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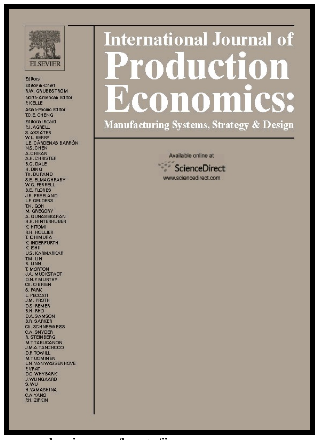

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The submission is for the Special Issue on Sustainable Consumption and Production in Emerging Markets

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Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance

Manufacturing firms in developing countries have recently started to adopt sustainable supply chain management (SSCM) to manage their environmental responsibility. However, achieving sustainable production within a SSCM context has been one of the most pressing challenges in emerging markets, as it may not involve securing financial benefits. Given the scarcity of empirical evidence, this study raises the proposition that SSCM practices can be both environmentally necessary and good business in the context of emerging economies. In light of this, this paper develops and empirically assesses an integrated SSCM performance framework underpinned by the Resource Dependence Theory (RDT), linking SSCM practices and their relationship with organisational performance. Using the tenants of RDT, this research develops an understanding of how firms use their partners' resources to implement SSCM practices and manage their performance implications.

Conducting an empirical study of 128 manufacturing firms, 72 in China and 56 in Iran, this study examined and compared the impact of SSCM adoption on environmental and cost performance within these two emerging markets. Using a multiple regression analysis, the results show that there are more similarities than differences amongst these two emerging economies. The results reveal that the adoption of SSCM practices results in higher levels of the environmental performance of Chinese and Iranian manufacturers, but does not necessarily lead to improved cost performance. Our findings suggest that firms operating within emerging markets need to undertake SSCM initiatives with a broader consideration of their financial bottom line in order to minimise trade-offs between the environmental and cost performance.

Keywords: Sustainable supply chain management (SSCM), Resource dependence theory (RDT), Sustainable production, Manufacturing firms, Environmental performance, Cost performance, Emerging markets.

1. Introduction

Over the past few decades, the topic of supply chain management (SCM) has become more socially and environmentally conscious and has evolved to not only embrace economic objectives but also to take social and environmental goals into account (Gimenez et al., 2012). Such a shift towards sustainability has mainly occurred in response to increasing governmental environmental legislation and also heightened environmental awareness among customers demanding product and services that are environmentally sustainable (Tan et al., 2014; Brandenburg et al., 2014). Hence, sustainable supply chain management (SSCM), which promotes environmental sustainability and sustainable production, has become an important topic within both the academic and industrial sectors. In light of this, manufacturing industries have begun to adopt SSCM practices to manage their environmental responsibility (Su et al., 2015). Today with increasing concern about environmental sustainability issues on a global scale, firms' reputation along with their stakeholders' value will be at risk if they are unable to demonstrate a rational position on sustainability (Tseng et al., 2015). The current sustainability agenda is pushing manufacturing industries to extend their focus beyond traditional economic goals to the triple bottom line approach that simultaneously embraces the environmental, social and economic domains (Carter and Easton, 2011; Gimenez et al. 2012).

From the emerging economies' perspective, manufacturing firms in developing countries have recently started to pay more attention to green concepts in their supply chain management activities as they have faced tighter environmental restrictions from their governments and intense scrutiny from an increasingly educated society and competitors (Govindan et al., 2014b). In view of this, manufacturers in emerging markets have started adopting various SSCM initiatives, such as green purchasing and eco-design, in order to limit the impact of their operations on the natural environment (Tseng and Chiu, 2013). This indeed not only enables manufacturers in emerging markets to meet their domestic expectations, but also permits them to compete in the global market, because they conform to international legislation. However, manufacturing firms often struggle to implement SSCM initiatives in the context of emerging economies as they are not fully self-sufficient with regards to their internal resources (Paulraj et al., 2008). In turn, manufacturing firms have attempted to overcome such strategic weakness by establishing inter-organisational collaborations with their partners in order to acquire the required green resources and expertise. Arguably, the consequent outcome of such supply chain alliance leans to some degree of influence over the performance of the involved partners. One well established theory used to explain this phenomenon is resource dependence theory (RDT) as it can help elaborate interdependencies formed with a focal firm and its partners in attaining organisational goals. This theory is valuable for extending this line of research in understanding inter-organisational collaboration in the SSCM implementation and its associated performance outcome. RDT has several important premises as it can be linked to supply chain collaborative advantage, each which is presented in the next section.

There has been recent concern in the literature as to whether the adoption of SSCM practices will ultimately translate into profitability and improved financial performance (Rao and Holt, 2005; Zhu et al., 2013). Despite this being widely studied in developed economies (Hollos et al., 2012; Green et al., 2012a), there is a scarcity of research in the context of emerging economies (Hsu et al., 2013), raising the question as to whether SSCM practices such as sustainable production really pay off in emerging markets. Thus, further understanding of the relationship between SSCM practices and performance is needed, especially for firms in developing countries such as China and Iran which need to balance a growing economy and environmental protection (Geng et al ., 2013; Soltani et al., 2015).

Current knowledge concerning the impact of SSCM adoption on the performance of manufacturing firms in emerging economies is limited because of a lack of empirical research (Jayarama and Avittathur, 2015). Few studies (Holt and Rao, 2005; Zhu et al., 2005; Zhu and Sarkis, 2007) to date have investigated the impacts of SSCM practices on environmental and economic performance in the context of emerging economies. However, these studies have struggled to report conclusive results and have posed contradicting directions. Such infancy within empirical evidence concerning SSCM practices and their performance implications in emerging economies calls for further empirical investigation. In light of this, this study sought to examine and compare the adoption of SSCM practices within two emerging economies on different trajectories, China and Iran (Zhu et al., 2008b). While China is positioned amongst top five major emerging economies (BRICS) with nominal GDP per capita of 7,589 USD (IMF, 2015), Iran is placed relatively lower than top five major emerging economies with nominal GDP per capita of 5,183 USD (IMF, 2015). Adopting China as an upper emerging economy and Iran as a middle emerging economy enables this study to generalize its findings on emerging markets. In turn, these two emerging economies on different trajectories are deemed as an appropriate representative of emerging markets.

