Supply chain leadership and firm performance: A meta-analysis[☆]Lujie Chen^{a,c}, Fu Jia Professor, PhD^{b,*}, Taiyu Li^{a,c}, Tianyu Zhang^b^a International Business School Suzhou, Xi'an Jiaotong Liverpool University, 8 Chongwen Road, Suzhou, Jiangsu, China^b School of Economics and Management, Chongqing Jiaotong University, Chongqing, China^c Management School, University of Liverpool, Chatham Street, Liverpool, L69 7ZH, UK

ARTICLE INFO

Keywords:

Supply chain leadership

Meta-analysis

Firm performance

Transactional leadership

Transformational leadership

ABSTRACT

The effect of transformational vis-à-vis transactional supply chain leadership on firm performance has been studied in the existing literature, but results remain mixed. Therefore, it is important to provide a meta-analysis literature review to investigate this relationship. In this study, 32 empirical journal articles published over the past 10 years have been reviewed and evaluated through a meta-analysis. The results reveal that supply chain leadership is positively related to firm performance; specifically, transformational supply chain leadership has a more significant influence than transactional supply chain leadership on firm performance. Further, the effect of leadership varies according to region, industry and performance type. This study provides the first meta-analysis on this relationship.

1. Introduction

As globalisation has rendered supply chain networks more sophisticated (Mokhtar et al., 2019b), a growing number of studies have expanded the scope of leadership research from the individual level to the organisation or supply chain level (Masa'deh et al., 2016; Gosling et al., 2016; Akhtar et al., 2017; Ojha et al., 2018; Wong, 2001). After Defee et al. (2009) first proposed the idea of extending individual leadership to a supply chain level, a growing number of studies tend to focus on the supply chain leadership (SCL). For example, Sharif and Irani (2012) investigated leadership in the context of the supply chain and linked this with improvement in supply chain performance. Birasnav et al. (2015) further extended this viewpoint and illustrated the relationship between leadership behaviour and supply chain performance; they stressed that both transactional and transformational leadership can facilitate information exchange throughout the supply chain and consequently lead to better performance.

Gosling et al. (2016) explored the role of SCL in learning regarding sustainable practices, considering SCL an important factor in developing the sustainable performance of a supply chain. Through the comprehensive case studies of three international companies (Tetra Pak, Nestlé and IKEA), Jia et al. (2018) proposed that companies apply different leadership styles towards suppliers in different tiers of the supply chain for the purpose of implementing or increasing sustainable initiatives in

their supply chain, thus promoting the sustainable performance of the supply chain. Birasnav and Bienstock (2019) investigated leadership styles in the supply chain, and found that transactional leadership is related to external integration and transformational leadership is related to internal integration. Akhtar et al. (2017) explored leadership styles in the agri-food supply chain in New Zealand and discovered a correlation between the leadership style of the chain coordinators and the operational and social performance of the supply chain; they further found that by improving operational and social performance, financial performance is also improved.

Although there are dozens of research papers focusing on elaborating the SCL–performance relationship, the measurements of corporate performance are various; thus it remains unclear which leadership style can exert the greatest benefits to certain performance improvement. Therefore, it is necessary to gain a deeper understanding of the correlation between adopted forms of SCL and multiple firm performances (Mokhtar et al., 2019a).

As samples are heterogeneous in existing empirical studies, individual empirical studies lack universality. Meta-analysis can be used to summarize the empirical results of previous studies. The generalized results of meta-analysis are more meaningful than individual empirical studies, because it integrates different samples into a single analysis, which tests different variations of the effect between different sampling groups. The meta-analysis is a statistically reliable method and is less

[☆] **Note:** The authors are in alphabetical order and have contributed equally to this work.

* Corresponding author.

E-mail addresses: Lujie.chen@xjtlu.edu.cn (L. Chen), fu.jia@york.ac.uk (F. Jia), taiyu.li@xjtlu.edu.cn (T. Li), tz950@york.ac.uk (T. Zhang).

subjective (Egger et al., 1997).

We employ meta-analysis (Hunter and Schmidt, 2004) to investigate the relationship between SCL and various firm performance. The benefits of adopting meta-analysis is to deal with the difficulties to achieve effective synthesis in dealing with a large number of research results, as the core idea of meta-analysis is to investigate the effect size of each individual sample to reveal the features of the total population, therefore, solving the problem of studies with large sample sizes having.

Following the introduction, this paper provides a literature review and a research framework, which introduces the meta-analysis method. The findings of the literature review are summarised, and the coding process and results are explained. Then, Sections 3 and 4 respectively present the process for and results of the meta-analysis. Based on the results of the meta-analysis, in the implementation section, theoretical and managerial contributions are proposed. Finally, the conclusion summarises the major results and limitations of this research.

2. Literature review and research framework

2.1. Sampling and literature review

To conduct a review using meta-analysis of the relationship between SCL and firm performance, we searched empirical studies in the English language literature from two databases: Web of Science and Scopus. Web of Science is one of the most authoritative and important databases for obtaining scientific and technological academic information in the world. It contains the most influential core academic journals in various research fields. Scopus is the largest database of peer-reviewed literature in the world, covering more than thirty thousand journals in top-level subject fields.

As over 90% of papers were published in the period 2010–2019, this timespan was chosen as the period for this study. To ensure that our data for the meta-analysis were comprehensive without sacrificing precision, external experts were invited to provide advice to the selected keywords and the inclusion and exclusion criteria to ensure comprehensiveness. Additionally, three categories of search terms were applied to limit the range of articles. The keywords in the first two categories, related to SC or SCL, were based on Mokhtar et al. (2019b). The first category of search terms aimed to identify articles in the supply chain domain. The terms included 'supply chain', 'supply chain management' and 'supplying'. The second category, designed to limit the search to influencers in SCL were based on Gosling et al. (2016) and Defee et al. (2010). These terms included 'leadership', 'transformational leadership', 'transactional leadership', 'inspirational', 'intellectual stimulation', 'individualised consideration', 'idealized influence', 'individualised consideration', 'contingent reward', 'management-by-exception active', 'transformation leadership', 'transaction leadership', 'transformational leadership', 'transactional leadership', 'group leadership', 'focal firm leadership', 'supply chain followership', 'transformational followership', 'transactional followership', 'entrepreneur leadership' and 'collaborative leadership'. The final category was applied to limit the search to articles that analysed impacts on firm performance. Keywords of firm performances were determined according to Geng et al. (2017) and Wang et al. (2018) including 'firm performance', 'consequence effect', 'performance', 'quality', 'benefit', 'outcome', 'return', 'firm value', 'competitive advantage', 'profit', 'profitability', 'turnover', 'sales growth', 'revenue', 'market share', 'relationship', 'customer satisfaction' and 'customer loyalty' (Wang et al., 2018). The categories of keywords for sampling are presented in Table 1.

Our initial search identified 182 journal papers: 51 articles from Web of Science and 141 articles from Scopus. To ensure the rigidity and the data quality of this research, all of selected articles are peer-review articles and conference papers and working papers are not considered. A further assessment was then applied to manually identify articles reporting a relationship between SCL and firm performance. Next, we set the criteria following the existing meta-analysis literatures

Table 1

Categories of keywords for sampling.

