been shared according to the terms for self-archiving. If no other license is stated, these terms apply:

• You may download this work for personal use only.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim. Please direct all enquiries to puresupport@bib.sdu.dk

Download date: 05. Nov. 2020
Supply chain sustainability and performance of firms: A meta-analysis of the literature

Kannan Govindan\textsuperscript{a,b,c,∗}, A. Rajeev\textsuperscript{b,d}, Sidhartha S. Padhi\textsuperscript{e}, Rupesh K. Pati\textsuperscript{f}

\textsuperscript{a}China Institute of FTZ Supply Chain, Shanghai Maritime University, Shanghai 201306, China
\textsuperscript{b}Center for Sustainable Supply Chain Engineering, Department of Technology and Innovation, University of Southern Denmark, Odense M 5230, Denmark
\textsuperscript{c}Danish Institute for Advanced Study, University of Southern Denmark, Campusvej 55, Odense M, Denmark
\textsuperscript{d}POM & QT Area, Institute of Rural Management Anand, India
\textsuperscript{e}Quantitative Methods and Operations Management Group, Indian Institute of Management Kozhikode, Room # C-16, Academic Hill, IIM Kozhikode, Kerala 673570, India
\textsuperscript{f}Quantitative Methods and Operations Management Group, Indian Institute of Management Kozhikode, Room # A-14, Academic Hill, IIM Kozhikode, Kerala 673570, India

ARTICLE INFO

Keywords:
- Sustainability
- Meta-analysis
- Supply chain management
- Natural resource based view
- Stakeholder theory

ABSTRACT

In recent years, many studies link supply chain sustainability practices to firm performance, since more and more firms are implementing sustainable practices in their manufacturing/services supply chains. This study uses a psychometric meta-analysis to synthesize the results from 167 effect sizes, collected from 129 articles, to understand the impact of various types of sustainability practices (i.e., environmental, social, and combined) on firm performance (Financial and Operational). A sub-group analysis, using industry (manufacturing/service) and economy (developed/developing), was also performed to study the relative strength of sustainability-firm performance relationships in respective categories. The study confirms a positive association between the various aspects of sustainability and firm performance and finds that the strength of sustainability-firm performance relationships grows over time. Findings also suggest a stronger relationship between sustainability-firm performances in manufacturing industries than in service industries. This study provides interesting insights for policymakers and companies in various economies, and it augments the understanding of the impact of sustainable supply chain practices on firm performance.

1. Introduction

In recent years, sustainability has been a topic of discussion in major global forums, including the United Nations. These forums highlighted the need for organizations to understand the importance of achieving sustainability in their business activities. It is also essential for the firm to know whether their sustainable practices are paying off, which makes it important to measure the impact of sustainability practices from 3BL perspective on firm performance (Margolis et al., 2007; Darbari, Kannan, Agarwal, & Jha, 2019). A

Abbreviations: CSR, corporate social responsibility; GrSCM, green supply chain management; GDP, gross domestic product; NRBV, natural resource based view; RBV, resource based view; SRI, socially responsible investing; SCM, supply chain management; SSCM, sustainable supply chain management; 3BL, triple bottom line; UN, United Nations

∗Corresponding author.
E-mail address: kgov@iti.sdu.dk (K. Govindan).

https://doi.org/10.1016/j.tre.2020.101923
Received 21 November 2019; Received in revised form 18 March 2020; Accepted 20 March 2020
Available online 13 April 2020

1366-5545/ © 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/BY/4.0/).
firm’s performance is generally evaluated from its efficiency, profitability, or its operating and financial ratios (Rao & Holt, 2005; Tan & Wang, 2010; Carter & Rogers, 2008). Hart and Milstein (2003) indicated that, while studying firm performance, most earlier studies had not considered the impact of social and environmental practices. Extant literature, however, has begun to explore the role of societal and environmentally friendly practices to strengthen a firm’s performance. The question now is, “how impactful are sustainable, social, and environmental practices on the various aspects of a firm’s performance?”

Hart and Milstein (2003) highlighted the difficulties in studying sustainable development strategies beyond firm boundaries. Therefore, this study attempts to synthesize the findings of the impact of sustainable practices on focal firms’ performance using research findings from previous studies over multiple contexts from a supply chain perspective. Meta-analysis studies on sustainability literature were done in the past with a significant focus on environmentally sustainable practices (Dixon-Fowler et al., 2013; Golicic and Smith, 2013), but a comprehensive analysis of studies addressing social sustainability along with environmental sustainability was found missing. In recent years, the sustainable supply chain and sustainable circular supply chain area has attracted many researchers and practitioners (Biswas et al., 2018; Saberi, 2018; Kannan, Minna, Nosrati-Abarghooei, & Khoosrojerdi, 2020; Mardani, Kannan, Hooker, Ozkul, Alrasheedi, & Tirkolaee, 2020). In a similar view, Villena and Gioia (2018) explored supply chain sustainability concerning the riskiness involved in the lower tier supplier. Bentahar and Benzhidia (2018, p. 202) define Sustainable Supply Chain Management (SSCM) as: “the integration of economic, environmental and social dimensions into the management of intra- and inter-organizational flows, through innovative and collaborative approaches, with the objective of creating sustainable value.” This study objectively examines the link that exists between various sustainable practices in supply chains and their influence on firms’ performance using a psychometric meta-analysis approach. Additionally, the study attempts to explore the impact of moderators such as the economic status of developing or developed countries, the industry type, and the temporal aspects of sustainability practices on firm performance. Thus, this study attempts to move beyond the broad question “does it pay to be good?” (Margolis et al., 2007) to a more specific question “Under what circumstances does it pay to be good?”

Proper understanding of the nuances in the relationship between SSCM (with associated practices) and firm performance (or vice versa) will help the stakeholders guide their firms to achieve higher performance by adopting sustainable practices. To better understand the contribution to the literature, this paper is arranged as follows. Section 2 captures the theoretical background to finalize the research objectives through a detailed literature search of the various dimensions of the 3BL. Section 3 presents the hypothesis proposed, along with the research framework and meta-analytic process followed, to study the variation in the strength of various relationships. Section 4 depicts the methodology followed in conducting the study, and Section 5 gives the detailed results of meta-analytic studies. Section 6 discusses and highlights the major contributions of the study to the literature through the theoretical and practical implications. The final section presents the conclusion and potential future research direction in this domain.

2. Theoretical background

Following Natural Resource Based View (NRBV), Golicic and Smith (2013) studied the link between green practices and their impact on a firm’s economic and environmental performance. They argued that a firm’s relationship with the natural environment might be used as a competitive advantage. Mao et al. (2017) also used the NRBV lens to analyze the relationship between carbon emission reductions and firm performance. The study indicated that reducing carbon emissions through process improvements improve the firm’s environmental performance but may hinder financial performance. An earlier study by Hart (1995) indicated that the capabilities based on lean-green strategies, material reduction, pollution reduction, and increased process efficiency simultaneously improve the ecological and financial performance of the firm, which was later empirically proven (de Sousa Jabbour et al., 2014). Further, the Resource Based view (RBV) supports the claim that sustainability-based operations improve the firm’s performance by developing certain markets and by differentiating intangible resources such as organizational culture (Howard-Grenville and Hoffman, 2003), trust (Yuen et al., 2018), innovation (Klassen and Whybark, 1999; Chiou et al., 2011), and human resources (Russo and Harrison, 2005).

Reviews by Wood and Jones (1995) and McWilliams and Siegel (2001) confirm the linkage between CSR and Financial Performance. Also, following stakeholder theory, Campbell (2007) and Bird et al. (2007) argued that firms might find it challenging to sustain their profitability and market share without creating value for stakeholders. Hart and Dowell (2011) and Wood (2010) stated that strategic management literature rarely had made a comprehensive attempt to understand the link between sustainable development strategies and firm performance (except the CSR perspective). Martinez-Conesa et al. (2017) studied the relationship between organizational innovations and firm performance and confirmed that strategic CSR initiatives improve the efficiency, innovativeness, and effectiveness of the organization. González-Benito and González-Benito (2005), Sanche et al. (2015) and Li et al., (2019) have also attempted to study the specific link between ecological and societal practices with respect to firm performance.

Contrary to the encouraging findings of the above theories, a negative relationship between sustainability practices and firm performance is often argued based on neoclassical economics theories. Apperle et al. (1985) claimed that a firm that opts for proactive sustainability practices ends up with a competitive disadvantage. Lazonick and O’Sullivan (2000) used Principal-Agent theory to argue that the primary responsibility of firms is to generate profit for its shareholders; hence, becoming involved in social/environmental sustainability practices reduces profit and leads to a high agency relationship cost. Barnett and Salomon (2006) argue that sustainability activities incur direct cost on the firms leading to reduced financial performance. Choi and Cai (2018) also points out the tradeoff between cost saving aspects of operations and environmental performance.

Most of the previous reviews in sustainable supply chain literature were based on qualitative content analysis, and they lack conclusive proof regarding the nature of the relationship between sustainable practices and the performance of the firm. This study is motivated by the lack of conclusive research on multiple aspects of sustainability, including Green Supply Chain Management.
(GrSCM) practices (Rao and Holt, 2005; Srivastava, 2007), SSCM practices (Linton et al., 2007; Golicic and Smith, 2013; Carter & Rogers, 2008; Mathivathanan, Kannan, & Haq, 2018; Kannan, 2018), and socially sustainable practices (Wood, 2010; Wang et al., 2015; Tang, 2018; Soundararajan and Brammer, 2018; Kalkanci et al., 2019) on focal firm performance (henceforth referred to as firm performance). Earlier research has made considerable efforts to differentiate GrSCM from SSCM practices (see Ahi and Searcy (2013)). Therefore, there is a necessity for a detailed comparison of various types of sustainability practices and their impact on firm performance. This study focuses on the 3BL, viewed from the lenses of NRBV and stakeholder theory. Multiple moderators have been identified and analyzed using sub-group analysis.

The present study follows a modified approach (with additional analysis; see Table 2) similar to the methods used in Mackelpinprang and Nair (2010), Wowak et al. (2013), and Dixon-Fowler et al. (2013) to perform a psychometric meta-analysis process and to study the impact of various moderators. This paper builds on earlier research by integrating empirical results across various study frameworks; it assists in exploring theoretical moderators and statistical artifacts that mitigate the highly variable results cited across previous studies. The main objectives of this paper are to:

• Present statistical integration of the research on the relationship between various sustainability practices in supply chains and firm performance. The relevant question is: What is the relationship between various sustainability practices (GrSCM, Social SCM, and SSCM) on firm performance? An associated research question is: How does the relation between various sustainability practices influence the operational performance and financial performance of firms? The goal is to assess the individual performance of environmental and social sustainability practices on different types of firm performances.
• Examine under what circumstances the relationship is stronger, using moderators such as the economic status of a country, industry type, and temporal aspects. The relevant question is: How is the relation moderated between various sustainability practices and firm performance by the economic status of the country, industry category, and time? The method used in this paper is to perform a sub-group meta-analysis based on the identified firm categories.