Arguably, a cross-country empirical comparison of SSCM adoption within two emerging economies will consolidate our research position on the findings. Such an approach has been adopted by previous authors (Zhu et al., 2008b) to distinguish potential contradicting directions. Adopting a similar approach, this paper provides a general comparative analysis of SSCM adoption, with a focus on similarities and differences between these two countries, in order to report a relatively conclusive result. Considering the lack of empirical evidence concerning the adoption of SSCM practices in emerging economies and also the current concern that SSCM practices can be both environmentally necessary and good business in the context of emerging economies, this study proposes the research question as follows:

(RQ) Does the adoption of SSCM practices result in a higher level of environmental performance and ultimately lead to improved cost performance in emerging economies?

To answer the proposed research question, this paper aims to develop and empirically assess a comprehensive SSCM performance model, linking SSCM practices and their relationship with organisational performance. This study contributes to the SSCM literature by incorporating recently developed constructs (Zhu et al., 2008a; Esty and Winston, 2009; Green et al., 2012b) into an integrated SSCM performance model which is underpinned by Resource Dependence Theory (RDT). Little empirical research has been done in the SSCM literature based on the conceptual footing of RDT (Lee et al., 2012). Furthermore, this paper bridges the existing gap surrounding the lack of empirical evidence concerning SSCM adoption in the context of emerging economies.

The remainder of this paper is structured as follows. The theoretical foundation and literature review is presented in the next section, addressing the theoretical lens and the linkage to the Resource Dependence Theory (RDT). Next, SSCM practices and performance implications are outlined along with their relevance to emerging economies. Thereafter, the research methodology is presented in Section 3 along with a summary of our samples. Section 4 reports the results of this study, followed by a discussion of the key findings in Section 5. Lastly, the conclusions of this research investigation are addressed in Section 6 along with the theoretical and managerial implications and also limitations and future directions.

2. Literature review and hypothesis development

2.1 Resource dependence theory (RDT)

RDT argues that firms are dependent on resources provided by others in order to sustain growth and secure competitiveness (Pfeffer and Salancik, 1978). Resource dependence theory has been broadly applied to explain how organisations exploit required external resources to move toward attaining their organisational goals. According to RDT, firms cannot be fully self-sufficient with respect to their strategically critical resources, and they depend on external resources to secure their competitiveness (Pfeffer and Salancik, 1978). In other words, firms that lack vital resources to accomplish their goals must build relationships with partner firms (e.g. suppliers) to obtain the required resources. Dyer and Singh (1998) have argued that inter-organisational relations provide formal and informal mechanisms that promote trust, reduce risk, and in turn increase innovation and profitability. Such inter-organisational relations can be deemed as a certain sort of alliance between partner firms which provides opportunities for learning, acquiring, sharing, and innovating over time (Paulraj et al., 2008).

Hence, establishing inter-organisational dependence is essential for firms' success, as relying solely on internal resources is not sufficient to compete in today's competitive market. Through such interdependence, firms can synergistically combine their own resources with the complementary resources of their partners and thus develop a resource bundle that is capable of accomplishing their goals (Harrison et al., 2001). Arguably, such interdependence among a firm and its partners can impact each other's business practices, which eventually impacts the business performance of the focal firm. This can be explained in the sense that dependencies often enable these partners to exercise some degree of control or influence over the external resource of the firm's exchange partners for performance gains (Cook, 1977).

2.2 Theoretical lens

This section provides the theoretical foundation linking sustainable supply chain management practices, environmental and cost performance. Carter and Rogers (2008) highlighted that studies concerning the development of conceptual frameworks should not only offer a conceptual tool but also present normative values, based on sound theoretical underpinnings. With this in mind, we attempted to develop a SSCM performance framework underpinned by Resource Dependence Theory (RDT). This paper used RDT principles as the theoretical anchor to develop the research model. Based on an RDT perspective, we argue that manufacturing firms must make collaborative efforts with their suppliers to effectively implement sustainable practices across the supply chain. This paper posits the adoption of SSCM practices as inter-organisational dependencies where a focal firm requires collaboration with its partners (e.g. suppliers) to develop products or services that are environmentally sustainable. Inter-organisational collaboration facilitates the implementation of SSCM practices, as it provides the focal firm with green resources, expertise and capabilities. In this aspect, RDT is a relevant theory to SSCM because it can help to elaborate activities spanning the organisation-environment boundary, implying that a single firm can hardly implement SSCM practices on its own. In many instances, focal firms often demand that their suppliers implement SSCM practices and fulfil even additional environmental requirements given the power development aspect of resource dependence (Lee et al., 2012). There has been little investigation into the effects of SSCM practices on performance implications in terms of the links with RDT (Sarkis et al., 2011). We extend the use of RDT to the supply chain and operations management research to examine relationships between the implementation of SSCM practices and performance outcome in the context of emerging economies.

In summary, to effectively adopt proactive SSCM practices, such as sustainable procurement, sustainable distribution, sustainable design, and investment recovery, firms need to make collaborative efforts with their suppliers and partners (Vachon and Klassen, 2008). From an emerging economy perspective, the role of collaboration in the supply chain becomes crucial as firms confront a potential lack of green resources, expertise and capabilities (Jayarama and Avittathur, 2015). Furthermore, the inter-organisational collaboration among the focal firm and its suppliers which is required for the implementation of SSCM practices, indeed has an impact on the firm's economic and environmental performance (Paulraj et al., 2008). Accordingly, the SSCM performance model was developed based on RDT's theoretical underpinnings in the sense that inter-organisational collaboration drives the adoption of SSCM practices.