Category of keywords	Detailed categorization	Keywords
Supply chain		'supply chain', 'supply chain management' and 'supplying'
Leadership related	Transactional leadership and transformational leadership	'leadership', 'transformational leadership', 'transactional leadership', 'inspirational', 'intellectual stimulation', 'individualised consideration', 'idealized influence', 'individualised consideration', 'contingent reward', 'management-by-exception active', 'transformation leadership', 'transaction leadership', 'transformational leadership', 'transactional leadership', 'group leadership', 'focal firm leadership', 'supply chain followership', 'transformational followership', 'transactional followership', 'entrepreneur leadership' and 'collaborative leadership'
Performance related	General performance	'firm performance', 'consequence effect' and 'performance'
	Financial and operational ability	'quality', 'benefit', 'outcome', 'return', 'firm value', 'competitive advantage', 'profit', 'profitability', 'turnover', 'sales growth', 'revenue' and 'market share'
	Social performance	'relationship', 'customer satisfaction' and 'customer loyalty'

(Abreu-Ledon et al., 2018; Yu et al., 2015; Grosse et al., 2015). They include: (1) the paper must comprise an empirical study; (2) the sample size must be reported; (3) a correlation or other reliable statistics must be reported; (4) the approach to collecting data must be reported and (5) no sample data from a different study could be used. Based on these criteria, 32 papers were finally identified for review, including 15 published articles from Web of Science and 17 from Scopus, and the number of reviewed paper satisfies the minimum number requirement for meta-analysis suggested by Hedges and Olkin (2014). The process of the literature review is showcased in Fig. 1.

Fig. 2 presents the number of papers relating to empirical research on SCL and firm performance published during the period 2010–2019. The number of articles published each year on the topic was limited to one until 2014, when the number of papers increased to four. Following a drastic decline in 2015 there was significant growth in 2016, in which six papers were published, with the peak number of seven reached in 2019. The growth since 2015 shows that the SCL–performance relationship has increasingly attracted scholars' attention, and it is expected that there will be further empirical research on SCL–performance in the future.

Some studies focused on specific countries or regions. For developing countries, the most commonly studied countries were India (five), followed by Malaysia (two). For developed countries, the US (five) and the UK (two) were the most frequently examined. Five studies collected data from more than one country or region. Fig. 3 displays the distribution across different industries. Among those exploring the SCL–performance relationship within a specific industry, the manufacturing industry was the most common (10), followed by transportation (five) and agriculture (five). The construction, healthcare and service industries were each the subject of one study.

Table 2 summarises the theoretical perspectives and analysis methods of the sample papers. In terms of theoretical perspectives, although nearly one-third of papers did not explicate the adopted theory in their research, we found that leadership theory (22%), institutional

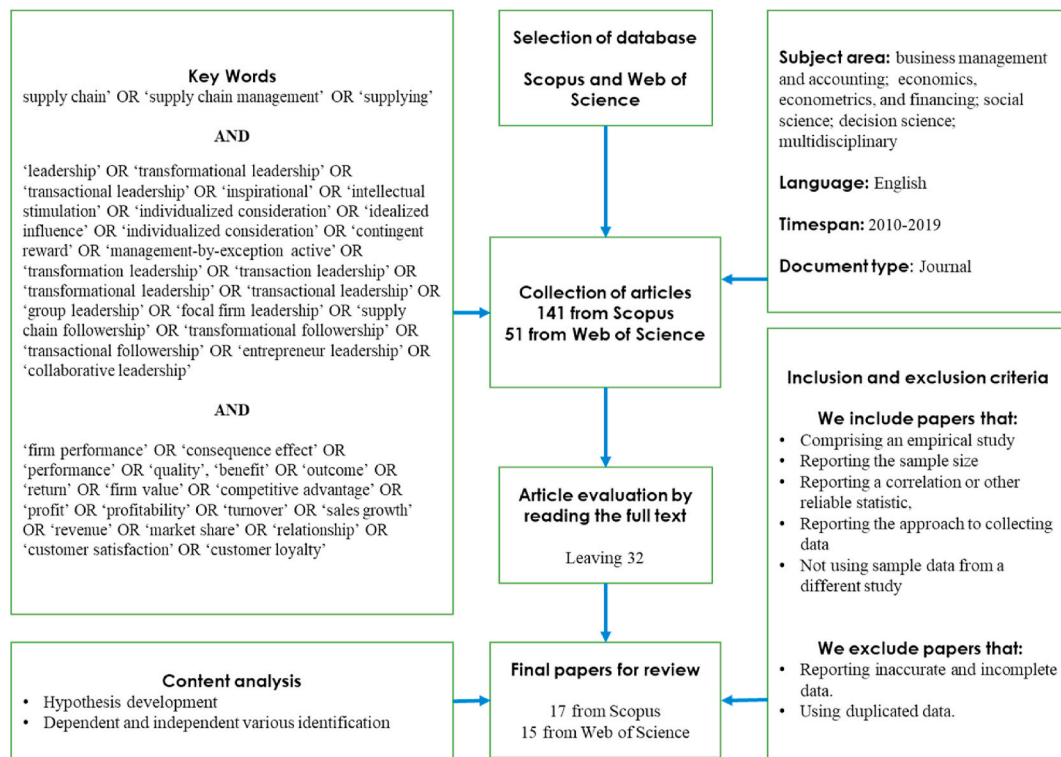


Fig. 1. Search process.

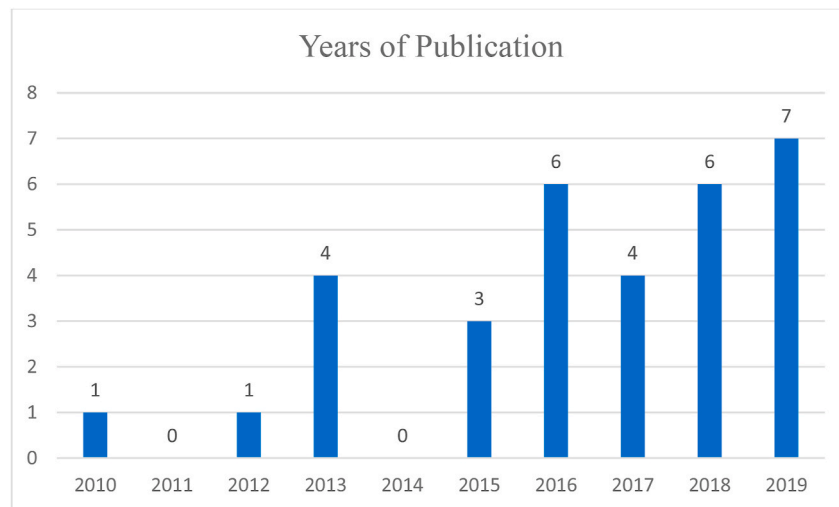


Fig. 2. Number of articles published in each year of publication.

theory (13%) and dynamic capabilities theory (13%) were the most common theories. Structural equation modeling (SEM) was the most common method to evaluate data in this sample (65.6%). Two papers combined SEM with other quantitative methods such as artificial neural networks (ANNs) and interaction effects.