Meta-analysis is a proven method used for consolidating the findings using previous individual studies with inconclusive or conflicting results (e.g., Rosenthal and DiMatteo, 2001). Meta-analytic studies reduce the community biases, enable inter-industry comparisons, and most importantly, synthesize existing studies to bring out more generalizable results for conflicting relationships, which is critical for enhancing knowledge (Singhal and Singhal, 2012). By statistically aggregating effect-sizes of individual studies and by correcting statistical errors (ex: sampling and measurement error), psychometric meta-analysis provides greater precision for generalized results. Since 2000, there have been 12 meta-analytic studies (Table 1) seeking to understand the relationship between sustainability practices and firm performance. Table 1 (initial rows) clearly highlights the contribution of the present study to literature summarizing these varied theoretical lenses. Moreover, post-2011 studies did not focus on sustainability practices from supply chain perspective. The study by Geng et al. (2017) attempts to consolidate the findings from Asian emerging economies but focuses only on environmental sustainability perspective.

3. Proposed hypotheses

This section presents various hypotheses to understand the relationship between GrSCM practices, socially sustainable practices, and SSCM practices based on various theoretical lenses. Additionally, moderator variables, based on the types of industries, economic development of the region, and the effect of time period of study, have been identified. Finally, based on the proposed hypothesis and identified moderator variables, a theoretical research framework has been proposed for detailed analysis.

3.1. Overall sustainability practices and firm performance relationship

With increasing pressure for sustainable development in industries across the globe, it is necessary to conduct a comprehensive study that addresses the individual as well as the combined effects of sustainability practices from various dimensions within the supply chain on firm performance. Based on NRBV, it is anticipated that environmentally sensitive operations and practices of a company in any part of its supply chain will result in improved firm performance. The improvement in firm performance can be through increased operational performance due to improved collaboration between suppliers (Gavronski et al., 2011) and through the development of environmental specific capabilities as part of green supply chain practices, which results in improvement of operational performance (Vachon and Klassen, 2008). Improvement in firm performance can also be due to lower carbon tax, pollution penalties, and resource wastage (Lo et al., 2012; Dong et al., 2019), or by better margins obtained through sales of environmentally friendly products to environmentally conscious customers (Kim and Han, 2010; Sheu and Choi, 2019). For this study, we define GrSCM as the set of practices that improve environmental performance during development, production, procurement, and distribution of a product or service to the end-user along the supply chain (Golicic and Smith, 2013).

Using the instrumental stakeholder theory, Jones (1995) suggested that stakeholders will reward ethical and socially responsible actions through CSR initiatives that result in higher firm performance. Freeman (2010) broadly defines stakeholders as the players in a firm who can influence the production activities of the firm or who bear environmental consequences for the extent of pollution caused. Studies have also pointed out that external stakeholders like NGOs can impact the brand image and financial performance of organizations (Chen et al., 2019). Socially responsible practices lead to improved firm performance through reduction in risk along the supply chain and through improved stakeholder involvement (Gualandris et al., 2015; Fahimnia and Jabbarzadeh, 2016). For the purpose of the study, we define socially sustainable supply chain practices as the set of practices that improve the social performance
| Meta-analytic studies in evolution of SSCM | Study Data used | No of Papers | Sample size | Theoretical Lenses for Meta-analytic study | Focus |
|------------------------------------------|----------------|--------------|-------------|------------------------------------------|-------|
|                                          |                |              |             | NRBV | RBV | Stakeholder | Agency Theory | Transaction Cost | Signalling Theory | Institutional Logic/Theory | Firm | Supply Chain |
| Orlitzky (2001)                          | 1975–97        | 20           | 4246        | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Orlitzky et al. (2003)                   | 1972–97        | 52           | 33,878      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Margolis et al. (2007)                   | 1972–07        | 167          | 27,867      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Orlitzky (2011)                          | 1972–97        | 52           | 33,878      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Quazi and Richardson (2012)              | 1974–99        | 51           | 33,878      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Golicic and Smith (2013)                 | 2000–11        | 31           | 15,160      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Rathner (2013)                           | 1991–11        | 25           | 38,526      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Mar Miras-Rodriguez et al. (2015)        | 2001–13        | 103          | 31,878      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Dixon-Fowler et al. (2013)               | 1970–09        | 39           | 22,869      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Revelli and Viviani (2014)               | 1972–12        | 85           | NA          | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Hou et al. (2016)                        | 2001–15        | 28           | 31,773      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Wang et al. (2016)                       | 2004–11        | 42           | 72,024      | x    | x   | x           | x              | x              | x              | x                | x    |             |
| Present study                            | 2010–17        | 118          | 47,019      | x    | x   | x           | x              | x              | x              | x                | x    |             |

| Meta-analytic studies in evolution of SSCM | Independent Variable (IV) | Dependent Variable (DV) | Sustainability lens (3BL) | Moderators | Model | No of Hypothesis |
|--------------------------------------------|----------------------------|--------------------------|--------------------------|-------------|-------|------------------|
|                                            | CSR | SRI | GrSCM | SSCM | Financial | Operational | Economic | Environment | Society | Firm size | Type, organizational learning, and reputation | Path model | 1 |
|                                            | X   | X   | X    | X    | X         | X            | X        | X          | x        | x        | x        | x        | x        | x | 5 |
|                                            | X   | X   | X    | X    | X         | X            | X        | x          | x        | x        | x        | x        | x        | x | 4 |
| Margolis et al. (2007)                     | X   | X   | X    | X    | X         | X            | X        | x          | x        | x        | x        | x        | x        | x | 3 |
| Orlitzky (2011)                            | X   | X   | X    | X    | X         | X            | X        | x          | x        | x        | x        | x        | x        | x | 3 |
| Quazi and Richardson (2012)                | X   | X   | X    | X    | X         | X            | X        | x          | x        | x        | x        | x        | x        | x | 2 |
| Golicic and Smith (2013)                   | X   | X   | X    | X    | X         | X            | X        | x          | x        | x        | x        | x        | x        | x | 1 |

(continued on next page)
| Meta-analytic studies in evolution of SSCM | Study Data | No of Papers used | Sample size | Theoretical Lenses for Meta-analytic study | Focus | Institutional Logic/Theory | Firm | Supply Chain |
|----------------------------------------|------------|------------------|-------------|------------------------------------------|-------|---------------------------|------|-------------|
|                                        |            |                  |             | NRBV | RBV | Stakeholder | Agency Theory | Transaction Cost economics | Signalling Theory | Time period, survival bias | Regression model | Fixed effect | 1 |
| Rathner (2013)                         | X          |                  |             | X    |     | X           | X             | X                        | X                | National culture            | Fixed effect | NA          |
| Mar Miras-Rodriguez et al. (2015)      | X          |                  |             | X    |     | X           | X             | X                        | X                | Environmental strategy, firm characteristics and methodology | Random effect | NA          |
| Dixon-Fowler et al. (2013)             | X          |                  |             | X    |     | X           | X             | X                        | X                | Fixed effect               | Random effect | NA          |
| Revelli and Viviani (2014)             | X          |                  |             | X    |     | X           | X             | X                        | X                | Economic development, type IV | Random effect | 7 |
| Hou et al. (2016)                      | X          |                  |             | X    |     | X           | X             | X                        | X                | Economic development, type IV | Random effect | 6 |
| Wang et al. (2016)                     | X          |                  |             | X    |     | X           | X             | X                        | X                | Economic development, time period, industry type, DV, IV | Random effect | 15 |
| Present study                          | X          |                  |             | X    |     | X           | X             | X                        | X                | Economic development, time period, industry type, DV, IV | Random effect | 15 |

K. Govindan, et al. Transportation Research Part E 137 (2020) 101923
(e.g., safety, equity, ethics, human rights, health and welfare, etc.) during development, procurement, production, and distribution of a product or service along the supply chain (Nichols et al., 2019).

Similarly, Sustainable Development from the combined pillars of environmentally conscious activities and socially responsible activities, along with economic consideration, is often studied in the CSR literature. Hart (1995) suggests that firms can improve their performance by adopting pollution prevention, sustainable development, and product stewardship as their main strategic capabilities. Hart and Dowell (2011) indicate that a sustainable development strategy that includes all 3BL aspects of firm performance is of utmost importance in the modern industrial world; sustainable development strategies of firms will lead to sustained and improved competitive advantage and higher firm performance. This study considers SSCM as a set of activities that simultaneously consider both environmentally conscious and socially responsible practices along the supply chain with a focus on economic viability (Ahi and Searcy, 2013; Yuen et al., 2019). Hence, we are proposing the hypothesis (H1) from the above discussion as:

\[
\text{H1: GrSCM practices, Socially responsible SCM practices, as well as SSCM practices, are positively correlated with firm performance.}
\]

Subsequently, the study also investigates the effect of several potential moderators that have been involved over time to assist sustainability practices and firm performance.

3.2. Moderators (sub-group) effects

Manufacturing industries are characterized by high levels of resource consumption and emissions that create high environmental and social impact (Cui et al., 2019; Rajeev et al., 2019). The pollution emitted by a firm is a potential moderator for the relationship between sustainable practices and firm performance (Konar and Cohen, 2001). Greater regulatory and stakeholder pressure on manufacturing industries generally increases the adoption rate of sustainable practices and leads to better firm performance (Dai et al., 2014). Tukker (2004) indicates that the relationship between sustainability practices and firm performance will be stronger for manufacturing industries as compared to that of service industries. In this following set of hypotheses, it is argued that the impact of various types of sustainability practices on firm performance will be higher for manufacturing industries than for service industries. It is hypothesized that:

\[
\text{H2: GrSCM practices, Socially responsible SCM practices, as well as SSCM practices and firm performance, are more positively correlated in manufacturing industries than in service industries.}
\]

Campbell (2007), from an institutional theory perspective, argues that organizations adopt socially and environmentally responsible business practices due to government regulations and pressure from Non-Governmental Organizations, thereby following the institutionalized norms. It is worth noting that the rules and regulations are often more firmly established in developed countries than in developing countries (Wu and Jia, 2018). Also, the higher level of environmental taxes in developed countries incentivizes the firms to shift to sustainable sourcing (Choi, 2013). It has also been argued that environmental concern is positively correlated with GDP per capita (Franzen, 2003) and developed nations have a greater environmental concern (Inglehart, 1997). This change in environmental concern is triggered due to the shifting of consumer psyche from materialistic values to post-materialistic values due to increasing income (Inglehart, 1997; Hong et al., 2018). So, companies that exhibit better environmental performances are expected to be rewarded higher in developed countries than in developing countries. Delmas and Toffel (2004) use the stakeholder theory perspective to indicate that society exerts pressure on organizations to adopt sustainable business practices, which results in higher operational and financial benefits for firms. In addition, Zhu et al. (2008) claim that customers in developed countries have a higher level of social awareness, which enhances stakeholder pressure. The lack of availability of quality data for decision making in developing countries is an additional reason for lower sustainability performance. Hence, it is believed that the relationship between sustainability practices and firm performance will be higher in developed economies than those in developing economies. The corresponding hypothesis is:

\[
\text{H3: GrSCM practices, Socially responsible SCM practices, as well as SSCM practices and firm performance, are more positively correlated for industries in developed economies than for those in developing economies.}
\]

Successful implementation of supply chain strategies has been used conventionally to differentiate between competing supply chains. The significance of sustainability-based competitive strategies is increasing due to changing business environment (Craighead et al., 2009). As customers in both developed and developing economies become more aware, they demand cleaner production and socially sustainable business practices (Rondinelli and Berry, 2000; Gao et al., 2018). Also, the availability of better quality data and advanced data analysis methods improves the sustainability performance of firms with time (Choi, 2018; Shen et al., 2019). Sustainable development policies and frameworks at global levels are continuously evolving and updated during various UN climate change conventions. To attain specified objectives, member nations continuously monitor and update regulations and adopt necessary policies with the objective of improving sustainability performance. With more countries around the globe choosing to improve sustainability in recent years, researchers hypothesize that the impact of sustainability practices on firm performance will be higher in studies done post-2010.

\[
\text{H4: GrSCM practices, Socially responsible SCM practices, as well as SSCM practices and firm performance, will have a more positive}
\]

6
correlation for industries post-2010 than pre-2010.