2.3 Sustainable supply chain management (SSCM)

Environmental sustainability and pollution are global concerns that affect manufacturing industries both in developed and developing countries. According to Beamon (1999, p. 332), "waste generation and natural resource use, primarily attributed to manufacturing, contribute to environmental degradation". These increasing global issues indicate an urgent need for manufacturing firms to realign their strategies and operations to undertake environmental initiatives. Sustainable supply chain management (SSCM) is an increasingly important topic in the operations and supply chain management literature, owing to various factors supporting its acceptance and favouring its adoption such as: social pressures, heightened customer expectations, corporate image, tighter governmental regulations, competitive pressures, the scarcity of natural resources and so forth (Tseng et al., 2015; Govidan et al., 2014a). From a holistic perspective, the notion of SSCM is generally deemed as a synergistic conflation of corporate social responsibility, environmental management, and supply chain management (Linton et al., 2007; Tseng and Chiu, 2013).

In essence, a supply chain is a set of business actions that directly involves the upstream or downstream flows of information, products and services from a point of origin to a point of consumption (Lambert et al., 1998). This definition reflects a linear production paradigm that posits constant inputs of natural resources and an unlimited capacity to assimilate waste (Geyer and Jackson, 2004). Unlike traditional models, a sustainable supply chain considers the environmental impacts of the production process as goods flow through the supply chain (Hsu et al., 2013). Hence, a sustainable supply chain extends:

[…] *the traditional supply chain to include activities that aim at minimizing environmental impacts of a product throughout its entire life cycle, such as green design, resource saving, harmful material reduction, and product recycle. (Beamon, 1999)*

The definition of both the traditional and sustainable supply chains reveals how a sustainable supply chain attempts to 'close the loop' by including the reuse, remanufacturing, and recycling of products and materials in a common forward supply chain (Zhu et al., 2008c). The goal is to minimise negative environmental impacts and wasted resources, from the acquisition of raw materials up to the final use and disposal of products (Hsu et al., 2013).

This paper defines SSCM as the management of raw materials, components and processes from manufacturers to suppliers to final customers along with the product being taken back through the lifecycle stages with the purpose of having the lowest possible negative environmental impact (Hu and Hsu, 2010; Tseng et al., 2015). Fig. 1 presents a visual representation of a simplified SSCM.

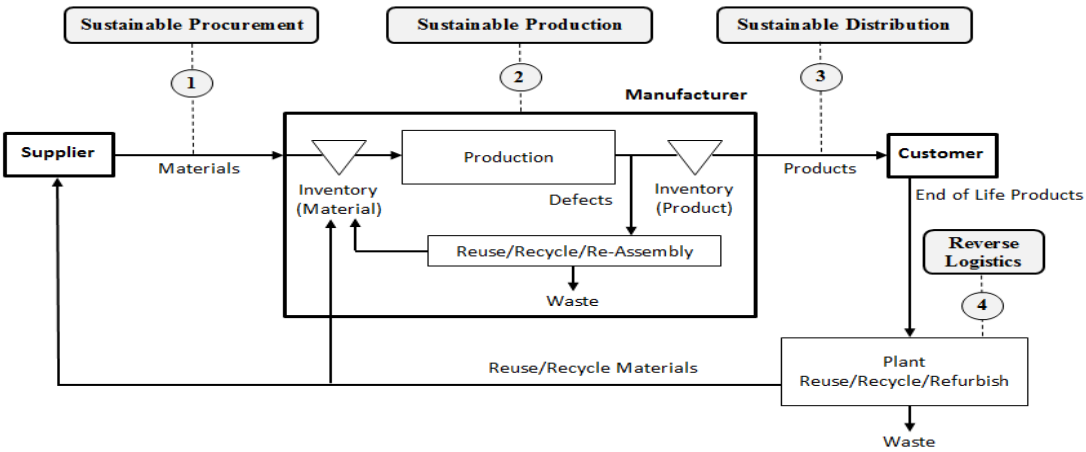


Fig. 1. Main activities in typical sustainable supply chain management (Adopted from Diabat and Govindan, 2011).

2.4 SSCM performance

Previous research has explored the relationships between the adoption of SSCM practices and performance implications, including operational, environmental, and economic performance. Existing literature has offered insights into potential patterns of sustainable supply chain initiatives for improving environmental performance (Rao and Holt, 2005; Zhu et al., 2005; Lee et al., 2012; Green et al., 2012a). The literature supporting such positive relationships is relatively strong. For instance, Lee et al. (2012) argued that inter-organisational linkage and collaboration could lead to improvements in environmental performance. Zhu et al. (2005) suggested that relations with suppliers aid the adoption and development of innovative environmental technologies. Opinions on whether SSCM practices cause or relate to positive or negative economic performance are still mixed (Wagner et al., 2002). Rao and Holt (2005) indicated that greening the supply chain leads to improved economic performance. However, Bowen et al. (2001) suggested that SSCM practices are not being reaped in terms of short-term profitability and financial performance.

This cross-country investigation examined whether Chinese and Iranian manufacturers perceive improvements in environmental and economic performance due to the adoption of SSCM practices. Overall, manufacturing firms in Iran are at an early stage of adopting SSCM practices, which may leave more room for further development and improvement. In China, manufacturing firms have been practising SSCM initiatives for a longer period, as they approached SSCM piecemeal (Zhu and Sarkis, 2007). However, SSCM practices are being employed in a roughly similar manner in most of the large manufacturing firms operating in China and Iran.