Additionally, based on the literature review, the definition of supply chain leadership is concluded. Defee et al. (2009) has unprecedentedly argued the feasibility of applying individual leadership to supply chain organizations, which show how the supply chain leader organizations interact with other supply chain member organisation. Further, Defee et al. (2010) developed from the concepts of Defee et al. (2009), and proposed the formal definition of SCL.

According to Defee et al. (2010), SCL integrates the classical leadership theory and supply chain management (SCM). It refers to the

ability of a firm to influence the actions, behaviour and performance of other organizations in the supply chain. Supply chain leaders usually possess disproportionate power and ability to dominate other supply chain organizations. That is, the exercise of power or lack of power of the supply chain leaders can influence the commitment of the other members on the supply chain. For example, as stated by Hall (2000), the power of channel leaders can influence supplier's sustainable performance. The leader in a supply chain is the party that recognises the necessity for change and creates a vision of a better future for the supply chain (Defee et al., 2010). Nestle is prominent example of supply chain leaders. Nestle realised the importance of sustainable supply chain management and thus make use of their dominant power in the supply chain to ensure suppliers' engagement in the sustainable supply chain initiatives (Jia et al., 2019). For example, Nestle has set up strict dairy

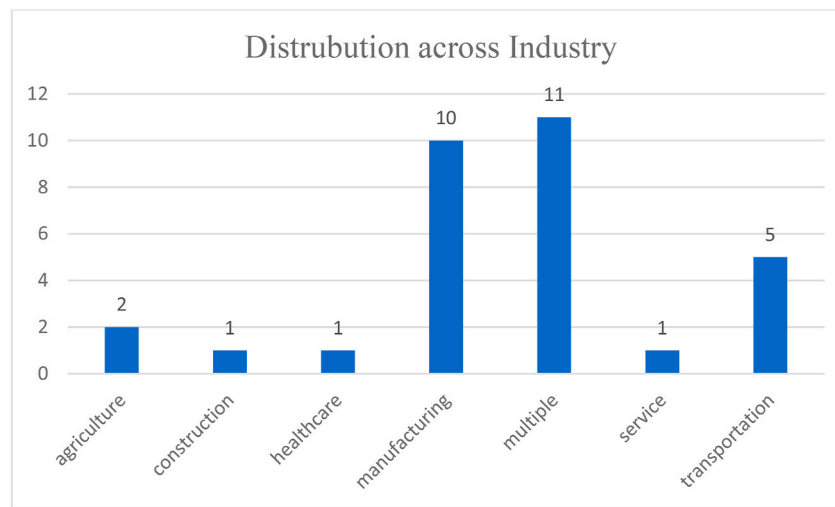


Fig. 3. Number of articles in different industry.

Table 2

Theoretical perspectives and analysis methods in sampled articles.

Theoretical approaches	Number	Percentage (%)	Analysis method	Number	Percentage (%)
dynamic capabilities theory	4	13%	SEM	21	65.6%
goal congruence theory	1	3%	SEM-ANN	1	3%
individual leadership theory	1	3%	PLS-SEM	1	3%
institutional theory	4	13%	factor analysis	1	3%
leadership theory	7	22%	SEM, interaction effects	1	3%
Organisational theory	2	6%	Spearman's correlation analysis	1	3%
Resource-based view	1	3%	polynomial regression	1	3%
Stakeholder theory	1	3%	cross-tabulation	1	3%
Supply chain integration theory	1	3%	two-factor ANOVA	1	3%
Not specified	10	31%	Multiple Regression Analysis	1	3%
			hierarchical regression analysis	1	3%
			covariance-based structural equation modeling	1	3%
SEM	Structural equation modeling				
PLS-SEM	Partial least squares-structural equation modeling				
SEM-ANN	Structural equation modeling-artificial neural network				
ANOVA	Analysis of variance				

purchasing requirements and differentiated purchasing price to encourage suppliers to act sustainably (Jia et al., 2019).

2.2. Coding

We followed Lipsey and Wilson's (2001) method to process the coding. First, to obtain an effective coding result, all authors agreed on the concepts and definitions of each category of SCL, the type of firm performance and the type of each moderator. Specifically, we coded each independent variable in SCL based on the description of leaders' traits, qualities, personalities and behaviours (Mokhtar et al., 2019a). The specified forms of SCL were categorised into transactional leadership and transformational leadership. This is in line with the categorization of SCL in Defee et al. (2010), in which the authors defined the concept of SCL by applying leadership theory developed from the individual level within the organisation to the supply chain level. The authors identified transformational and transactional leadership as two major SCL forms; most forms of SCL in the samples could be mapped onto these two leadership forms.

For example, where there was a value exchange between leaders and employees that led them to contribute to one goal, we coded this as transactional leadership (Kuhnert and Lewis, 1987) ($k = 3$). Where a leader used their personality to set forth a vision of a mutual goal to employees, inspiring them to serve the greater good, we coded this as transformational leadership (Bass et al., 2003) ($k = 17$). Where a study did not specify leadership type, gave a blurred description of leadership

or showed comprehensive leadership (such as integrative leadership or general leadership) (Zhang et al., 2018; Mokhtar et al., 2019b), we coded it in the 'others' category ($k = 12$).

Having agreed on definitions and concepts, two authors worked independently as coders, applying a comprehensive assessment of types of SCL, firm performance type, region and industry to each paper. The two sets of coding results were checked for consistency, and any inconsistent results were reassessed by all the authors. In this study, correlations were chosen to capture effect sizes. For articles that reported t-values, z-values, f-values and beta-coefficients, we used the transfer equations from Wang et al. (2018).

The effect sizes from each paper were unified to correlation if the study did not report the correlation (Wang et al., 2018). Table 3 presents the coding results.

2.2.1. Independent variables

The independent variable of this meta-analysis was SCL. Based on the literature review, there were two types of research focusing on the relationship between SCL and firm performance. Some papers explored SCL and firm performance but did not specify leadership behaviour in their research (Raut et al., 2019; Jermisittiparsert and Srihirun, 2019). Others investigated how a specific leadership behaviour affected firm performance. The most frequently mentioned SCL management behaviours in the literature were transactional leadership and transformational leadership.

For example, Birasnav and Bienstock (2019) stated that

Table 3
Coding results of samples studies.