As previously indicated, the measurement of firm performance is highly contextualized. That measure may be either operational performance or financial/accounting performance per the choice of the decision-maker. Glick et al. (2005) indicate that several works measure firm performance using a single indicator (i.e., one dimensional), even if they admit its multidimensionality (Crook et al., 2008; Richard et al., 2009). Kausik et al. (2016) state that “no single measure is, by itself, a comprehensive indicator of a firm’s ‘true’ performance”. Hence, the interpretation of the relationship between SSCM practices and firm performance depends heavily on the performance measure undertaken. Golicic and Smith (2013) indicate that the returns from any resource will depend on the type of the dependent variable used. Ray et al. (2004) argue that the effect of any strategic practice will have a higher impact on that specific process, like operational performance, than any other outcome variable such as the firm’s financial performance. Finally, it is also hypothesized that sustainability practices will have a higher impact on operational performance (through waste reduction, utility consumption, worker engagement, community support, etc.), than on financial variables such as accounting performance or return on investment.

**H5:** GrSCM practices, Socially responsible SCM practices, as well as SSCM practices and firm performance, have a more positive correlation for studies using operational performance measures than for those using financial performance measures.

Fig. 1 represents the research framework based on 3BL aspects of supply chain practices and its impact on firm performance, along with the potential moderators, as proposed in the above hypotheses.

### 4. Methodology

This section attempts to provide the detailed process of sample selection, data collection, and subsequently the meta-analytic procedure adopted to attain the objective of the study.

#### 4.1. Sample selection and data collection

This study attempts to address the stated objectives by collating literature dealing with Environmental/GrSCM, Social SCM, and SSCM practices impacting various measures of firm performance from the years 2010 to 2018.

Scopus, EBSCO, and ProQuest databases were selected to perform popularly used keyword-based searches; the following words were utilized: performance and sustainability, green/lean/sustainable practices, safety, social responsibility, CSR, environmental management, reverse logistics, environmental practices, closed-loop, etc. To ensure that no papers were omitted, we cross-checked with major databases, including ScienceDirect, Emerald Management Plus, SpringerLink, Wiley Interscience, and Taylor and Francis. Over 1500 articles were collected on SSCM and GrSCM from 2010 to 2018 (with a significant increase, some 70%, in studies post-
2010). Studies post 2010 started exploring various dimensions of sustainability within supply chains. This significant increase may be attributed to the 2009 Copenhagen Summit agreement, among other global developments towards an increased focus on sustainable development. Hence, this meta-analytic study captures only papers published from 2010 onwards. Upcoming trends can be captured to fill the lack of meta-analytic studies using data collected post-2010 using the identified theoretical lenses. This sample also helps test the hypothesis in the present period. The following selection steps were carried out:

(a) Screening based on the quality of publication: Publication quality was assessed based on presence in journal rankings (ABDC (2013) /ABS/ Scimago etc.), which helped reduce the number of studies to 782.

(b) Empirical Qualification: We eliminated non-empirical papers (studies using non-rigorous quantitative studies such as informational surveys or qualitative methods). Exploratory studies and semi-structured interviews were removed (due to lack of effect size reporting). Only quantitative empirical studies were considered in the study, including those that reported correlation tables of variables.

(c) Decision Variable Qualification: We eliminated articles that did not have firm financial and operational performance as a dependent or outcome variable. Studies that did not capture an environmental, social, or sustainable supply chain practice as the independent variable were not selected. Based on the three abovementioned imposed filters, a final sample of 129 studies was obtained.

An individual effect is taken as the unit of analysis used, and we obtained 167 effects from 129 studies. The 167 effects size is based on a total of 49,543 samples from across the globe, using multiple scales. Most of the studies used bi-variate regression (or multivariate regression) and structural equation modeling, respectively, for studying the relationship between sustainability and firm performance. CSR-based studies mostly used secondary data, whereas sustainable operation papers most often used primary data. The effect sizes of various studies were extracted from the correlation table and were classified based on the parameters of the study. This study is one of the largest and most diverse samples in this emerging area. A major assumption of the screening is that all the firms have at least economics or profitability as a dependent variable. Details of all papers used in the analysis are given separately in Appendix 3.

As the research on SSCM is still evolving, some difficulty is expected in collating the significant number of studies under similar external business environments. The unit of measurement for firm performance is not established; the literature also concludes there is no consensus regarding measurement matrices for firm performance. This lack of consensus might be considered one of the major limitations of this study. However, the insights from the study are still expected to provide necessary inputs for future research in the evolving domain.

4.2. Characteristics of primary sample studies

Preliminary analysis of the data indicates a rising trend towards studying SSCM (at various entity levels) and the firm’s performance relationship. A detailed content analysis of the collated literature finds that the studies have been steadily increasing over the years, a finding that highlights the growing importance of the domain. Because there are substantial numbers of publications from developed and developing economies, a comparison of results across economies and time periods is expected to provide interesting inputs from the meta-analysis. An industry-based classification of data has been performed, and it found that most studies (86) use multiple industry data to identify the relationship between sustainability practices and firm performance. Hence, the impact of various industries (manufacturing versus services) should be examined to determine sustainability practices on firm performance. The type of sustainability being studied has been classified into GrSCM as follows. First, green/environmentally friendly practices were investigated in 99 studies, including those based on environmental-focused practices in any part of the supply chain. Social sustainability practices done on any part of the supply chain for the benefit of society were found in 28 studies. Finally, SSCM, which takes care of socio-environmental aspects on the performance of the supply chain and economic aspects, could be seen in 40 studies from the collated literature.

The sample studies were categorized into manufacturing and service-based studies for the purpose of moderator analysis, where the categorization of study samples was done based on the two-digit Standard Industrial Classification code (Ehie and Olibe, 2010). The studies that could not be properly categorized into any of the above classifications were included in both categories to avoid bias. Each country’s economic status was obtained from the 2015 UN classification of developed and developing countries. Similarly, a time zone-based classification of articles on data collected pre- and post-2010 was done. To classify firm performance-based studies, financial and operational units of measurement have been implemented on the classification provided by Golicic and Smith (2013).

4.3. Meta-analysis procedure

This study followed a psychometric meta-analysis methodology proposed by Schmidt and Hunter (2014) for testing the proposed hypothesis. The effect size used in the study is the correlation coefficient between sustainability practice construct and firm performance construct as in Mackelprang and Nair (2010). Table 2 explains in detail the steps followed in conducting the meta-analysis for this study. According to Hollingworth (2003), meta-analysis does not correct the measurement error inherent in the studies (resulting from imperfections in the scale used for measuring constructs), but it does correct sampling errors in primary data-based studies. Hence, this study attempts to reduce measurement errors by correcting the final effect size with the mean of available reliability coefficients using the correction formula suggested by Schmidt and Hunter (2014).
Table 2
Meta-analysis Steps for this Study.

Step 1: Identification of articles based on the research problem to be studied using keyword search technique with keywords such as “performance” and “sustainable”, “supply chain”, “green”, “social”, etc.

Step 2: Selection of articles based on phenomena to be studied: i.e., papers reporting relationships between impact of various sustainability initiatives in supply chain on focal firm performance.

Step 3: Classification of different types of variables used in the selected articles for studying the relationship and also selection of other variables of interest for the study (industry type, time of study, economy of country, etc.)

Step 4: Selection of type of effect size (i.e., correlation or standardized regression scores) to explore relationships between variables. In this paper, correlation values have been used as a measure of unbiased estimator (to counter different scales considered in various studies) to explore relationship between variables.

Step 5: Abstraction of relevant data from the selected papers based on the hypothesis to be tested. Data collected include effect size, sample size, sub group and moderator variables.

Step 6a: Analysis of dataset to get total effect size and range of the effects. For instance, the present study estimated the mean effect size using the mean of random effect weighted correlation (Schmidt and Hunter, 2014):

\[
I^2 = \left(\frac{(Q - df)}{Q}\right) \times 100\%.
\]

If the \(I^2\) statistics is very high (> 75%), it implies there is true variance in the population relationship (for details, refer Borenstein et al., 2009) and in such situations, a sub-group analysis should be performed.

Step 6b: Perform the correction of obtained mean effect size to reduce measurement error. Hence, the present study uses reliability of scale to reduce instrument bias. Calculate the corrected \(\bar{r}_{c}\) using the mean of the available reliability coefficients (Schmidt and Hunter, 2014):

\[
\bar{r}_{c} = \frac{\bar{r}}{\sqrt{\sum w_i (\bar{r}_{ci}^2)}},
\]

where \(w_i\) weight of \(i^{th}\) study and \(\bar{r}\) is its reported effect size.

Step 6c: Test whether the amount of heterogeneity in the sample by calculating the proportion of observed variation makes a real difference in effect size. \(I^2\) statistics proposed by Higgins et al. (2003) has been used to calculate the heterogeneity in the sample using the below given formula:

\[
I^2 = \left(\frac{(Q - df)}{Q}\right) \times 100\%.
\]

If the \(I^2\) statistics is very high (> 75%), it implies there is true variance in the population relationship (for details, refer Borenstein et al., 2009) and in such situations, a sub-group analysis should be performed.

Step 6d: Perform a retrospective power analysis to verify whether there is sufficient power to sense small, medium, and large mean effect size alterations between sub-groups moderator (Cohen, 1988; Hedges and Pigott, 2004; Wowak et al., 2013). For the sample under consideration, small mean effect size alteration between sub-groups moderator has been observed.

Step 6e: Assess the publication bias and variability to know the influence of bias on the meta-analysis outcomes. Follow with an estimation of type of model to be used (i.e., Fixed/random effects model and report values). Develop funnel plots and use Trim and Fill method (Duval and Tweedie, 2000) to identify heterogeneity in the sample and the degree of impact, bias it has on the results (McDaniel et al., 2006). Moreover, random effects model should be used to conduct the study when the sample is heterogeneous in nature (Card, 2015).