2.5 SSCM initiatives

A manufacturing firm may undertake a set of SSCM initiatives to minimise the negative environmental impacts associated with the entire lifecycle of its products or services, starting from design through the acquisition of raw materials to consumption and product disposal (Zsidisin and Siferd, 2001). The concept of SSCM has evolved to include boundary-spanning activities such as sustainable procurement (Tseng and Chiu, 2013), sustainable production (Vachon and Klassen, 2006), eco-design (Sarkis 2006), sustainable distribution (Lakshmimeera and Palanisamy, 2013) and investment recovery (Zhu et al., 2008a). Although the SSCM concept has evolved beyond a firm-specific or end-of-pipeline green solution, such initiatives are not widespread, particularly in emerging economies, despite their environmental benefits (Hsu et al., 2013). Arguably, firms can overcome this by adopting a collaborative approach with their partners to confront a potential lack of green resources, expertise and capabilities (Matos and Hall, 2007).

The SSCM literature has addressed a variety of initiatives, ranging from organisational practices to prescriptive models, that evaluate sustainable supply chain practices and technology (Hsu et al., 2013). Given the multi-dimensional expansion of SSCM literature, this paper focuses on four major SSCM initiatives, namely, sustainable production, eco-design, sustainable distribution, and investment recovery. These four areas represent SSCM adoption fairly, as they cover the main internal and external activities and functions within sustainable supply chain management (Zhu et al., 2005; Su et al., 2015).

2.5.1 SSCM initiatives in emerging economies

Both China and Iran have gone through rapid economic development over a short period of less than two decades (Geng et al., 2013; Feizpour and Mehrjardi, 2014). However, the downside to this is a host of environmental pollution problems which are now of serious public concern, particular from the Chinese perspective. In response, the Chinese and Iranian governments have developed and enacted environmental laws and policies to give more power to their environmental programmes in order to limit the impact of their manufactures' operations on the natural environment (Tan et al., 2014). Recognising that businesses are the principal source of investment and economic growth, and are hence key players in environmental protection (Hsu et al., 2013), the Chinese and Iranian governments have instituted several green incentives to stimulate manufacturing firms to play a more voluntary role in environmental protection. Indeed, this has led to a shift from relying solely on internal resources to depending on external resources to undertake SSCM initiatives. As environmental awareness is rapidly building in these two emerging economies, the Chinese and Iranian governments have placed further emphasis on preventive measures (Geng, 2011; Soltani et al., 2015). These measures are put in place to mitigate and minimise negative environmental impacts at source, e.g. suppliers' evaluation and suppliers' environmental certification, to intensify and reward the efforts of manufacturing firms that have sustainable production, and to ensure reasonable sustainable development by closing the loop, with a focus on remanufacturing, recycling, and disposal initiatives (Zhu et al., 2008c). Arguably, this requires strategic alliances and collaboration amongst involved supply chain members.

Among the several SSCM initiatives that the Chinese and Iranian governments have introduced, specific importance has been placed on four fundamental practices: sustainable procurement, sustainable production along with design for the environment, sustainable distribution, and reverse logistics. In the context of emerging Chinese and Iranian manufacturers, each initiative represents the extent to which each firm in these developing countries engages in sustainable supply chain practices. While the four major SSCM initiatives are not unique to China and Iran, and are prevalent in other emerging economies including India and Brazil, they represent a strong commitment that these governments had made through their strategic environmental plans to focus on such initiatives to foster SSCM approaches in these two emerging markets (Geng et al., 2013; Govidan et al., 2014a).

This paper now describes the four initiatives within the umbrella of the SSCM approach and their growing importance for Chinese and Iranian manufacturing firms.

2.5.1.1 Sustainable procurement

Sustainable procurement is generally referred to as an environmental purchasing approach that ensures purchased items are in line with desirable ecological attributes, such as reusability, recyclability, and nontoxic materials (Zsidisin and Siferd, 2001). Sustainable procurement deals with material substitution through the proper sourcing of raw materials and also waste reduction through the waste minimisation of hazardous materials (Min and Galle, 2001). It requires working closely with suppliers to develop products or services that are environmentally sustainable (Carter and Carter, 1998). Suppliers' involvement is crucial in improving firms' environmental performance, as it is the suppliers who are capable of ensuring purchased materials are environmentally sustainable and have been produced using environmentally conscious processes (Hsu et al., 2013). Thus, most of the large manufacturing firms tend to collaborate with their suppliers to procure materials and services that are environmentally sustainable (Vachon and Klassen, 2008).

Most of the leading manufacturing firms operating in China and Iran have instituted sustainable procurement policies with their local suppliers in response to increasing pressure from the regulatory bodies and also heightened environmental expectation among customers (Zhu et al., 2010; Feizpour and Mehrjardi, 2014). In many instances, manufacturing firms normally tend to establish inter-organisational collaboration with a certain suppliers that posses green resources and capabilities essential for acquisition of environmental friendly inputs. Such collaborative advantage provides firms with required resources and green expertise to develop products and services that are environmentally sustainable. Thus, the interdependence with suppliers is of paramount importance in the context of SSCM as it can furnish firms with green resources that facilitate the implementation of SSCM practices and also influence consequent performance outcome.

In essence, core SSCM initiatives such as sustainable procurement are developed specifically to improve the environmental performance of manufacturing firms (Green et al., 2012a). Vachon and Klassen (2008) stressed that, in manufacturing settings, strong relationships and collaboration with suppliers aid the adoption and development of innovative environmental technologies. With our definition of sustainable procurement and RDT intellectual underpinnings, we acknowledge their impact on performance outcomes. Considering the main aim of sustainable procurement, cooperating with suppliers for the purpose of developing environmentally friendly products (Carter and Carter, 1998), this paper posits that there is a certain degree of association between sustainable procurement and environmental performance. Furthermore, sustainable procurement can have an impact on cost performance, as it involves collaboration with suppliers to acquire green materials and services (Carter and Carter, 1998). The role of suppliers is decisive for a firm's overall economic performance, as environmentally friendly suppliers tend to give different price quotations to those not comparatively environmentally friendly. Thus, with this set of arguments, we hypothesise the following in the context of emerging economies:

H1a. Sustainable procurement is directly and positively associated with environmental performance.