	Study	Year	Region	Industry	Leadership category	Performance category	Sample size	Effect size
1	Ahmed et al.(1)	2018	developing region	manufacturing	others	environmental	174	0.43
2	Akhtar et al.(2)	2017	global	agriculture	transformational leadership	operational	225	0.49
3	Akhtar & Khan	2015	global	agriculture	transformational leadership	operational	112	0.64
4	Akhtar et al.	2016	global	multiple	transformational leadership	environmental	220	0.62
5	Bag	2018	developing region	manufacturing	transformational leadership	operational	75	0.22
6	Birasnav & Bienstock	2019	developing region	manufacturing	transformational leadership	operational	107	0.75
7	Defee	2010	developed region	multiple	transformational leadership	financial	249	0.36
8	Dubey et al.	2015	developing region	manufacturing	others	operational	358	0.98
9	Goffnett & Goswami	2016	developed region	multiple	transformational leadership	innovative	184	0.76
10	Harun et al.	2019	developing region	transportation	transformational leadership	operational	215	0.17
11	Izquierdo et al.	2015	developed region	multiple	transformational leadership	innovative	149	0.22
12	Jermstipparsert & Srihirun	2019	global	manufacturing	others	operational	339	0.16
13	Khan et al.	2019	developing region	multiple	transformational leadership	social	248	0.21
14	Kharub & Sharma	2016	developing region	multiple	others	operational	215	0.82
15	Loke et al.	2012	developing region	manufacturing	others	innovative	202	0.9
16	Luu	2017	developing region	manufacturing	others	innovative	844	0.65
17	Mokhtar et al.	2019a	developing region	manufacturing	transactional leadership	operational	190	0.32
18	Noruzi et al.	2013	developing region	manufacturing	transformational leadership	innovative	280	0.56
19	Ojha et al.	2018	developed region	multiple	transformational leadership	innovative	128	0.83
20	Overstreet et al.	2013	developed region	transportation	transformational leadership	innovative	158	0.62
21	Prasad et al.	2018	developing region	manufacturing	others	financial	145	0.37
22	Raut et al.	2019	developing region	manufacturing	others	innovative	316	0.13
23	Reyes et al.	2016	global	transportation	others	innovative	175	0.24
24	Roman	2017	developed region	multiple	transformational leadership	operational	206	0.46
25	Saini et al.	2017	developed region	construction	transformational leadership	operational	56	0.5
26	Sinha et al.	2016	developing region	transportation	others	operational	120	0.6
27	Teoman & Ulengin	2018	developing region	multiple	transformational leadership	operational	158	0.88
28	Ul-Hameed et al.	2019	developed region	transportation	transactional leadership	operational	150	0.18
29	Yoon et al.	2016	developed region	healthcare	transformational leadership	operational	272	0.58
30	Youn et al.	2013	developed region	multiple	others	operational	142	0.56
31	Zhang et al.	2018	developing region	multiple	others	operational	236	0.47
32	yee et al.	2013	developed region	service	transactional leadership	social	1840	0.66

transformational leadership exhibited in top-level management is positively related to external supply chain integration and supply chain performance. This argument was supported by [Harun et al. \(2019\)](#), who found that transformational leadership in the supply chain can influence SCM and improve supply chain operational accuracy. [Ul-Hameed et al. \(2019\)](#) found a relationship between transactional leadership and supply chain performance in the manufacturing industry in the UK.

The concept of transactional and transformational leadership theory is derived from the full-range leadership theory, which postulated five transformational and three transactional factors ([Verlage et al., 2012](#)). The transformational factors include inspirational motivation, idealized influence (attributed), idealized influence (behaviour), intellectual stimulation, and individualised consideration, while the transactional factors are contingent reward, active management-by-exception, management-by-exception passive ([Verlage et al., 2012](#)). Based on the factors provided by the full-range leadership theory, the transactional and transformational leadership styles in the supply chain management are more clearly identified.

Transactional leadership is a leadership style in which leaders reward or punish their subordinates based on their performance ([Mokhtar et al., 2019b](#); [Yee et al., 2013](#)). It emphasises the contractual exchange between leaders and subordinates ([Ul-Hameed et al., 2019](#)). Transactional leaders offer extrinsic rewards, such as financial rewards or promotion, in exchange for subordinates' work efforts ([Birasnav and Bienstock, 2019](#); [Mokhtar et al., 2019b](#)).

In contrast, transformational leadership is a leadership style in which leaders stimulate their subordinates to think innovatively, challenging old methods and proposing new solutions ([Goffnett and Goswami, 2016](#)). Transformational leadership is therefore often related to creativity and innovation ([Goffnett and Goswami, 2016](#)), and, by increasing an organisation's ability to adapt, can help the organisation reach an advanced level of management and operation ([Ul-Hameed et al., 2019](#)). It emphasises leading by example, and, because of their personality and character, transformational leaders are role models that are admired,

respected and trusted by their subordinates ([Defee et al., 2010](#)).

In our sample, 20 out of 32 papers specified SCL type and examined its relationship with firm performance. All 20 papers that specified SCL type discussed the relationship between transformational leadership and firm performance. Three papers simultaneously analysed the effects of transformational leadership and transactional leadership on performance. No paper individually discussed the effects of transactional leadership on firm performance. The remainder did not elaborate type of leadership, simply offering a general discussion on leadership and performance.

2.2.2. Dependent variables

The dependent variables of this meta-analysis are factors pertaining to firm performance. From the literature review, it was noted that firm performance contains multiple dimensions. To compare the specific impacts of different SCLs on firm performance, five detailed categories of firm performance were devised. After reviewing the sample papers, we first identified two major dimensions of firm performance: financial and non-financial performance. We found that 30 out of 32 papers investigated how SCL affects non-financial performance, and the remaining two focused on financial performance. After scrutinising non-financial performance, we coded this into four categories: operational, environmental, social and innovative performance. Firm performance in this meta-analysis is defined as the integration of operational performance, environmental performance, social performance, innovative performance and financial performance, as defined below.

Operational performance is measured in terms of the efficiency and accuracy of a firm's operation, quality of product, process transparency, speed and punctuality of delivery, resource utilisation efficiency and customer satisfaction ([Harun et al., 2019](#); [Teoman and Ulengin, 2018](#); [Ul-Hameed et al., 2019](#)). Environmental performance is related to green initiatives, including green purchasing and designing, product recycling and reverse logistics ([Akhtar et al., 2016](#); [Ahmed et al., 2018](#); [Mokhtar et al., 2019a](#)). It is also concerned with saving energy and reducing

waste and usage of harmful materials (Akhtar et al., 2016). Social performance is characterised by providing a green and safe product to customers (Khan and Wisner, 2019), ensuring the health, safety and satisfaction of employees and customers (Yee et al., 2013; Bag, 2018) and other socially responsible behaviours, such as building schools and hospitals (Khan and Wisner, 2019). Innovative performance mainly refers to the frequency of launching new products or services (Goffnett and Goswami, 2016; Reyes et al., 2016). One indicator of innovative performance is investment in, or adoption of, emerging technologies (Raut et al., 2019). It is also measured by the extent to which the corporation proactively innovates and experiments with new products, services or solutions to deal with market change (Luu, 2017; Ojha et al., 2018). Financial performance is often measured by profit, market share, sales volume (Akhtar et al., 2016) and organisational health (Prasad et al., 2018). There are limited discussions related to the direct relationship between SCL and firm performance. Often, in the sample papers, financial performance was considered a by-product of other performance improvements facilitated by SCL. For example, Ahmed et al. (2018) showed that SCL can have a significant impact on corporate environmental performance through implementing green SCM, which improves financial performance. Table 4 illustrated different types of firm performance and its corresponding measurements.

2.2.3. Moderators

Previous literature has noted that factors related to region or industry type are vital control variables that can moderate the relationship between SCL and firm performance (Camarero Izquierdo et al., 2015; Akhtar et al., 2017; Zhang et al., 2018). When industry changes, the SCL–performance relationship might change (Camarero Izquierdo et al., 2015; Ojha et al., 2018). Based on the sample articles, seven industry types were coded: manufacturing, agriculture, services, transportation, healthcare, construction and miscellaneous industries.