Step 7a: Subgroup/moderator analysis is performed on the data to conduct in-depth statistical analysis to identify significant relationships between factors and the impact of various subgroups on it. For instance, in this study geographical factors, nature of industry, timeline of study were analyzed to identify the effect of various subgroups on relationship between firm performance and sustainability practices.

Step 7b: Testing of hypothesis in the presence of significant moderators; three major approaches are used by Aguinis et al. (2008), based on Aguinis and Pierce (1998) and Schmidt and Hunter (2014). In case of confounding moderators, hierarchical subgroup analysis (Schmidt, 2017) or meta-regression needs to be performed. It has been found that hierarchical subgroup analysis provides better results in such cases (Schmidt, 2017). However, in most cases it is difficult to conduct meta-analysis based on hierarchical subgroup analysis due to data scarcity. In this study, test procedure as mentioned in Schmidt and Hunter (2014) is followed to check the presence of moderators and inter-group heterogeneity. Subsequently, to check if the moderators have significant impact on the average effect size Aguinis and Pierce (1998, Equation 9) is used.

Furthermore, publication bias calculations were performed to assess whether any bias based on the selected papers will affect the results. A high value of \(F^2\) suggests that there is a high proportion of variability due to heterogeneity between studies (Borenstein et al., 2009). This strengthens the case of the present study for sub-group moderator analysis. Because there was high heterogeneity in the sample, a random-effects model analysis was used to incorporate the variation due to the sample’s heterogeneity and its outputs. By following the random-effects model (suggested by Hedges and Vevea, 1998), the assumption that the population effect sizes are the same across studies is significantly reduced/canceled.

5. Results

5.1. Overall sustainability practices – Firm performance relationships

To guide the analysis, this paper utilizes the method developed by Schmidt and Hunter (2014) and is applied in a similar context (Nair, 2006; Wowak et al., 2013). As per the method, for the mean population correlation to be greater than zero, the value of RATIO1 should be greater than \(^1\) or equal to 2. (RATIO1 is the ratio between mean correlation and population standard deviation). For testing the presence of moderators, Chi-square statistics are calculated to see if the amount of unexplained variance is larger than expected (Wowak et al., 2013). Hypotheses H1 was tested by analyzing the RATIO1 of sub-samples using the unit of analysis, covering studies from GrSCM, Social SCM, and SSCM perspectives. Table 3 reports the test results of the H1 hypotheses. H1 results support that GrSCM practices are positively correlated with firm performance. The estimate of the effect size is \(\bar{r} = 0.32\), which, after correcting for measurement error updates to \(\bar{r}_{c} = 0.37\) (RATIO1(12.25) > 2). The results also support that socially sustainable practices are positively correlated with firm performance. The estimate of the effect size is \(\bar{r} = 0.197\) with corrected correlation \(\bar{r}_{c} = 0.227\) (RATIO1(3.79) > 2). Similarly, it also demonstrates that SSCM practices are positively correlated to firm performance with effect size estimates of \(\bar{r} = 0.21\) and \(\bar{r}_{c} = 0.245\) (RATIO1(8.19) > 2). For the hypotheses, \(I^2\) statistics are > 88% (> than the

\(^1\) “A value greater than 2 implies that a positive correlation exists between the variables considered”.

K. Govindan, et al.
Transportation Research Part E 137 (2020) 101923
The higher correlation and smaller spread of CI range (Table 3 and Fig. 2) between green supply chain practices and firm performance indicate that firms adopting GrSCM practices are more economically benefited compared to firms practicing social or sustainable supply chain practices. Presently, although the world community is talking about sustainability, the result indicates most firms have a lack of empathy towards social issues. This observation calls for further research in the area of SSCM with an increased emphasis on social aspects for the practitioners in addition to GrSCM practices that are currently adopted. As the entire hypothesis was supported, it indicates that investment in sustainability practices will result in improved firm performance.

5.2. Moderator analysis

Table 4 offers a summary of the meta-analysis and test results for the additional hypotheses (H2-H5). These results evaluate the direct relationship between sustainability practices and firm performances for different industries categorized under service and manufacturing based firms. For the evaluation of the stated hypothesis, the collated papers were grouped into manufacturing or service industry. H2’s prediction that Green supply chain practices are more positively correlated with the firm performance of manufacturing firms than those of service firms was supported (Table 4). The estimate of the corrected mean effect size is $r = 0.45$ for manufacturing firms, compared to $r = 0.31$ for service firms. Socially sustainable practices are more positively associated with firm performance among manufacturing firms than among service firms was also supported. Since the effect size for service firms was not available, the net effect size of combined manufacturing and service firms was used for the analysis. The estimate of the mean effect size for manufacturing firms is $r = 0.48$ and that of service firms is $r = 0.16$. Similarly, in the case of sustainable supply chain management, an estimate of the corrected effect size for manufacturing firms is $r = 0.46$ and that of service firms is $r = 0.16$. The results clearly indicate that the impact of various practices studied is higher on manufacturing-centric firm performance compared to that of service-centric firms. The Chi-square test for variance between studies is also significant and supports the moderators. Subsequently, following the meta-analytic procedure depicted in Table 2, individual samples were checked for heterogeneity across groups, and it was found that intergroup heterogeneity is significant (Table 4).

Table 4 (second set) reports the summary of the meta-analysis and test results of the third hypotheses (H3), which compares the relationship of sustainability practices on firm performance in developed and developing economies. H3’s prediction, that Green supply chain management has a higher effect size in developing economies than in developed ones, was supported (Table 4). The estimate of the corrected mean effect size for developing economies is $r = 0.46$ and that of developed economies is $r = 0.16$. Similarly, in the case of sustainable supply chain management, an estimate of the corrected effect size for developing economies is $r = 0.46$ and that of developed economies is $r = 0.16$. The results clearly indicate that the impact of various practices studied is higher in developing economies compared to that of developed ones. The Chi-square test for variance between studies is also significant and supports the moderators. Subsequently, following the meta-analytic procedure depicted in Table 2, individual samples were checked for heterogeneity across groups, and it was found that intergroup heterogeneity is significant (Table 4).

Table 3
Summary of Meta-Analysis Results of H1.

| #  | Study name/Subgroup name | $\bar{r}$ | $\bar{r}$ | Confidence Interval Lower limit | Confidence Interval Upper limit | $P_{Q}$ | $I^2$ | RATIO1 |
|----|------------------------|---------|---------|-------------------------------|-------------------------------|---------|------|-------|
| H1 | GrSCM (1 in Fig. 2)    | 0.37    | 0.32    | 0.26                          | 0.37                          | > 0.001 | 0.962 12.25 |
|    | Social (2)             | 0.23    | 0.20    | 0.07                          | 0.32                          | > 0.001 | 0.945 3.80 |
|    | SSCM (3)               | 0.25    | 0.21    | 0.15                          | 0.28                          | > 0.001 | 0.943 8.19 |
|    | Combined effect size (4)| 0.29    | 0.25    | 0.17                          | 0.33                          | > 0.001 | 0.96 14.48 |

Fig. 2. Average effect size of sub-groups and overall study and Funnel plot
supply chain practices are more positively associated with firm performance in developed economies over those of developing economies, was rejected. The estimate of the corrected effect size is \( \bar{r} = 0.49 \) for a developing economy firm against \( \bar{r} = 0.31 \) for a developed economy firm. As hypothesized, a more positive association for socially sustainable practices with firm performance in developed over developing economies was supported. The estimate of the corrected effect size for a developed economy firm is \( \bar{r} = 0.28 \) and that of a developing economy firm is \( \bar{r} = 0.197 \). Furthermore, the relationship was not supported in the case of sustainable supply chain practices firm performance relationship. An estimate of the corrected effect size for developed economy firms is \( \bar{r} = 0.16 \) and that of developing economy firms is \( \bar{r} = 0.48 \). For testing the hypothesis, following the meta-analytic procedure discussed in Table 2 (step 7b), individual samples were checked for heterogeneity across groups, and it was found that intergroup heterogeneity is significant (Table 4) in the case of H2, but the relationship established ran opposite to what was hypothesized. The relationship was found to be significant and as hypothesized for social sustainable SC practices. This indicates that customer awareness may not be the lone factor in driving higher returns for firms who invest in environmentally responsible practices. Two additional factors, visibility and the impact of pollution, are higher in developing economies because of greater population density and poverty. Hence, the observation follows the finding of hypothesis H3. Green and Sustainable supply chain practices lead to better firm performance in developing countries than in developed economies. Investing in social welfare leads to better firm performance in developed economies than in developing economies, which may explain why there is lower interest from academicians to study social issues in developing economies (Rajeev et al., 2017).

Table 4 (third set) reports the summary of the meta-analysis and test results of the fourth hypotheses (H4); our interpretation follows a similar approach. This is a direct comparison of relationships between sustainability practices and firm performance across two time periods: pre- and post-2010. The hypothesis predicted that GrSCM and SSCM practices respectively, are more positively associated with firm performance post-2010 were both supported by the study. It also predicted that socially sustainable practices are more positively associated with firm performance post-2010 than pre-2010, was supported. For testing the hypothesis, the meta-analytic procedure discussed in Table 2 was followed, and individual samples were checked for heterogeneity across groups, and it was found that intergroup heterogeneity is significant (Table 4). These positive results post 2010 could be due to an increased number of countries participating (agreeing to participate actively and take proactive measures to improve environmental and social scenarios) in various forums hosted by the United Nations (climate change summits, MDG, etc.). A rise in customer awareness over time in both developed and developing economies should also be noted (Rondinelli and Berry, 2000).

The last section of Table 4 reports the summary of the meta-analysis and test results of the fifth hypotheses (H5). All three hypotheses, that GrSCM, Social SCM and SSCM are more positively associated with firm’s operational performance than the firm’s financial performance, got support. As in the above analysis, individual samples were checked for heterogeneity across groups, and significant results were observed for green supply chain practices. In the case of social and sustainable supply chain practices, mean effect sizes were observed to be supporting the hypothesis, and the intergroup heterogeneity was significant. This supports the argument posed by (Ray et al., 2004) which says any strategic practice will have a higher impact on that specific process, like
operational performance, than other outcome variables like a firm’s financial performance. Hence, any improvement in the operational metric is directly impacted compared to the financial metric (which is expected to have lower immediate improvement due to the firm’s sustainability practices).

The summary of the meta-analysis conducted is presented in Fig. 1 (Appendix 1 also complies with the statistics of the meta-analysis). Publication bias was checked for each relationship, as it may affect the results. Publication bias is checked to assess whether the meta-analysis has covered a significant representative sample of the entire literature (Rothstein et al., 2006), as it is a major threat to validity. It avoids the risk of the sample being unrepresentative of the comprehensive literature choices that assess this relationship. Publication bias analysis based on the Funnel plot and Trim and Fill method was employed (as explained in Table 2, Step 6e). In this method, the studies required to improve the p-value are trimmed, and the revised p-value is calculated. If the difference before and after the trim and fill method is insignificant, it indicates an absence of publication bias. The funnel plots for the samples (combined, GrSCM, Social SCM, and SSCM) are given in Appendix 2. In this study, all relationships had minimal or no difference in p-value before and after Trim and Fill was applied; hence, it indicates that the collated studies/papers are a good representative of the actual population.