H2a. Sustainable procurement is directly and positively associated with cost performance.

2.2.5.2 Sustainable distribution

Sustainable distribution deals with environmental issues related to sustainable transportation, storage, inventory control, warehousing, packaging, and facility location-allocation decisions that aim to have the least possible negative environmental impact, e.g. the smallest carbon footprint (Sarkis, 2006). Green packaging characteristics such as size, shape, and materials are of paramount importance in sustainable distribution, because of their effect on the transport of the product (Seuring and Muller, 2008). Arguably, firms can benefit from better packaging along with rearranged loading patterns as it can reduce materials usage, increase space utilisation in the warehouse, and reduce the amount of handling required. Furthermore, the design of the logistics network is of great importance in the SSCM context and includes options such as direct shipping or hub and-spoke, central warehouse or distributed network, intermodal or single mode, and third-party services or private fleet (Lakshmimeera and Palanisamy, 2013).

Most of the large manufacturing firms operating in China and Iran have recently started to adopt a set of proactive distribution practices that support environmental planning in this area, including less handling, shorter movements, minimising empty miles, more direct routes, and better space utilisation (Zhu et al., 2010, Feizpour and Mehrjardi, 2014). In addition, large Chinese and Iranian manufacturers often employ third-party logistics providers with green expertise, capabilities and resources to effectively carry out sustainable distribution initiatives (Zhu and Sarkis, 2007). Green third-party logistics providers aim to provide outsourced logistics services that have the capacity to minimise negative environmental impacts (Sarkis, 2006).

Sustainable distribution is developed specifically to improve the environmental performance as it focuses on the elimination of emissions associated with products transportation throughout the supply chain (Green et al., 2012b). Hollos et al. (2012) found a significant direct linkage between sustainable distribution and the environmental and cost performance. Their results suggested that sustainable distribution aids the reduction of waste levels and CO_2 emissions in the chain, as it entails green packaging and logistics characteristics that minimise the footprint left behind during product transportation. They also reported that the benefits of green packaging and green logistics characteristics can be reaped in long-term profitability yet are costly to implement short-term, as this requires technological upgrades. Accordingly, we propose that:

H1b. Sustainable distribution is directly and positively associated with environmental performance.

H2b. Sustainable distribution is directly and positively associated with cost performance.

2.5.1.3 Sustainable production

Sustainable production, which is commonly referred to as sustainable manufacturing, is deemed as production processes using inputs with relatively low environmental impact that generate little or no waste or pollution (Lakshmimeera and Palanisamy, 2013). Eco-design plays an important role in such efficient production processes. According to Zhu et al. (2007), sustainable design is the most significant sub-attribute of sustainable production which can be measured. A number of earlier studies (Zhu et al., 2008a; Green et al., 2012a) argued that the practice of sustainable design relatively represents the sustainable production approach as it reflects the green activities involved in manufacturing processes. Adopting a similar approach, we propose to use the sustainable design practice which relatively represents the sustainable production approach. Sustainable design is mainly about designing a product or a service with environmental awareness and considerations (Sarkis, 2006). Sustainable design aims to reduce the negative environmental impacts of products during their lifecycle (Seuring and Muller, 2008). Any success designing for the environment does not only require cross-functional cooperation within the firm's units but also inter-organisational collaboration.

In an emerging economy such as China or Iran, new international regulatory compliances have forced the countries' governments to ensure that all large manufacturers have requirements to design for the environment built into their operations (Zhu and Sarkis, 2007; Soltani et al., 2015). It is noteworthy to point out that, most of the manufacturing firms in China and Iran tend to make collaborative efforts with their suppliers and partners to effectively undertake eco-design related initiatives. Generally, manufacturing firms operating in emerging economies establish inter-organisational collaboration with their partners to acquire required green resources, expertise and capabilities (Jayarama and Avittathur, 2015). China is home to various large manufacturers which supply to developed countries, and the same is true of manufacturers in Iran, who supply the Middle Eastern countries. Hence, Chinese and Iranian manufacturing firms have to undertake eco-design initiatives in order to comply with the environmental legislation concerning overseas export. The compliance issues adopted by most of the large manufacturers operating in these two countries range through lifecycle assessment of all products, reduction in material and energy consumption, and ensuring that packaging materials are not only reusable but also have a significant portion of recyclable contents (Zhu et al., 2010; Feizpour and Mehrjardi, 2014).

Environmentally-friendly design can potentially influence environmental performance, as the impetus of the designers will be towards reducing the environmental impact of the design (Green et al., 2012a). The sustainable design practice focuses on the elimination of wastes associated with environmental sustainability across the supply chain (Zhu et al., 2008a). Such waste minimisation should not only lead to environmental improvements but also to reduced costs associated with waste discharge or treatment, influencing cost performance (Green et al., 2012a). In addition, sustainable design requires manufacturers to minimise the consumption of material and energy, which again can potentially lead to reduced costs associated with material and energy consumption (Esty and Winston, 2009). In light of this, Rao and Holt (2005) also demonstrated a significant direct linkage between sustainable design and economic performance and reported that sustainable design has the capacity to enhance economic performance and lead to competitiveness. Thus, we hypothesise that:

H1c. Sustainable design is directly and positively associated with environmental performance.

H2c. Sustainable design is directly and positively associated with cost performance.