In addition, we coded three economic regions: developing, developed and global. Nine different countries or regions were mentioned in the sample papers. There was only one developing region (South Africa) located outside Asia, with the remaining developing regions (India, Pakistan, Malaysia, Turkey, Vietnam, China, Iran and Bahrain) in Asia. The developed regions included two countries from Europe and North America and two Asian regions (South Korea and Hong Kong). The global region in our sample referred to studies with a wide range of regions from which corporate information was collected. For example, Akhtar et al. (2016), who showed how adaptive leadership influences

corporate environmental performance in emerging markets, examined over 10 regions in their research.

2.3. Research framework and hypotheses development

In this section, we propose our hypotheses on the relationship between SCL and firm performance and the differential effects of different forms of leadership. Following a discussion of the meta-analysis approach, we propose hypotheses on the moderating effects of different regions and industries. The research framework is depicted in Fig. 4.

The results of the literature review reveal that there is a correlation between SCL and firm performance (Yee et al., 2013). Gosling et al. (2016) concluded that the role of leadership in the supply chain is important, and stated that if one organisation takes a leadership role, this can reduce risks and prevent chaos in the supply chain. In other words, appropriate SCL can facilitate superior SCM (Youn et al., 2012, which is critical to organisational performance improvement (Jermisittiparsert and Srihirun, 2019).

In addition, some argued that SCL can generate improvement in various firm performance measures (Saini et al., 2018). For example, in terms of operational performance, Harun et al. (2019) discovered that leadership ethics in the supply chain can facilitate the accuracy of operations within the supply chain and improve business performance. For social performance, Khan and Wisner (2019) found that transformational leadership is positively associated with an enterprise's participation in corporate social responsibility (CSR) activities, such as building schools and hospitals, which leads to higher social performance. Studies also elucidated how SCL can advance corporate environmental performance (Khan and Wisner, 2019; Ahmed et al., 2018). SCL is considered an essential motivator for green SCM initiatives (Dubey et al., 2015), encouraging the development of green policies and the implementation of green practices, such as green product design and environmental protection training within the supply chain (Ahmed et al., 2018). Firm innovation performance is also affected by SCL, as complex innovations usually rely on the leadership of management to achieve efficient allocation of resources (Jermisittiparsert and Srihirun, 2019). Goffnett and Goswami (2016) claimed that transformational leadership can inspire followers to be more creative and drive them to engage in innovation behaviours. Moreover, transformational leadership can positively influence knowledge management and organisational learning, and can further lead to better innovative performance (Noruzi et al., 2013).

Based on the above discussion, the first hypothesis is proposed:

H1. Supply chain leadership is positively related to firm performance.

In this study, leadership is categorised into two major forms: transactional leadership and transformational leadership. Transactional leadership is characterised by a contractual exchange between leaders and their subordinates (Camarero Izquierdo et al., 2015), and influences employees' commitment indirectly (Yee et al., 2013). Transformational leadership is characterised by ideological influence, inspirational motivation, intellectual stimulation and individualised consideration (Camarero Izquierdo et al., 2015), and influences employees' commitment directly (Yee et al., 2013). In the context of the supply chain, appropriate SCL can reinforce followers' commitment to firm goals (Defee et al., 2010). Although both forms of leadership can have a positive impact on followers' commitment, Yee et al. (2013) found that in the context of the high-contact service industry, transformational leadership has a greater impact on employee commitment than transactional leadership. Because higher employee commitment usually brings about better firm performance (Tolera, 2018), transformational leadership is more effective in improving firm performance than transactional leadership (García-Morales et al., 2008).

Further, compared with transactional leaders, transformational supply chain leaders are more able to stimulate innovation and

Table 4
Firm performance and measurements.

Types of performance	Measurement
Financial performance	It is measured by profit, market share, sales volume and organisational health (Akhtar et al., 2016; Prasad et al., 2018).
Operational performance	It is measured by the efficiency and accuracy of a firm's operation, quality of product, process transparency, speed and punctuality of delivery, resource utilisation efficiency and customer satisfaction (Harun et al., 2019).
Environmental performance	It is measured by green initiatives including green purchasing and designing, product recycling and reverse logistics, saving energy and reducing waste and usage of harmful materials (Akhtar et al., 2016).
Social performance	It is measured by corporate socially responsible behaviours such as providing a green and safe product to customers; ensuring the health, safety and satisfaction of employees and customers; and other socially responsible behaviours, such as building schools and hospitals (Yee et al., 2013; Khan and Wisner, 2019).
Innovative performance	It is measured by the amount of investment in, or adoption of, emerging technologies. It is also measured by the extent to which the corporation proactively innovates and experiments with new products, services or solutions to deal with market change (Reyes et al., 2016; Raut et al., 2019).

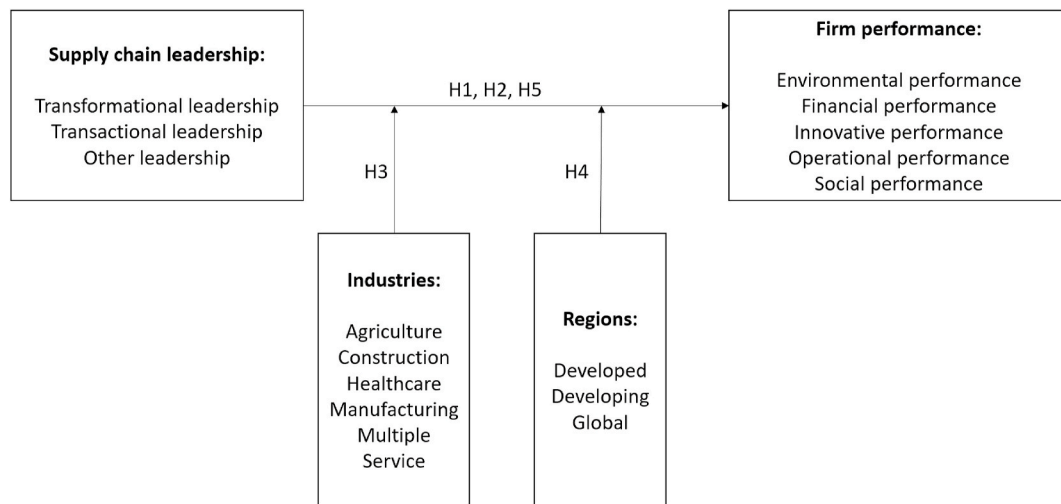


Fig. 4. Research framework.

knowledge management practices among their supply chain partners (Loke et al., 2012; Yoon et al., 2016). From the resource-based view, innovation and knowledge are valuable intangible resources that can contribute to sustaining competitive advantage, thereby enabling firms to obtain a better performance (García-Morales et al., 2008).

Based on the above discussion, the second hypothesis is proposed:

H2. The performance effect of transformational leadership is stronger than that of transactional leadership.