6. Discussion

6.1. Theoretical implications

Sustainability practices are essential for increasing the competitiveness of firms and its supply chain (Swink et al., 2010). The NRBV argues that the development of sustainability starts with increasing investments in pollution prevention activities followed by product stewardship. Considering the tests of hypothesis H1, it is suggested that the overall investments in sustainable supply chain practices reward the firms with higher performance, which indicates an increased competitive advantage. These results are in alignment with the previous meta-analysis (Orlitzky et al., 2003; Margolis et al., 2007; Golicic and Smith, 2013; Dixon-Fowler et al., 2013, Geng et al., 2017). A comparison of the mean effect size of the relationship between green, social, and sustainable supply chain practices on firms’ performance indicates that the green supply chain practices do lead to higher firm performance when compared to the performance of others. This supports the argument that pollution prevention and product stewardship practices lead to higher firm performance than social or sustainable development activities (Hart and Dowell, 2011). The result from SSCM and Social SCM supports the Instrumental Stakeholder theory that ethical and socially responsible actions through CSR initiatives will be rewarded by the stakeholders through higher firm performance (Jones, 1995). Considering the emphasis given on sustainability by the world bodies (UN), future studies should concentrate more on balancing social supply chain practices in addition to the environmental aspect of the business to achieve better performance. Thus, it helps to study the viability of business considering both lenses, including both NRBV and stakeholder theory.

Table 1 (with two segments) provides important insights into the major theoretical contributions of the present study in comparison to the previously conducted meta-analysis in various relevant fields leading to the evolution of sustainability concepts. Previous meta-analytic studies conducted post-2011 (Mar Miras-Rodríguez et al., 2015; Revelli and Viviani, 2014; Hou et al., 2016) utilized the lenses of institutional, signaling, and stakeholder theory only at the firm level. The present study, on the other hand, considers the lenses of NRBV and stakeholder theory, both of which are essential for achieving sustainability goals through the supply chain. This study considers papers from 2010 to 2018, which is relatively new and is more diverse in comparison with previous studies. In addition, the present study has considered both operational as well as financial performance of firms through the NRBV and stakeholder theoretical lenses in the unexplored domain of sustainable supply chain following the 3BL principle.

6.2. Overall relationship between sustainability practices and firm performance

6.2.1. Manufacturing and service industries

The hypotheses H2 got supported, that manufacturing firms influence firm performance more than service firms by implementing all identified sustainability practices, which is in line with popular literature (Tüker, 2004). This finding indicates that the sustainability level is comparatively better in service-based industries (Konar and Cohen, 2001). It also supports the argument that the sustainability of business models increases when the service component within it increases (Kastalli and Van Looy, 2013). It was determined that when product-based companies shift towards service-based offerings, they are incentivized for consuming fewer products while maintaining the same level of output (Mont, 2002). That also underscores the reason why the United Nations Environment Program (UNEP, 2015) promotes a Product service system as one method of attaining sustainability.

6.2.2. Developed and developing economies

Hypotheses H3 was rejected; they suggested that firms in developing countries yield more benefits by implementing GrSCM and SSCM practices than developed countries. Although per capita emission is high in developed countries, the impact due to high pollution on society is more in developing countries due to high population density. Demand in developed countries is fulfilled by manufacturing industries that reside in developing countries, and the trend is expected to continue. The result indicates that higher benefits will be obtained by investing in sustainability practices in developing economies compared to developed economies. This finding conflicts with the popular narrative that a higher level of social/environmental awareness leads to better rewards for a firm’s sustainability practices (Zhu et al., 2008). The results also suggest that process efficiency and waste reduction strategies are driving the profits in case of environmental supply chain practices rather than consumer environmental sensitivity, as suggested by Inglehart.
Researchers should consider that higher returns may occur in firms from developing economies because they have improved process efficiency through GrSCM practices rather than from consumers' willingness to pay for green products. The manufacturing technologies used in developing economies are observed to be inferior to that in developed economies. So, the incremental improvement in process efficiency and wastage reduction will be higher for unit investment in developing economies, which might be one reason for the better return for investment in environmental technologies in developing economies. The result achieved for social supply chain practices was as hypothesized and significant, and we conclude that the mean effect size was higher in the developed economy than in the developing economy. In other words, socially sustainable practices were rewarded more in developed countries’ firms than those in developing countries. It is also supported by Institutional theory (Campbell, 2007), which states that the CSR spending will be more in economies where the state regulation is in place to ensure such behavior. Due to weak regulatory frameworks, along with large numbers of people without basic income, the social impacts of business operations are often neglected in developing countries. This may explain the reason for the lower sensitivity of firms towards social sustainability practices in developing economies.

6.2.3. Pre 2010 and post 2010 studies

It was expected that, as time passes, the competitive advantage due to the implementation of sustainability practices would have an increased positive impact on firm performance. Hypotheses H4 was accepted; indeed, sustainability practices pay more as time passes, due to increased pressure both from stakeholders and from regulatory authorities (Craighead et al., 2009). It also indicates that customer awareness is increasing over time in both developed and developing economies; customers are more likely to demand cleaner production and socially sustainable business practices (Rondinelli and Berry, 2000). Each UN convention presents more stringent regulations to counter issues arising due to increasing pollution. The Copenhagen climate change summit, Paris Agreements, along with the acceptance of Millennium Development Goals, are important events leading to the participation of an increased number of developing nations proactively undertaking actions to achieve the sustainability deliverables in terms of carbon emissions reduction and social inclusion. In current negotiations, developed countries agreed to provide funding for carbon reduction of the order of US $100 billion a year by 2020 from multiple sources to the developing countries. It is expected that sustainability practices and firm performance relationship will get stronger in the coming years.

6.2.4. Operational, financial based performance measures

It was hypothesized in H5 that the type of firm performance measured would moderate the various relationship types between sustainability and firm performance. As expected, the reflection of sustainability practices on firm performance is better than that on operational performance, and it aligns with the findings of Golicic and Smith, (2013) and Geng et al. (2017). Hence, investment in sustainable practices affecting operational performance impacts reductions in environmental pollution. An improved environment leads to a direct positive impact on social aspects. In the long term, this will effectively cascade into improved financial performance. This result supports the fact that no single measure is, in itself, a comprehensive indicator of ‘true’ firm performance (Kausik et al., 2016). Future studies should include operational performance measures to study the impact of sustainability practices in firms (Ray et al., 2004).

6.3. Managerial implications

The results of this study suggest that the impact of sustainability practices is positive on focal firm performance in both financial as well as operational metrics. This should encourage organizations to adopt sustainable practices for attaining long-term benefits. The higher impact of sustainability practices on operational performance than financial performance means that policymakers and practitioners should measure the impact of sustainability practices using operational indicators to strengthen their decision making. Previous studies suggested that environmental practices would improve firm performance. In this study, it is clearly proven that all forms of sustainability – including GrSCM, SSCM, and Social sustainability practices – will lead to improved firm performance. Also demonstrated is that the level of improvement in firm performance differs with the adoption of sustainability practices across various economies of the world and industry classification. Sustainability practices in manufacturing industries derive more benefits in the present business environment as compared to the service sector. It is also to be noted that investment in environmentally sustainable practices in developing countries yields better results than in developed economies. Thus, multinational companies should take serious initiatives to develop or transfer clean technologies to developing countries. Practitioners should also note that the impact of sustainability practices on firm performance is growing over time and is expected to grow further in the coming years. Investment in sustainability initiatives will have to be taken seriously for ensuring the competence of firms.

7. Conclusion and implications for future research

This study attempted to consolidate the research finding in the SSCM practices and its impact on focal firm performance through NRBV and stakeholder-based theoretical perspectives. This approach helps to enhance the understanding of SSCM practices (from the lenses of NRBV and stakeholder theory) through the aspects of pollution prevention, product stewardship and sustainable development, and its effect on competitive advantage and firm performance. The results of this study confirm a positive link between all forms of sustainability practices and firm performance. The adoption of social and environmental sustainability practices has a positive impact on both the operational and financial performance of the firms across all economies and industry types. It is also observed that the relationship between sustainability practice and firm performance is higher in manufacturing industries than in...
service industries, which implies that manufacturing industries should invest more in sustainability practices along the supply chain than service industries. The study also points out the significance of investment in sustainability practices in developing economy firms. The analysis shows higher environmental practices and firm performance relationship in developing economies, which means that developing economy firms should invest more in environmental sustainability practices. The analysis also suggests that firms in developed economies should focus more on social sustainability practices along the supply chain than developing economy firms. The increasing strength of the sustainability–firm performance relationship along the years confirms the need for firms to invest more in sustainability practices than before. The comparatively stronger relationship between sustainability practices and operational performance suggests that the primary driver of higher firm performance is due to internal cost reduction rather than to external income from sustainability-conscious purchasing.

Future exploratory studies to identify moderator and mediator variables for these relationships should be pursued to expand the NRBV and Instrumental stakeholder theory. More research is required in the domains of social and sustainable supply chain development by finding interfaces between NRBV and instrumental stakeholder theory. This work expects to develop strategies for improving the sustainability of industries from a 3BL perspective. In the future, more industry-oriented studies are required, as sustainability practices in different industries will have a different impact on their competitiveness. Surveys should be carried out in a particular industry, in similar economies, to validate some of the findings from the present study in a contextualized environment.

Although the analysis confirms the presence of significant positive relationships between sustainability practices and firm performance, the presence of causality cannot be confirmed due to limitations with the meta-analysis methodology used, so that is a limitation of this study. The presence of heterogeneity in sub-group analysis and low $R^2$ values in moderator analysis also points to the need for future studies using hierarchical sub-group analysis using more data points. Since time-based data was not available, an analysis of the causality direction of the relationship was not studied. In the future, researchers can focus on studying the time-based causality (e.g., Bayesian inference) of sustainability practices on firm performance. Also, due to lack of data, this paper could not ascertain the individual effects of various sub-functions of the supply chain and their relationship with firm performance. Future studies can focus on variations in the impact of various levels of sustainability practices on firm performance (to include upstream, downstream, and closed loop).

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.