2.5.1.4 Reverse logistics

Reverse logistics is commonly referred to as being the opposite of traditional or forward logistics, and are defined as a process where used or end-of-life products are retrieved from the point of consumption for possible recycling and remanufacturing purposes (Lai et al., 2013). Zhu et al. (2008a) argued that the process of recovering and recapturing the value in reverse logistics is not limited to the effective reuse and recycling of unused or end-of-life products, but can also be obtained through surplus sales of products and assets. Effective surplus sales can be accomplished through the adoption of investment recovery practices, which play a critical role in the reverse logistics approach. Generally, investment recovery involves the task of recapturing the value of unused products or unproductive assets through effective reuse or surplus sales and divestment (Zhu et al., 2008a).

Handling the mechanics of reverse logistics including investment recovery practices requires significant attention by logistics professionals, which firms are often incapable of providing, thanks to a lack of internal resources (Lai et al., 2013). This necessitates collaboration with partner firms that possess expertise in taking back discarded products as well as preparing them for recycling procedures. Reverse logistics including investment recovery has received much less attention in both China and Iran due to a lack of focus on waste management policies and an absence of appropriate closed-loop infrastructure. As landfills in China and Iran continue to reach capacity, their governments continue to pursue legislation on recycling and remanufacturing (Zhu et al., 2007; Soltani et al., 2015). Consequently, an increasing number of manufacturers in China and Iran have recently been engaging in voluntary or mandatory end-of-life product management and adopting environmentally related practices.

The practice of investment recovery is developed with potentials of improving the environmental performance as it focuses on recovering and recapturing the value of unused or end-of-life assets through effective reuse or surplus sales (Green et al., 2012a). Investment recovery involves reuse and surplus sales of used materials, which eventually leads to a decrease in the waste and emission generated by by-products (Zhu et al., 2008a). Investment recovery can have an impact on a firm's cost performance, as it involves surplus sales of scrap and used materials, and capital excess equipment (Zhu et al., 2008a). Zhu and Sarkis (2007) also demonstrated a linkage between investment recovery and performance outcome and reported that investment recovery has the capacity to influence both the environmental and economic performance. Accordingly, we hypothesise that:

H1d. Investment recovery is directly and positively associated with environmental performance.

H2d. Investment recovery is directly and positively associated with cost performance.

2.6 Theoretical model

This study developed a research model based on RDT's theoretical underpinnings, linking SSCM practices to a firm's performance. Fig. 2 outlines the SSCM performance model that guided this research. The relationships between SSCM practices and environmental and cost performance are theorised in order to assess the impact of SSCM implementation on the firm's performance. The theoretical model is a path analytical framework with six latent variables (shown in Fig. 2): sustainable procurement, sustainable distribution, sustainable design, investment recovery, cost performance, and environmental performance. Each of the hypotheses is theorised as being direct and positive. As discussed, to effectively adopt SSCM practices, it is essential for manufactures to make collaborative efforts with partner firms (e.g. suppliers), particularly in the emerging economy context where the firm under consideration may not be self-sufficient with respect to its green resources and capabilities.

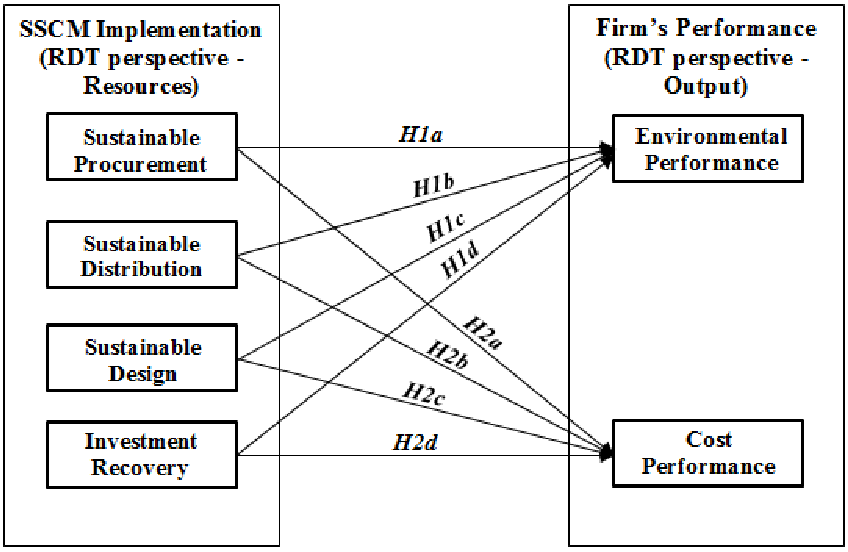


Fig. 2. Sustainable supply chain management performance model with hypotheses.

Although prior research demonstrated a linkage from the environmental performance to the cost performance owing to the cost saving nature of environmental performance (Zhu et al., 2008a), we excluded this relationship in our model as it was not consistent with our research question. Definitions of the constructs incorporated in the theoretical model are provided in Table 1.

Table 1. Construct definitions.