The existing empirical research regarding SCL involves multiple industries (Zhang et al., 2018). It is already known that owing to differences in industry characteristics, such as industrial structure and products, firms in different industries may have different levels of performance under the same leadership form (Camarero Izquierdo et al., 2015; Akhtar et al., 2017). For example, transformational leadership in a fast-moving industry such as electronics tends to generate better innovation performance because firms in such industries may prefer to focus on exploration activities, while in food retail and other more stable industries, transformational leadership can improve operational performance because firms in such industries emphasise exploitation activities (Ojha et al., 2018). Likewise, regional factors may alter the implementation of practices promoted by SCL, and therefore change the effect of SCL on firm performance (Raut et al., 2019). Raut et al. (2019) found that, in developing countries such as Malaysia and India, there are strict policies to enforce corporate sustainable behaviour, and therefore, the impact of transformational leadership on environmental and social performance there is strengthened by regional factors. (Saini et al., 2018) discovered that leadership is a factor in knowledge transfer and operational performance in the UK construction supply chain; however, in other regions, the role of leadership may not be as vital as it is in the UK.

Based on the above discussion, we propose the third and fourth hypotheses:

H3. The observed leadership's effect on firm performance varies by industry type.

H4. The observed leadership's effect on firm performance varies by region.

In this study, firm performance is categorised as financial performance and non-financial performance; non-financial performance is further subdivided into operational, environmental, social and innovative performance. Most studies examined how SCL can affect non-financial performance, and only two focused on the impact of SCL on financial performance (Defee et al., 2010; Prasad et al., 2018). Overall, SCL may facilitate each identified aspect of performance. However,

Mokhtar et al. (2019b) argued that SCL is prominent in promoting the operational performance of the supply chain network, while enhanced operational performance may promote financial sustainability. This suggests that the impact of leadership on operational performance is greater than on financial performance.

Based on the above discussion, we propose the final hypothesis:

H5. The observed leadership's impact varies by performance measurement.

3. Research method

3.1. Data analysis

To determine the associations between SCL and firm performance, the first step was to unify effect sizes. Typically, two kinds of effect size are used in meta-analysis: r (Pearson correlation) and d (mean difference). In this study, we chose correlations to capture effect sizes. For articles that reported t -values, z -values, f -values and beta-coefficients, we used the transformation equations from Wang et al. (2018).

Before further analysis of our hypothesis, it is necessary to test the existence of publication bias on the effect size because it would reduce the reliability of the meta-analysis. Publication bias appears when published literature does not represent the whole population systematically (Rothstein et al., 2005). The reason for publication bias may arise is that the published literature usually confirms the research hypothesis; very few papers reject the research hypothesis. Researchers are also more likely to publish significant results (Rosenthal and DiMatteo, 2001). For our study, we used two methods, the funnel plot (Light and Pillemer, 1986) and the fail-safe N (Rothstein et al., 2005), to test for potential publication bias in the sample. Once the sampled data passed two tests, the meta-analysis can be proceeded.

Meta-analysis is used to combine quantitative data from related research to summarize the results for the whole population, from which it estimates the combined effect of the whole population by synthesising the weighted means of the effect size from each empirical study. There are two ways to estimate the model to process the meta-analysis: a fixed-effect model and a random-effect model.

The fixed-effect model operates under the assumption that there is an identical effect size from all sampled studies. Samples from different studies are seen as arising from a single population (Hunter and Schmidt, 2004). Under the fixed-effect assumption where the effect size is fixed and homogeneous, the weight attributed to each study is determined entirely by the information content of the sample set (Borenstein et al., 2010).

The random-effect model operates under the assumption that effect sizes vary among different studies. Populations of different studies are seen as arising from a superior population, and the effect size is not fixed but heterogeneous (Hedges, 1992). Under the random-effect assumption, the combined effect is assessed by the weighted means of effect sizes, and a study with a small sample size can still contribute to the combined effect.

The random-effect model was chosen for our study based on the characteristics of our samples, which cover diverse populations in different regions and different industries and exhibit different levels of performance.

3.2. Publication bias

Two methods were applied to test if publication bias appeared in our sample selection. First, we used CMA 2.0 software to draw a funnel plot (see Fig. 5). The plots do not take an inverted pyramid form, so publication bias may not appear in our study (Light and Pillemer, 1986).

Second, we ran the classic fail-safe N test on CMA 2.0 to test for publication bias. The fail-safe N is an estimation of the number of unpublished studies that would make the results insignificant. In this case, the estimated number of missing studies that would bring a p-value larger than $\alpha = 0.05$ was 7321 ($p = 0.000$). Based on the formula from Wang et al. (2018), the threshold for publication bias is 170, and thus, this test result implies no significant publication bias.

4. Results of the meta-analysis

4.1. The relationship between supply chain leadership and firm performance

Firstly, based on previous studies (Geng et al., 2017; Cohen, 2013; Triana et al., 2018), we defined the effect size as follows: the estimated effect size is weak if it is 0.10–0.30, medium if it is 0.30–0.50, and strong if it is over 0.50.

The meta-analytic estimations of the aggregated correlations for the supply chain leadership–firm performance relationship are presented in Table 5. The overall supply chain leadership–firm performance relationship is significantly strong, because the effect size is 0.578, with $p = 0.000$. The confidence interval (0.457, 0.677) does not contain 0, which implies moderators are not present (Hunter and Schmidt, 2004). Therefore, the overall effect of SCL on firm performance is confirmed (H1).

The effect for three subgroups of SCL were examined. The estimated effect size of transformational leadership was 0.563, with $p = 0.000$, while the estimated effect size of transactional leadership was 0.414, with $p = 0.039$. The confidence intervals were (0.444, 0.662) and (0.022, 0.686), neither of which contains 0. As the effect size of transformational leadership was strong and that of transactional leadership was medium, H2 is supported. We note that under the ‘others’ category, the effect was significantly strong ($r = 0.632$, $p = 0.000$).

Table 6 presents the results of the moderating effect size of industry. Of seven industry categories, three showed very strong effects: manufacturing ($r = 0.613$, $p = 0.001$), multiple ($r = 0.615$, $p = 0.000$) and services ($r = 0.660$, $p = 0.000$). Strong measurements were found in construction ($r = 0.500$, $p = 0.000$), agriculture ($r = 0.563$, $p = 0.000$) and healthcare ($r = 0.580$, $p = 0.000$). Transportation was the only measurement that was only medium in strength. As the effects varied between different industry types, H3 is supported.

Table 7 presents the effect size analysis results for the moderator of region. Samples were distinguished into developed, developing and global. It was found that the developing region showed a stronger impact ($r = 0.628$, $p = 0.000$) on the leadership–performance relationship than the developed region ($r = 0.552$, $p = 0.000$). For the global region, the impact on the leadership–performance relationship was medium ($r = 0.447$, $p = 0.000$). The findings support H4 that the impacts of SCL vary by region.

Table 8 shows three measurements that indicate a strong leadership–performance relationship: environmental ($r = 0.533$, $p = 0.000$), innovative ($r = 0.610$, $p = 0.000$) and operational ($r = 0.598$, $p = 0.000$). In addition, leadership has a significantly medium impact on financial performance ($r = 0.364$, $p = 0.000$). These four measurements are elements of 0.95 confidence intervals that do not contain 0, respectively. However, the social measurement was not significant (p-value 0.081). The 0.95 confidence interval (−0.062, 0.791), which contains 0, also implies that there might be a hidden moderator in this correlation. Overall, H5, that the impact of leadership varies by performance measurement, is supported by our findings.