Appendix 1. Statistics of meta-analytics study sample

| Display # | Subgroup | Studies in subgroup | Q | $p_0$ | $I^2$ | $SE_{ES} (z)$ | Correlation | Corrected correlation | N | CI LL | CI UL |
|-----------|----------|--------------------|---|------|------|--------------|-------------|----------------------|---|------|------|
| H2        | GrSCM    | Multiple           | 62| 1509.577 | 2.7E-275| 0.955951 | 0.03742 | 0.300153 | 0.345799 | 24,322 | 0.230614 | 0.366442 |
|           | Manufacturing | Service       | 8 | 90.01882 | 1.23E-16| 0.922238 | 0.103387 | 0.264629 | 0.304872 | 1917 | 0.018097 | 0.480827 |
| Social    | Multiple  | Service          | 9 | 21,530.37 | 0.005864 | 0.628432 | 0.042277 | 0.134645 | 0.155121 | 2022 | 0.035482 | 0.231182 |
| Social    | Developing| GrSCM            | 43| 944.0777 | 1.3E-170| 0.955512 | 0.043794 | 0.425657 | 0.490294 | 11,585 | 0.35052 | 0.495198 |
|           | Developing| Developed        | 47| 990.0921 | 1.8E-177| 0.95354 | 0.039215 | 0.270732 | 0.311903 | 18,746 | 0.196096 | 0.342248 |
| Social    | Developing| GrSCM            | 13| 340.7185 | 1.27E-65| 0.96478 | 0.127301 | 0.171473 | 0.19755 | 3898 | -0.1066 | 0.426667 |
| Social    | Developing| Developed        | 9 | 132.5347 | 8.43E-25| 0.939638 | 0.088849 | 0.417417 | 0.480895 | 2176 | 0.23062 | 0.574795 |
| H3        | GrSCM    | Developing       | 25 | 355.8729 | 1.19E-59| 0.92694 | 0.030255 | 0.138832 | 0.159944 | 16,631 | 0.077269 | 0.199339 |
| H4        | GrSCM    | Post 2010       | 71 | 1423.313 | 2.9E-251| 0.950819 | 0.033741 | 0.380257 | 0.438084 | 16,874 | 0.321258 | 0.482444 |
|           | Pre 2010 | Post 2010       | 28 | 581.5628 | 2E-105 | 0.953573 | 0.050196 | 0.155252 | 0.178862 | 16,136 | 0.053287 | 0.254013 |
| Social    | Post 2010| Pre 2010        | 19 | 274.3513 | 8.79E-48| 0.934391 | 0.051807 | 0.28186 | 0.324723 | 5613 | 0.178466 | 0.379097 |
| Social    | Post 2010| GrSCM           | 9 | 173.1419 | 2.83E-33| 0.953795 | 0.153597 | 0.010292 | 0.011857 | 4210 | -0.33895 | 0.357042 |
| SSCM      | Post 2010| Pre 2010        | 15 | 235.5159 | 2.82E-42| 0.940556 | 0.065788 | 0.31963 | 0.368621 | 4184 | 0.187243 | 0.441211 |
| SSCM      | Pre 2010 | GrSCM           | 25 | 409.0386 | 1.05E-71| 0.953573 | 0.050196 | 0.155252 | 0.178862 | 16,136 | 0.053287 | 0.254013 |
| H5        | GrSCM    | Financial       | 59 | 1342.338 | 1.6E-242| 0.956792 | 0.037944 | 0.253016 | 0.291493 | 23,017 | 0.180646 | 0.322662 |
|           | Operational| Social       | 40 | 989.5403 | 3.5E-182| 0.960588 | 0.044574 | 0.411527 | 0.474111 | 9993 | 0.339011 | 0.483609 |
| Social    | Financial| GrSCM           | 21 | 395.6327 | 1.65E-71| 0.949448 | 0.078256 | 0.149222 | 0.171912 | 8025 | -0.01345 | 0.304194 |
| Social    | Operational| GrSCM       | 7 | 69.26194 | 8.06E-10 | 0.902247 | 0.072425 | 0.394237 | 0.45419 | 1828 | 0.212438 | 0.496568 |
| SSCM      | Financial| GrSCM           | 32 | 522.8562 | 1.03E-90| 0.940701 | 0.035016 | 0.180137 | 0.207531 | 18,303 | 0.110163 | 0.248333 |
| Operational| GrSCM     | GrSCM          | 8 | 101.2966 | 5.82E-19| 0.930896 | 0.090073 | 0.347514 | 0.400362 | 1606 | 0.141262 | 0.524853 |
Appendix 2. Funnel plots for indicating publication bias

Appendix 3. References of papers used for conducting Meta-analysis

Aalirezaei, A., Esfandi, N., & Noorbakhsh, A. (2018). Evaluation of relationships between GSCM practices and SCP using SEM approach: an empirical investigation on Iranian automobile industry. Journal of Remanufacturing, 8(1–2), 51–80.

Agan, Y., Acar, M. F., & Borodin, A. (2013). Drivers of environmental processes and their impact on performance: A study of Turkish SMEs. Journal of Cleaner Production, 51, 23–33.

Agan, Y., Kuzey, C., Fatih, M., & Açıkgoz, A. (2016). The relationships between corporate social responsibility, environmental supplier development, and firm performance. Journal of Cleaner Production, 112, 1–10.

Aguilera-Caracuel, J., & Ortiz-de-Mandojana, N. (2013). Green innovation and financial performance: An institutional approach. Organization & Environment, 26(4), 365–385.

Alonso-Almeida, M. D. M., Bagur-Femenias, L., Llach, J., & Perramon, J. (2018). Sustainability in small tourist businesses: the link between initiatives and performance. Current Issues in Tourism, 21(1), 1–20.

Amores-Salvadó, J., Castro, G. M., & Navas-López, J. E. (2014). Green corporate image: moderating the connection between environmental product innovation and firm performance. Journal of Cleaner Production, 83, 356–365.

Ananda, A. R. W., Astuty, P., & Nugroho, Y. C. (2018). Role of Green Supply Chain Management in embolden Competitiveness and Performance: Evidence from Indonesian Organizations. International Journal of Supply Chain Management, 7(5), 437.

Ardito, L., & Dangelico, R. M. (2018). Firm environmental performance under scrutiny: The role of strategic and organizational orientations. Corporate Social Responsibility and Environmental Management, 25(4), 426–440.

Bagur-Femenias, L., Llach, J., & del Mar Alonso-Almeida, M. (2013). Is the adoption of environmental practices a strategic decision for small service companies? An empirical approach. Management Decision, 51(1), 41–62.

Bai, X., & Chang, J. (2015). Corporate social responsibility and firm performance: The mediating role of marketing competence and the moderating role of market environment. Asia Pacific Journal of Management, (5 S 5), 505–530.

Barnett, M. L., & Salomon, R. M. (2012). Does it pay to be really good? Addressing the shape of the relationship between social and financial performance. Strategic Management Journal, 33(11), 1304–1320.

Basuony, M. A., Elseidi, R. I., & Mohamed, E. K. (2014). The impact of corporate social responsibility on firm performance: Evidence form a MENA country. Corporate Ownership & Control, 12(1–9), 761–774.

Blodgett, M. S., Hoitash, R., & Markelevich, A. (2014). Sustaining the financial value of global CSR: Reconciling corporate and stakeholder interests in a less regulated environment. Business and Society Review, 119(1), 95–124.

Botetat, E., Dodescu, A., Văduva, S., & Fotea, S. (2018). An Exploration of Circular Economy Practices and Performance Among Romanian Producers. Sustainability, 10(9), 3191.

Böttcher, C. F., & Müller, M. (2015). Drivers, Practices and Outcomes of Low-carbon Operations: Approaches of German Automotive Suppliers to Cutting Carbon Emissions. Business Strategy and the Environment, 24(6), 477–498.
Böttcher, C., & Müller, M. (2014). Insights on the impact of energy management systems on carbon and corporate performance. An empirical analysis with data from German automotive suppliers. Journal of Cleaner Production, 137, 1449–1457.

Brik, A. B., Rettab, B., & Mellah, K. (2011). Market orientation, corporate social responsibility, and business performance. Journal of Business Ethics, 99(3), 307–324.

Busch, T., & Hoffmann, V. H. (2011). How hot is your bottom line? Linking carbon and financial performance. Business & Society, 50(2), 233–265.

Cahan, S. F., Chen, C., & Chen, L. (2017). Social norms and CSR performance. Journal of Business Ethics, 145(3), 493–508.

Chan, H. K., Yee, R. W., Dai, J., & Lim, M. K. (2015). The moderating effect of environmental dynamism on green product innovation and performance. International Journal of Production Economics, 181, 384–391.

Chan, R. Y., He, H., Chan, H. K., & Wang, W. Y. (2012). Environmental orientation and corporate performance: The mediation mechanism of green supply chain management and moderating effect of competitive intensity. Industrial Marketing Management, 41(4), 621–630.

Chen, H., & Wang, X. (2011). Corporate social responsibility and corporate financial performance in China: an empirical research from Chinese firms. Corporate Governance: The international journal of business in society, 11(4), 361–370.

Chen, L., Tang, O., & Feldmann, A. (2015). Applying GRI reports for the investigation of environmental management practices and company performance in Sweden, China and India. Journal of Cleaner Production, 98, 36–46.

Chen, M., Liu, H., Wei, S., & Gu, J. (2018). Top managers' managerial ties, supply chain integration, and firm performance in China: A social capital perspective. Industrial Marketing Management, 74, 205–214.

Cherrafi, A., Garza-Reyes, J. A., Kumar, V., Mishra, N., Ghobadian, A., & Elfezazi, S. (2018). Lean, green practices and process innovation: A model for green supply chain performance. International Journal of Production Economics, 206, 79–92.

Chetty, S., Naidoo, R., & Seetharam, Y. (2015). The impact of corporate social responsibility on firms' financial performance in South Africa. Contemporary Economics, 9(2), 193–214.

Chiu, J. Z., & Hsieh, C. C. (2016). The impact of restaurants' green supply chain practices on firm performance. Sustainability, 8(1), 42.

Colwell, S. R., & Joshi, A. W. (2013). Corporate ecological responsiveness: Antecedent effects of institutional pressure and top management commitment and their impact on organizational performance. Business Strategy and the Environment, 22(2), 73–91.

Cui, Z., Liang, X., & Lu, X. (2014). Prize or Price? Corporate Social Responsibility Commitment and Sales Performance in the Chinese Private Sector. Management and Organization Review, 11(1), 25–44.

Dai, J., Cantor, D. E., & Montabon, F. L. (2017). Examining corporate environmental proactivity and operational performance: A strategy-structure-capabilities-performance perspective within a green context. International Journal of Production Economics, 193, 272–280.

Dangelico, R. M., & Pontrandolfo, P. (2015). Being 'green and competitive': the impact of environmental actions and collaborations on firm performance. Business Strategy and the Environment, 24(6), 413–430.

Das, D. (2017). Development and validation of a scale for measuring Sustainable Supply Chain Management practices and performance. Journal of Cleaner Production, 164, 1344–1362.

De Giovanni, P. (2012). Do internal and external environmental management contribute to the triple bottom line?. International Journal of Operations & Production Management, 32(3), 265–290.

Delmas, M. A., Nairn-Birch, N., & Lim, J. (2015). Dynamics of Environmental and Financial Performance: The Case of Greenhouse Gas Emissions. Organization & Environment, 28(4), 374–393.