Construct	Definition
Sustainable Procurement	Sustainable procurement focuses on cooperating with suppliers for the purpose of developing products that are environmentally sustainable (Carter and Carter, 1998; Zhu et al., 2008a)
Sustainable Distribution	Sustainable distribution refers to any means of transportation of products or services from suppliers to manufacturers to final customers with the purpose of having the least possible negative environmental impact (Zhu et al., 2008a; Green et al., 2012b)
Sustainable Design	Sustainable design requires that manufacturers design products that minimise consumption of materials and energy, facilitate the reuse, recycling, and recovery of component materials and parts, and avoid or reduce the use of hazardous products within the manufacturing process (Zhu et al., 2008a; Esty and Winston, 2009)
Investment Recovery	Investment recovery refers to the process of recovering and recapturing the value of unused or end-of-life assets through effective reuse or surplus sales. It requires the sale of excess inventories, scrap and used materials, and excess equipment (Zhu et al., 2008a)
Environmental Performance	Environmental performance relates the ability of manufacturing plants to reduce air emissions, effluent waste, and solid wastes and the ability to decrease consumption of hazardous and toxic materials (Zhu et al., 2008a; Vachon and Klassen, 2008)
Cost Performance	Cost performance relates to the manufacturing plant's ability to reduce costs associated with purchased materials, energy consumption, waste treatment, waste discharge, and fines for environmental accidents (Zhu et al., 2008a)

3. Research methodology

3.1 Survey development

Zhu et al. (2008a) developed and tested a measurement model for SSCM practice implementation with performance outcome variables. They found four underlying constructs which fairly reflect the key dimensions of SSCM practices along with three performance measures: economic, operational, and environmental performance. In this paper, however, only two dimensions of performance outcome, economic performance and environmental performance, are selected. We directly adopted these measurement items of Zhu et al. (2008a) for the "sustainable procurement" and "investment recovery" constructs. For "sustainable distribution" and "sustainable design", we utilised additional items that are found in other studies (Esty and Winston, 2009; Green et al., 2012b). Based on these measurement scales, we developed the survey questionnaire (provided in the Appendix).

In developing the survey questionnaire, the double translation protocol was used, following a similar approach employed by Hsu et al., (2013). The survey questionnaire was first developed in English and was then translated into Chinese and Persian. After the translation, the questionnaire was presented to a panel of experts from academia as well as industry to solicit their comments and suggestions regarding the survey items. Then, the Chinese and Persian version was translated back into English. The two English versions did not have any major differences.

3.2 Samples

The constructs incorporated into our theoretical model were defined and described with a focus on manufacturing firms. Considering this manufacturing focus, data was collected from a sample of manufacturing managers working for Chinese and Iranian manufacturing firms. The questionnaire was administered using convenience sampling to a subset of the population of manufacturing managers, e.g., plant managers, logistics managers, operations managers, purchasing managers, supply chain managers, sales managers, engineering managers, and industrial waste managers.

The surveys were conducted via a Web-based survey service (Bristol Online Surveys) from October 2013 to December 2013 and data was collected from 128 qualified samples of various manufacturing firms, 72 in China and 56 in Iran. The data collection process was managed by Bristol Online Surveys and was structured to as to ensure unique responses from validated employees of Chinese and Iranian manufacturers. Kline (1998) argues that sample sizes from 100 to 400 are generally suitable for the traditional path analysis methodology based on regression analysis. Although the response rate is comparable, Nulty (2008) asserts that the average response rate to online surveys in social research is generally 33 per cent. With this in mind, we set the threshold of the participation requests to 500 as it could potentially provide us with 165 samples (500*(33/100)) which fall within the recommended range. Of the 500 individual sent e-mail requests to participate, 47 were screened out as non-managers and 204 managers completed the survey. Of the 209 respondents, 76 selected the "other manager" category. Because of concerns related to a lack of knowledge of sustainable supply chain management practices and organisational performance, data from the 76 were not included in the dataset analysed. Finally, data from 128 manufacturing managers likely to have the necessary knowledge to fully complete the survey were included in the dataset that is subsequently analysed. The effective response rate, therefore, is 28 per cent (128/(500-47)). Of 128 qualified samples, 72 samples were collected from manufacturing firms in China and 56 in Iran. Table 2 provides a more detailed description of the sample.

All of the respondents hold management positions in manufacturing firms. The majority of respondents (40 per cent) are operations and supply chain managers. The respondents selected 12 different industry classifications representing a diverse array of manufacturing firms. They work for firms with an average of 540.12 employees for the Iranian sample and 638.62 employees for the Chinese sample. According to Zhu and Sarkis (2007), firms with over 500 employees are classified as large enterprises. We chose large manufacturing firms because they are likely to have undertaken some sustainable supply chain initiatives (Zhu et al., 2008d). The sample is diverse as intended and is made up of individuals with knowledge of SSCM initiatives. Credible respondents minimise the threat of common method bias (Phillips, 1981).

Table 2. Samples demographics summary.

Title	China Number	Iran Number
Plant Manager	8	6
Logistics Manager	10	7
Operations Manager	14	11
Purchasing Manager	9	6
Supply Chain Manager	16	13
Sales Manager	7	3
Engineering Manager	5	6
Industrial Waste Manager	3	4
Total	*72*	*56*
Industry classification (UK SIC – Standard Industrial Classification)		
Manufacture of Food Products	6	4
Manufacture of Beverages	9	4
Manufacture of Textile	5	6
Manufacture of Rubber and Plastics Products	10	4
Manufacture of Wood and of Products of Wood and Cork	4	1
Manufacture of Paper and Paper Products	7	2
Manufacture of Chemicals and Chemical Products	5	6
Manufacture of Basic Metals	3	4
Manufacture of Electrical Equipment	7	8
Manufacture of Machinery and Equipment	4	4
Manufacture of Motor Vehicles, Trailers and Semi-Trailers	7	8
Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations	6	4
Total	*72*	*54*
Mean years in current position	8.26	7.45
Mean number of employees	638.62	540.12

4. Analyses and results

The measurement scales were assessed for reliability and validity and further assessed within the measurement model context using confirmatory factor analysis using LISREL 8.80 software. LISREL 8.80 software was used to perform the confirmatory factor analysis necessary to assess the measurement model because it is capable of providing the important model fit information and also offering modification indices suggestions to improve the fitness of the model. Multiple linear regression was then used to examine the relationships between SSCM practices and organisational performance. A comparison of the means of the demographic variables for the two samples was conducted using a one-way ANOVA. The comparisons resulted in statistically non-significant differences at the 0.01 level, indicating general equality between the two sample groups.