5. Discussion

5.1. Theoretical implications

First, this research makes a contribution to the SCL literature. Among the extant studies, only two literature reviews were identified. Gosling et al. (2016) proposed a conceptual model to explain the role of SCL in

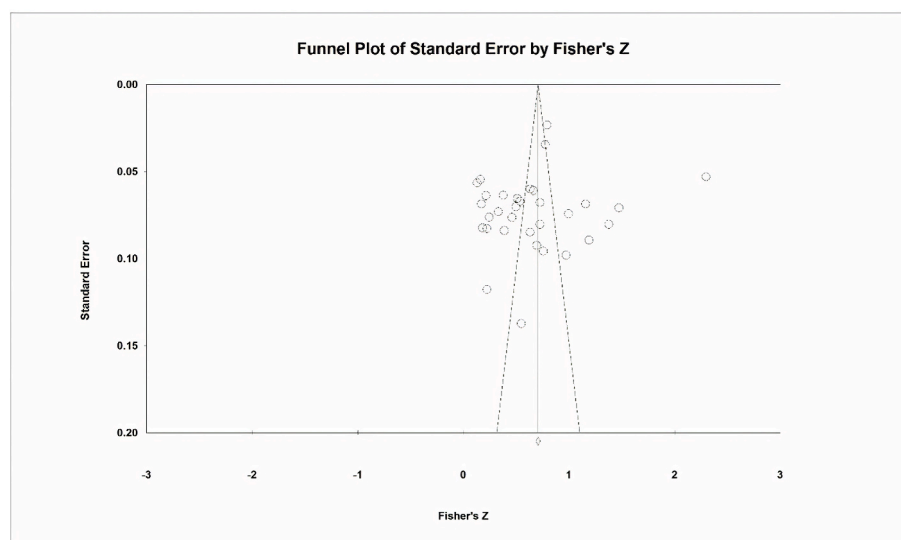


Fig. 5. Funnel Plot of the sample.

Table 5

The supply chain leadership-firm performance relationship.

	Sample Size	Studies	Effect Size (<i>r</i>)	0.95 CI		<i>z</i> -value	<i>p</i> -value	<i>Q</i> -statistics	<i>I</i> ²	Standard error
Total effect										
Leadership	8488	32	0.578	0.457	0.677	7.801	0.000	1755.423	98.234	0.471
Subgroup effect										
Transformational	3042	17	0.563	0.444	0.662	7.826	0.000	310.772	94.852	0.042
Transactional	2180	3	0.414	0.022	0.696	2.063	0.039	80.345	97.511	0.148
Others	3266	12	0.632	0.344	0.811	3.781	0.000	1312.357	99.162	0.230

Table 6

The supply chain leadership-firm performance relationship in various industries.

	Sample Size	Studies	Effect Size (<i>r</i>)	0.95 CI		<i>z</i> -value	<i>p</i> -value	<i>Q</i> -statistics	<i>I</i> ²	Standard error
agriculture	337	2	0.563	0.397	0.693	5.758	0.000	3.607	72.273	0.035
construction	56	1	0.500	0.273	0.674	3.999	0.000	0.000	0.000	0.000
healthcare	272	1	0.580	0.495	0.654	10.865	0.000	0.000	0.000	0.000
Manufacturing	3030	11	0.613	0.288	0.812	3.353	0.001	1282.485	99.220	0.264
multiple	2135	11	0.615	0.449	0.739	6.036	0.000	294.258	96.602	0.071
service	1840	1	0.660	0.633	0.685	33.980	0.000	0.000	0.000	0.000
Transportation	818	5	0.380	0.158	0.566	3.259	0.001	47.982	91.694	0.054

Table 7

The supply chain leadership-firm performance relationship in various regions.

	Sample Size	Studies	Effect Size (<i>r</i>)	0.95 CI		<i>z</i> -value	<i>p</i> -value	<i>Q</i> -statistics	<i>I</i> ²	Standard error
Developed	3534	11	0.552	0.433	0.653	7.691	0.000	170.388	94.131	0.043
Developing	3883	16	0.628	0.402	0.783	4.624	0.000	1413.522	98.939	0.175
Global	1071	5	0.447	0.233	0.620	3.860	0.000	63.265	93.677	0.057

Table 8

The impact of supply chain leadership on various performance.

	Sample Size	Studies	Effect size (<i>r</i>)	0.95 CI		<i>z</i> -value	<i>p</i> -value	<i>Q</i> -statistics	<i>I</i> ²	Standard error
environmental	394	2	0.533	0.323	0.693	4.488	0.000	6.722	85.123	0.050
Financial	394	2	0.364	0.274	0.447	7.507	0.000	0.012	0.000	0.008
innovative	2436	9	0.610	0.411	0.754	5.108	0.000	340.616	97.651	0.101
operational	3176	17	0.598	0.357	0.764	4.275	0.000	1281.407	98.751	0.170
Social	2088	2	0.467	−0.062	0.791	1.746	0.081	72.630	98.623	0.238

learning regarding sustainable practices; however, SCL was not the only focus. Mokhtar et al. (2019b) conducted a systematic literature review of SCL based on content analysis. Therefore, to the best of our knowledge, this paper is the first attempt to provide a meta-analysis in the context of SCL to integrate and analyse the empirical findings of the SCL–firm performance relationship. The results comprehensively conclude that there are benefits to firm performance from applying leadership in the supply chain.

Second, although our study found that both transactional leadership and transformational leadership have positive effects on overall firm performance, the results show that the impact of transformational leadership on firm performance is higher than that of transactional leadership, a conclusion which supports some of the existing research (e.g., Yee et al., 2013; Ul-Hameed et al., 2019). However, there is no study among the sample papers comparing the effect of transactional and transformational leadership on firm performance. Additionally, compared with transformational leadership, transactional leadership is less studied (Ul-Hameed et al., 2019). Therefore, it is possible that an insufficient sample could have interfered with the analysis. The lack of research regarding transactional leadership in the supply chain also reflects the popularity of supply chain transformational leadership. Some authors even ignored transactional leadership, recognising only transformational leadership as a contributor to performance improvement (Noruzi et al., 2013; Overstreet et al., 2013). However, according

to classic leadership theory, transformational leadership and transactional leadership should be combined, as they are complementary for superior overall performance; it might be expected that the situation would be the same in the context of SCL (Mokhtar et al., 2019b). As argued by Birasnav and Bienstock (2019), these two leadership forms are not exclusive; transactional leadership is effective in promoting internal integration, while transformational leadership is related to external integration. This research expands current literatures by providing evidence that both leaderships have positive contributions on increasing the firm performance.

Third, our research shows that SCL is related to firm performance in various aspects. This study goes beyond previous literature reviews. Mokhtar et al. (2019b) identified in their literature review that SCL facilitates operational performance, sustainable performance and buyer–supplier relationships. However, in our research, the strong relationship between SCL and corporate innovative performance is further verified. Additionally, the results also show that the impacts of SCL on performance vary with changes in performance measurement. Environmental, operational and innovative performance showed the strongest relationships with SCL, followed by financial performance. The relationship between SCL and social performance was found to be insignificant. There are few studies on the correlation between SCL and environmental, social and financial performance, and therefore future research is required to clarify the relationship via more empirical

evidence.