Dong, Y., Wang, X., Jin, J., Qiao, Y., & Shi, L. (2014). Effects of eco-innovation typology on its performance: Empirical evidence from Chinese enterprises. Journal of Engineering and Technology Management, 34, 78–98.

Esfahbodi, A., Zhang, Y., & Watson, G. (2016). Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance. International Journal of Production Economics, 181, 350–366.

Esfahbodi, A., Zhang, Y., Watson, G., & Zhang, T. (2017). Governance pressures and performance outcomes of sustainable supply chain management–An empirical analysis of UK manufacturing industry. Journal of Cleaner Production, 155, 66–78.

Feng, T., Cai, D., Wang, D., & Zhang, X. (2016). Environmental management systems and financial performance: the joint effect of switching cost and competitive intensity. Journal of Cleaner Production, 113, 781–791.

Galbreath, J., & Shum, P. (2012). Do customer satisfaction and reputation mediate the CSR–FP link? Evidence from Australia. Australian Journal of Management, 37(2), 211–229.

Gallea, D., Ghobadian, A., & Chen, W. (2012). Corporate responsibility, supply chain partnership and performance: An empirical examination. International Journal of Production Economics, 140(1), 83–91.

García-Sánchez, I. M., & Prado-Lorenzo, J. M. (2012). Greenhouse gas emission practices and financial performance. International Journal of Climate Change Strategies and Management, 4(3), 260–276.

Ghisetti, C., & Rennings, K. (2014). Environmental innovations and profitability: How does it pay to be green? An empirical analysis on the German Innovation survey. Journal of Cleaner production, 75, 106–117.

Gimenez, C., Sierra, V., & Rodon, J. (2012). Sustainable operations: Their impact on the triple bottom line. International Journal of Production Economics, 140(1), 149–159.

Green Jr, K. W., Zelbst, P. J., Bhaduria, V. S., & Meacham, J. (2012). Do environmental collaboration and monitoring enhance organizational performance? Industrial Management & Data Systems, 112(2), 186–205.

Green Jr, K. W., Zelbst, P. J., Meacham, J., & Bhaduria, V. S. (2012). Green supply chain management practices: impact on performance. Supply Chain Management: An International Journal, 17(3), 290–305.
Grekovala, K., Calantone, R. J., Bremmers, H. J., Trienekens, J. H., & Om, S. W. F. (2016). How environmental collaboration with suppliers and customers influences firm performance: evidence from Dutch food and beverage processors. Journal of Cleaner Production, 112, 1861–1871.

Ham, S., & Lee, S. (2011). US restaurant companies’ green marketing via company websites: impact on financial performance. Tourism Economics, 17(5), 1055–1069.

Hasan, I., Kobeissi, N., Liu, L., & Wang, H. (2016). Corporate social responsibility and firm financial performance: the mediating role of productivity. Journal of Business Ethics, 149(3), 671–688.

Hollos, D., Blome, C., & Foe, K. (2012). Does sustainable supplier co-operation affect performance? Examining implications for the triple bottom line. International Journal of Production Research, 50(11), 2968–2986.

Huang, J. W., & Li, Y. H. (2015). Green Innovation and Performance: The View of Organizational Capability and Social Reciprocity. Journal of Business Ethics, 145(2), 309–324.

Huang, Y. C., Huang, Y. C., Huang, C. H., Huang, C. H., Yang, M. L., & Yang, M. L. (2017). Drivers of green supply chain initiatives and performance: Evidence from the electrical and electronics industries in Taiwan. International Journal of Physical Distribution & Logistics Management, 47(9), 796–819.

Huang, Y. C., Rahman, S., Wu, Y. C. J., & Huang, C. J. (2015). Salient task environment, reverse logistics and performance. International Journal of Physical Distribution & Logistics Management, 45(9/10), 979–1006.

Inoue, Y., & Lee, S. (2011). Effects of different dimensions of corporate social responsibility on corporate financial performance in tourism-related industries. Tourism Management, 32(4), 790–804.

Jayachandran, S., Kalya, K., & Ellert, M. (2013). Product and environmental social performance: Varying effect on firm performance. Strategic Management Journal, 34(10), 1255–1264.

Jung, H. J., & Kim, D. O. (2016). Good neighbors but bad employers: Two faces of corporate social responsibility programs. Journal of Business Ethics, 138(2), 295–310.

Kemper, J., Schilke, O., Reimann, M., Wang, X., & Brettel, M. (2013). Competition-motivated corporate social responsibility. Journal of Business Research, 66(10), 1954–1963.

Khan, S. A. R., & Qian, D. (2017). Impact of green supply chain management practices on firms’ performance: an empirical study from the perspective of Pakistan. Environmental Science and Pollution Research, 24(20), 16829–16844.

Kiesling, T., Isaksen, L., & Yasar, B. (2016). Market orientation and CSR: Performance implications. Journal of Business Ethics, 137(2), 269–284.

Kirchhoff, J. F., Tate, W. L., & Mollenkopf, D. A. (2016). The impact of strategic organizational orientations on green supply chain management and firm performance. International Journal of Physical Distribution & Logistics Management, 46(3), 269–292.

Koo, C., Chung, N., & Ryu, S. Y. (2014). How does ecological responsibility affect manufacturing firms' environmental and economic performance? Total Quality Management & Business Excellence, 25(9–10), 1171–1189.

Laari, S., Tyk, J., Solakivi, T., & Ojala, L. (2016). Firm performance and customer-driven green supply chain management. Journal of Cleaner Production, 112, 1960–1970.

Lam, H. K. (2018). Doing good across organizational boundaries: Sustainable supply chain practices and firms’ financial risk. International Journal of Operations & Production Management, 38(12), 2389–2412.

Lannelongue, G., Gonzalez‐Benito, J., & Gonzalez‐Benito, O. (2015). Input, output, and environmental management productivity: effects on firm performance. Business Strategy and the Environment, 24(3), 145–158.

Lee, K. H., & Min, B. (2015). Green R&D for eco-innovation and its impact on carbon emissions and firm performance. Journal of Cleaner Production, 108, 534–542.

Lee, K. H., Cin, B. C., & Lee, E. Y. (2014). Environmental responsibility and firm performance: the application of an environmental, social and governance model. Business Strategy and the Environment, 23(1), 40–53.

Lee, K. H., Min, B., & Yook, K. H. (2015). The impacts of carbon (CO2) emissions and environmental research and development (R & D) investment on firm performance. International Journal of Production Economics, 167, 1–11.

Lee, S. M., Tae Kim, S., & Choi, D. (2012). Green supply chain management and organizational performance. Industrial Management & Data Systems, 112(8), 1148–1180.

Lee, S., Seo, K., & Sharma, A. (2013). Corporate social responsibility and firm performance in the airline industry: The moderating role of oil prices. Tourism Management, 38, 20–30.

Lee, S., Singal, M., & Kang, K. H. (2013). The corporate social responsibility–financial performance link in the US restaurant industry: Do economic conditions matter? International Journal of Hospitality Management, 32, 2–10.

Lee, V. H., Ooi, K. B., Chong, A. Y. L., & Lin, B. (2015). A structural analysis of greening the supplier, environmental performance and competitive advantage. Production Planning & Control, 26(2), 116–130.

Leonidou, L. C., Christodoulides, P., Kyrgidou, L. P., & Paliwadana, D. (2015). Internal drivers and performance consequences of small firm green business strategy: the moderating role of external forces. Journal of Business Ethics, 140(3), 585–606.

Leonidou, L. C., Fotiadis, T. A., Christodoulides, P., Spyropoulou, S., & Katsikeas, C. S. (2015). Environmentally friendly export business strategy: Its determinants and effects on competitive advantage and performance. International Business Review, 24(5), 798–811.

Li, S., Jayaraman, V., Paulraj, A., & Shang, K. C. (2016). Proactive environmental strategies and performance: role of green supply chain processes and green product design in the Chinese high-tech industry. International Journal of Production Research, 54(7), 2136–2151.

Li, Y., Ye, F., Sheu, C., & Yang, Q. (2018). Linking green market orientation and performance: Antecedents and processes. Journal
of Cleaner Production, 192, 924–931.
Lin, R. J., Tan, K. H., & Geng, Y. (2013). Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry. Journal of Cleaner Production, 40, 101–107.
Liou, A., & Sharma, Z. (2012). Environmental corporate social responsibility and financial performance: Disentangling direct and indirect effects. Ecological Economics, 78, 100–111.
Llach, J., Perramon, J., del Mar Alonso-Almeida, M., & Bagur-Femenias, L. (2013). Joint impact of quality and environmental practices on firm performance in small service businesses: an empirical study of restaurants. Journal of Cleaner Production, 44, 96–104.
Lo, C. K., Pagell, M., Fan, D., Wiengarten, F., & Yeung, A. C. (2014). OHSAS 18,001 certification and operating performance: The role of complexity and coupling. Journal of Operations Management, 32(5), 268–280.
Luan, C. J., Tien, C., & Wu, P. H. (2013). Strategizing Environmental Policy and Compliance for Firm Economic Sustainability: Evidence from Taiwanese Electronics Firms. Business Strategy and the Environment, 22(8), 517–546.
Luethge, D., & Guohong Han, H. (2012). Assessing corporate social and financial performance in China. Social Responsibility Journal, 8(3), 389–403.
Martí, C. P., Rovira-Val, M. R., & Drescher, L. G. (2015). Are firms that contribute to sustainable development better financially? Corporate Social Responsibility and Environmental Management, 22(5), 305–319.
Martín-de Castro, G., Amores-Salvadó, J., & Navas-López, J. E. (2015). Environmental management systems and firm performance: improving firm environmental policy through stakeholder management. Corporate Social Responsibility and Environmental Management, 23(4), 243–256.
Masa'deh, R. E., Alanazheh, O., Algiatheen, N., Ryati, R., Albayyari, R., & Tarhini, A. (2017). The impact of employee’s perception of implementing green supply chain management on hotel’s economic and operational performance. Journal of Hospitality and Tourism Technology, 8(3), 395–416.
Misani, N., & Pogutz, S. (2015). Unraveling the effects of environmental outcomes and processes on financial performance: A non-linear approach. Ecological Economics, 109, 150–160.
Muhammad, N., Scrimgeour, F., Reddy, K., & Abidin, S. (2015). The relationship between environmental performance and financial performance in periods of growth and contraction: evidence from Australian publicly listed companies. Journal of Cleaner Production, 102, 324–332.
Nollet, J., Filis, G., & Mitrokostas, E. (2016). Corporate social responsibility and financial performance: A non-linear and disaggregated approach. Economic Modelling, 52, 400–407.
O’Donohue, W., & Torugsa, N. (2016). The moderating effect of ‘Green’ HRM on the association between proactive environmental management and financial performance in small firms. The International Journal of Human Resource Management, 27(2), 239–261.
Ogunyomi, P., & Bruning, N. S. (2016). Human resource management and organizational performance of small and medium enterprises (SMEs) in Nigeria. The International Journal of Human Resource Management, 27(6), 612–634.
Padgett, R. C., & Moura-Leite, R. C. (2012). Innovation with high social benefits and corporate financial performance. Journal of technology management & innovation, 7(4), 59–69.
Pakdeechoho, N., & Sukhotu, V. (2018). Sustainable supply chain collaboration: incentives in emerging economies. Journal of Manufacturing Technology Management, 29(2), 273–294.
Panwar, R., Nybak, E., Hansen, E., & Pinkse, J. (2017). Does the business case matter? The effect of a perceived business case on small firms’ social engagement. Journal of Business Ethics, 144(3), 597–608.
Paulraj, A., Chen, I. J., & Blome, C. (2015). Motives and performance outcomes of sustainable supply chain management practices: A multi-theoretical perspective. Journal of Business Ethics, 145(2), 239–258.
Paulraj, A., Chen, I. J., & Blome, C. (2017). Motives and performance outcomes of sustainable supply chain management practices: A multi-theoretical perspective. Journal of Business Ethics, 145(2), 239–258.
Pereira-Moliner, J., Claver-Cortés, E., Molina-Azorín, J. F., & Tari, J. J. (2012). Quality management, environmental management and firm performance: direct and mediating effects in the hotel industry. Journal of Cleaner Production, 37, 82–92.
Perez-Valls, M., Cespedes-Lorente, J., & Moreno-Garcia, J. (2016). Green practices and organizational design as sources of strategic flexibility and performance. Business Strategy and the Environment, 25(8), 529–544.
Pons, M., Bikfalvi, A., Llach, J., & Palcis, I. (2013). Exploring the impact of energy efficiency technologies on manufacturing firm performance. Journal of Cleaner Production, 52, 134–144.
Ramirez, A. M. (2012). Product return and logistics knowledge: Influence on performance of the firm. Transportation Research Part E: Logistics and Transportation Review, 48(6), 1137–1151.
Reverte, C., Gómez-Melero, E., & Cegarra-Navarro, J. G. (2016). The influence of corporate social responsibility practices on organizational performance: evidence from Eco-Responsible Spanish firms. Journal of Cleaner Production, 112, 2870–2884.
Rodriguez-Fernandez, M. (2016). Social responsibility and financial performance: The role of good corporate governance. BRQ Business Research Quarterly, 19(2), 137–151.
Saeidi, S. P., Sofian, S., Saeidi, P., Saeidi, S. P., & Saaeidi, S. A. (2015). How does corporate social responsibility contribute to firm financial performance? The mediating role of competitive advantage, reputation, and customer satisfaction. Journal of Business Research, 68(2), 341–350.
Sambasivan, M., Bah, S. M., & Jo-Ann, H. (2013). Making the case for operating “Green”: impact of environmental proactivity on multiple performance outcomes of Malaysian firms. Journal of Cleaner Production, 42, 69–82.
Sanca, C., Gimenez, C., Sierra, V., & Kazemiania, A. (2015). Does implementing social supplier development practices pay off?
Supply Chain Management: An International Journal, 20(4), 389–403.