Fourth, our review of the literature found that the examined performance was either related to the buying firm or the supply chain; few studies concentrated on how SCL can bring about performance improvement for supply chain partners (e.g. suppliers). For example, Mokhtar et al. (2019a) stated that both transactional and transformational SCL can affect suppliers' reverse supply chain performance; however, Bag (2018) found an insignificant correlation between SCL and supplier development and supplier relationship management, which are important supporting factors for supplier performance improvement (Modi and Mabert, 2007). Considering the mixed results regarding how SCL can influence supplier performance, more attention should be paid to justify the role of SCL in affecting supplier performance.

Fifth, via the moderator analysis, our research shows that the impact of SCL on performance is effective in all the categorised regions; however, the impact in developing countries is stronger than that in developed countries and the global region. The reason for this difference might derive from different policies and institutional systems (Raut et al., 2019), which may lead to distinct cultural, economic and operational environments, thus moderating the relationship between SCL and firm performance. This finding may also arise from the fact that firms in the developed region tend to have abundant human and financial resources and stable operational environments (Syed et al., 2012), which may lead to higher performance, yet weaker effects of SCL on firm performance. However, identifying the primary cause for the moderating effect requires further empirical research.

Industry types were categorised in our research and firm performance in each industry proved to be positively related to SCL. The effect of SCL on firm performance was shown to vary by industry type, with the effects in the manufacturing and service sectors stronger than those in other sectors. This finding can be explained by the fact that service and manufacturing industries are more dependent on continuous innovation to maintain competitive advantages, while SCL, especially transformational leadership, can enable innovation, rendering SCL more effective in affecting the performance of the firms in those two sectors (Cheng and Krumwiede, 2010; Kastalli and Van Looy, 2013). In terms of number of studies, only the manufacturing and transportation industries were represented by over five papers, while the other industries had less than or equal to two per industry. Therefore, the SCL–performance relationship in the other industries (i.e. services, healthcare, construction and agriculture industries) and the moderating effect of industry type should be further explored.

5.2. Managerial implementation

Apart from its theoretical contribution, this research also has practical implications for managers in multiple industries with supply chains, such as the manufacturing industry. This meta-analysis reveals significant empirical evidence that SCL can affect various aspects of firm performance, regardless of industry or economic region. The research findings suggest that having supply chain leaders and adopting suitable forms of SCL can lead to better firm performance and supply chain performance (Birasnav and Bienstock, 2019), across multiple dimensions of performance improvement.

The improvement in operational performance is important (Kharub and Sharma, 2016), leading to improved operational accuracy and efficiency, and better quality of service and products (Ul-Hameed et al., 2019). Our results indicate that SCL, especially transformational leadership, can improve corporate innovative performance, by intellectual stimulation, thus encouraging followers to solve problems via new ideas. The improvement in innovative performance is also represented in the fact that SCL can also encourage the adoption of emerging technologies in the supply chain (Raut et al., 2019). The case of Toyota is a great example of supply chain leader use transformational leadership to improve the innovation performance of their followers (i.e., suppliers). Applying intellectual stimulation, Toyota promotes the voluntary

learning teams for supplier and encourage its suppliers to be innovative.

Moreover, environmental and social performance is improved by SCL, as it can facilitate CSR activities (Khan and Wisner, 2019) and green initiatives, such as green purchasing, green design and reverse logistics (Mokhtar et al., 2019a). In addition, SCL can improve financial performance, because it is related to better financial health (Prasad et al., 2018) and financial sustainability (Akhtar et al., 2016). If practitioners are able to gain a comprehensive understanding of the potential benefits of SCL for firm performance, they are more likely to stress the importance of SCL and adopt SCL concepts to scrutinise and reconfigure their supply chain practices (Mokhtar et al., 2019b).

Although our research shows that SCL leads to overall performance improvement, the performance effect of different leadership forms varies. Transformational SCL has a greater impact on performance than transactional SCL. This conclusion does not suggest that only transformational SCL should be adopted in practice, because there is no single leadership form that is appropriate and effective under all circumstances (Mokhtar et al., 2019b). The optimised SCL form should comprise a combination of both forms for superior performance: for instance, a firm could alternatively or simultaneously utilise transformational and transactional leadership towards different suppliers (Mokhtar et al., 2019b). For example, Toyota applies transformational leadership in their supply chain to encourage supplier's innovative performance, meanwhile, they would leverage tough method, such as economic sanctions to correct supplier's behaviour, which is a typical transactional leadership behaviour. Managers should consider their industry and product characteristics before making decisions on the leadership forms to be adopted in the supply chain (Ojha et al., 2018). As stated by Ojha et al. (2018), transformational leadership and transactional leadership are suitable for different industries, because the type of performance that needs to be improved the most varies between industries. For example, innovative performance is prioritised in fast-moving industries such as electronics, and transformational leadership is appropriate for this industry type, while in relatively stable industries, such as food retail, transactional leadership is recommended to ensure better operational performance.

6. Conclusion

This study conducted a meta-analysis to examine empirical studies reported in 32 peer-reviewed journal articles, in which 8488 sampled companies were examined. We explored the SCL–performance relationship and the impact of control variables (industry and region) on this relationship.

The results indicate that applying leadership in the supply chain can positively affect the firm performance. Specifically, we draw a comprehensive result by conducting a meta-analysis to show that transformational SCL has a more significant influence than transactional SCL on firm performance. The effect of SCL on performance varies with the different performance measurements. The most obvious effect of SCL is observed in environmental, operational and innovative performance, however, the effect of SCL on financial and social performance is less significant than others aspects.

There are several future research directions. First, due to the number of empirical studies on SCL is limited, more empirical studies are expected in the future, and it may be promising to test the proposed hypotheses for robustness with a larger sample size. Second, this study focuses on only transformational and transactional SCL. Other categorization of leaderships should be further examined in future to discuss their impacts on the supply chain performance. Third, meta-analysis can only examine linear relationships between SCL and firm performance; the method is not able to investigate non-linear effects of SCL on performance, which require further study to explore the non-linear relationship between SCL and firm performance. Fourth, future research could conduct more empirical studies of supply chain transactional leadership to further clarify its relationship with firm performance.

Additionally, as most SCL research focuses on either transactional leadership or transformational leadership, the scope of the supply chain leadership style should be further expanded. For example, individual leadership style such as full-range leadership or charismatic leadership and other leadership styles could be taken into account determining its feasibility to be applied in the organisation or the supply chain level. Last, as we find that both transformational and transactional SCL have positive impacts on firm performance, future research should emphasise the adoption of a combination of the two leadership forms in the supply chain and then examine the extent to which the combined SCL influences firm performance.

Acknowledgement

The authors gratefully acknowledge the financial support by Natural Science Foundation of China Young Scientist Fund (no. 71902159), Key Program Special Fund in XJTLU (no. KSF-A-06) as well as Key Program Special Fund in XJTLU (no. KSF-A-13).

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