Schoenherr, T., Modi, S. B., Talluri, S., & Hult, G. T. M. (2014). Antecedents and Performance Outcomes of Strategic Environmental Sourcing: An Investigation of Resource-Based Process and Contingency Effects. Journal of Business Logistics, 35(3), 172–190.

Shee, H., Miah, S. J., Fairfield, L., & Pujawan, N. (2018). The impact of cloud-enabled process integration on supply chain performance and firm sustainability: the moderating role of top management. Supply Chain Management: An International Journal, 23(6), 500–517.

Simionescu, L. N., & Gherghina, S. C. (2014). Corporate social responsibility and corporate performance: empirical evidence from a panel of the Bucharest Stock Exchange listed companies. Management & Marketing, 9(4), 439.

Song, Y., Feng, T., & Jiang, W. (2017). The Influence of Green External Integration on Firm Performance: Does Firm Size Matter? Sustainability, 9(8), 1328.

Sun, L., & Yu, T. R. (2015). The impact of corporate social responsibility on employee performance and cost. Review of Accounting and Finance, 14(3), 262–284.

Tan, Y., Ochoa, J. J., Langston, C., & Shen, L. (2015). An empirical study on the relationship between sustainability performance and business competitiveness of international construction contractors. Journal of Cleaner Production, 93, 273–278.

Tang, Z., Hull, C. E., & Rothenberg, S. (2012). How corporate social responsibility engagement strategy moderates the CSR–financial performance relationship. Journal of Management Studies, 49(7), 1274–1303.

Tarus, D. K. (2015). Corporate Social Responsibility Engagement in Kenya: Bottom Line or Rhetoric? Journal of African Business, 16(3), 289–304.

Tebini, H., Lang, P., MacZali, B., & Perez-Gladish, B. (2014). Revisiting the impact of social performance on financial performance from a global perspective. International Journal of Business Science & Applied Management, 9(2), 30–50.

Thorne, L., Mahoney, L. S., Gregory, K., & Convery, S. (2017). A comparison of Canadian and US CSR strategic alliances, CSR reporting, and CSR performance: Insights into implicit–explicit CSR. Journal of Business Ethics, 143(1), 85–98.

Thornton, L. M., Autry, C. W., Gligor, D. M., & Brik, A. B. (2013). Does Socially Responsible Supplier Selection Pay Off for Customer Firms? A Cross-Cultural Comparison. Journal of Supply Chain Management, 49(3), 66–89.

Torres, N. A., O'Donohue, W., & Hecker, R. (2013). Proactive CSR: An empirical analysis of the role of its economic, social and environmental dimensions on the association between capabilities and performance. Journal of Business Ethics, 115(2), 383–402.

Valmohammadi, C. (2014). Impact of corporate social responsibility practices on organizational performance: an ISO 26,000 perspective. Social Responsibility Journal, 10(3), 455–479.

Vlachos, I. P. (2016). Reverse logistics capabilities and firm performance: the mediating role of business strategy. International Journal of Logistics Research and Applications, 19(5), 424–442.

Von Arx, U., & Ziegler, A. (2014). The effect of corporate social responsibility on stock performance: New evidence for the USA and Europe. Quantitative Finance, 14(6), 977–991.

Wang, D. H. M., Chen, P. H., Yu, T. H. K., & Hsiao, C. Y. (2015). The effects of corporate social responsibility on brand equity and firm performance. Journal of Business Research, 68(11), 2232–2236.

Wang, D., Feng, T., & Lawton, A. (2017). Linking ethical leadership with firm performance: A multi-dimensional perspective. Journal of business ethics, 145(1), 95–109.

Wei, Z., Shen, H., Zhou, K. Z., & Li, J. J. (2017). How does environmental corporate social responsibility matter in a dysfunctional institutional environment? Evidence from China. Journal of Business Ethics, 140(2), 209–223.

Wiengarten, F., Pagell, M., & Fynes, B. (2012). Supply chain environmental investments in dynamic industries: Comparing investment and performance differences with static industries. International Journal of Production Economics, 135(2), 541–551.

Wong, C. W., Miao, X., Cui, S., & Tang, Y. (2018). Impact of Corporate Environmental Responsibility on Operating Income: Moderating Role of Regional Disparities in China. Journal of Business Ethics, 149(2), 363–382.

Wu, G. C. (2017). Effects of Socially Responsible Supplier Development and Sustainability-Oriented Innovation on Sustainable Development: Empirical Evidence from SMEs. Corporate Social Responsibility and Environmental Management, 24(6), 661–675.

Youn, H., Hua, N., & Lee, S. (2015). Does size matter? Corporate social responsibility and firm performance in the restaurant industry. International Journal of Hospitality Management, 51, 127–134.

Youn, S., Yang, M. G. M., Hong, P., & Park, K. (2013). Strategic supply chain partnership, environmental supply chain management practices, and performance outcomes: an empirical study of Korean firms. Journal of Cleaner Production, 56, 121–130.

Yu, M., & Zhao, R. (2015). Sustainability and firm valuation: An international investigation. International Journal of Accounting and Information Management, 23(3), 289–307.

Yu, Y., & Choi, Y. (2014). Corporate social responsibility and firm performance through the mediating effect of organizational trust in Chinese firms. Chinese Management Studies, 8(4), 577–592.

Yuen, K. F., Li, K. X., Xu, G., Wang, X., & Wong, Y. D. (2019). A taxonomy of resources for sustainable shipping management: Their interrelationships and effects on business performance. Transportation Research Part E: Logistics and Transportation Review, 128, 316–332.

Yuen, K. F., Wang, X., Wong, Y. D., & Zhou, Q. (2018). The effect of sustainable shipping practices on shippers' loyalty: The mediating role of perceived value, trust and transaction cost. Transportation Research Part E: Logistics and Transportation Review, 116, 123–135.
UNEP. 2015. Using product-service systems to enhance sustainable public procurement. (Retrieved October 6, 2016) http://www.unep.org/10yfp/Portals/50150/10YFP%20SPP%20A_Technical%20report.pdf.

Vachon, S., Klassen, R.D., 2008. Environmental management and manufacturing performance: The role of collaboration in the supply chain. Int. J. Prod. Econ. 111 (2), 299–315.

Villena, V.H., Gioia, D.A., 2018. On the riskiness of lower-tier suppliers: Managing sustainability in supply networks. J. Oper. Manage. 64, 65–87.

Wang, D.H.M., Chen, P.H., Yu, T.H.K., Hsiao, C.Y., 2015. The effects of corporate social responsibility on brand equity and firm performance. Journal of Business Research 68 (11), 2212–2236.

Wang, Q., Dou, J., Jia, S., 2016. A meta-analytic review of corporate social responsibility and corporate financial performance: The moderating effect of contextual factors. Bus. Soc. 55 (8), 1083–1121.

Wood, D.J., 2010. Measuring corporate social performance. Int. J. Manage. Reviews 12 (1), 50–84.

Wood, D.J., Jones, R.E., 1995. Stakeholder mismatching: A theoretical problem in empirical research on corporate social performance. Int. J. Org. Anal. 3 (3), 229–267.

Wowak, K.D., Craighead, C.W., Ketchen, D.J., Hult, G.T.M., 2013. Supply chain knowledge and performance: a meta-analysis. Decis. Sci. 44 (5), 843–875.

Wu, Z., Jia, F., 2018. Toward a theory of supply chain fields—understanding the institutional process of supply chain localization. J. Oper. Manage. 58, 27–41.

Yuen, K.F., Li, K.X., Xu, G., Wang, X., Wong, Y.D., 2019. A taxonomy of resources for sustainable shipping management: Their interrelationships and effects on business performance. Transp. Res. Part E: Logist. Transp. Rev. 128, 316–332.

Yuen, K.F., Wang, X., Wong, Y.D., Zhou, Q., 2018. The effect of sustainable shipping practices on shippers’ loyalty: The mediating role of perceived value, trust and transaction cost. Transp. Res. Part E: Logist. Transp. Rev. 116, 123–135.

Zhu, Q., Sarkis, J., Cordeiro, J.J., Lai, K.H., 2008. Firm-level correlates of emergent green supply chain management practices in the Chinese context. Omega 36 (4), 577–591.