4.1 Scale assessment process

This study first examined the exploratory factor analysis (EFA) for all variables within both samples to "determine whether the majority of the variance can be accounted for by one general factor" (Podsakoff et al., 2003, p. 890). As a result of exploratory factor analysis, the following measurement items were excluded from the measurement model: SP4, SDIST5, EP6 and EP7. Please refer to Appendix A for the details. This confirmed that all of the remaining measurement items in each variable represent one factor, indicating sufficient convergent validity (Field, 2009).

Given that all of the measurement scales were directly taken from existing studies (Zhu et al., 2008a; Esty and Winston, 2009; Green et al., 2012b), content validity was assumed. Adopting a similar approach to Green et al.'s (2012a), chi-square difference tests for pairings of each scale with the other study scales returned significant differences at the 0.01 level, indicating sufficient discriminant validity for all scales (Gerbing and Anderson, 1988).

Furthermore, the reliability coefficients, i.e. Cronbach alpha values, for all of the constructs within both sample groups fairly exceeded the recommended 0.70 level, indicating sufficient reliability (Garver and Mentzer, 1999). The Cronbach alpha values are displayed in Table 3.

4.2 Measurement model assessment

As Koufteros (1999) recommended, the scales were assessed within the context of the full measurement model using a confirmatory factor analysis (CFA) methodology. CFA was examined using LISREL 8.80 software which reported the results shown in in Table 3. For the China sample, the measurement model fits the data relatively well, with a relative chi-square value (chi-square/degrees of freedom) of 1.742, a root mean square error of approximation (RMSEA) value of 0.068, a comparative fit index (CFI) value of 0.920, a non-normed fit index (NNFI) value of 0.910, and an incremental fit index (IFI) value of 0.920. Likewise, for the Iran sample, the measurement model fits the data fairly well, with a relative chi-square value of 1.892, RMSEA value of 0.084, CFI value of 0.911, NNFI value of 0.898, and IFI value of 0.905.

For both sample groups, the relative chi-square value is less than the 3.00 maximum recommended by Kline (1998) and the RMSEA value is below the maximum of 0.08 (Schumacker and Lomax, 2004). According to Byrne (1998), the CFI and IFI are more appropriate fit indicators when the sample size is small. The IFI and CFI values for both samples are greater than the 0.90 level (Byrne, 1998). The results concerning the fit of the model generally support a claim of good fit. The results of this CFA are provided in Table 3.

Table 3. Measurement model results.

Constructs	**Alpha (α)** (Iran)	**Alpha (α)** (China)	**Standardized Coefficient (β)** (Iran)	**Standardized Coefficient (β)** (China)	**t-values** (Iran)	**t-values** (China)
Sustainable Procurement	0.645	0.668				
SP1			0.52	0.58	6.92	7.18
SP2			0.44	0.49	5.14	5.85
SP3			0.55	0.57	7.42	7.58
SP5			0.66	0.68	9.17	9.33
SP6			0.56	0.57	7.33	7.47
Sustainable Distribution	0.723	0.796				
SDIST1			0.67	0.66	9.24	9.36
SDIST2			0.64	0.62	9.16	9.08
SDIST3			0.61	0.64	9.08	9.24
SDIST4			0.60	0.66	8.86	9.08
SDIST6			0.58	0.59	7.07	7.28
Sustainable Design	0.705	0.759				
SD1			0.56	0.58	6.86	6.94
SD2			0.72	0.75	10.02	10.38
SD3			0.52	0.58	7.05	7.62
SD4			0.70	0.73	9.82	9.98
SD5			0.55	0.54	6.22	6.16
SD6			0.54	0.58	6.13	6.46
Investment Recovery	0.665	0.688				
IR1			0.74	0.77	11.14	12.36
IR2			0.62	0.64	8.46	9.26
IR3			0.48	0.52	5.23	5.63
Environmental Performance	0.745	0.766				
EP1			0.68	0.69	8.11	8.35
EP2			0.53	0.55	5.85	6.08
EP3			0.71	0.74	10.12	10.96
EP4			0.65	0.63	8.18	8.02
EP5			0.49	0.51	5.22	5.56
Cost Performance	0.688	0.715				
CP1			0.48	0.50	5.31	5.24
CP2			0.54	0.58	6.14	6.44
CP3			0.66	0.68	8.77	9.38
CP4			0.72	0.76	10.08	10.86
CP5			0.51	0.55	5.74	6.18

Notes:
China: Chi-Square Ratio = 1.742; RMSEA = 0.068; NFI = 0.81; NNFI = 0.91; CFI = 0.92; IFI = 0.92
Iran: Chi-Square Ratio = 1.892; RMSEA = 0.084; NFI = 0.81; NNFI = 0.89; CFI = 0.91; IFI = 0.90

All of the t-values of the measurement items exceed the recommended value of 2.575 for both samples and are significant at the 0.01 level, indicating sufficient convergent validity (Byrne, 1998). Furthermore, none of the standardised residuals exceeds the 4.00 maximum recommended by Hair et al. (2006), suggesting that there is no concern regarding a potential unacceptable degree of error.

4.3 Hypothesis testing and results

This paper first examined the correlations between the variables as part of the prior regression analysis. The correlation coefficients are positive and significant at the 0.01 level for all variable pairings for both samples, except for investment recovery (IR) which is significant at the 0.05 level. The results indicate that there is a certain degree of association between the variables, but it does not report regression weights or directions (Field, 2009). This is commonly used as a widely accepted statistical technique prior to regression analysis to determine whether a relationship exists between variables (Byrne, 1998; Hair et al., 2006). The correlation coefficients are displayed in Table 4.

Table 4. Correlation matrix for the China and Iran samples.

	SP	SDIST	SD	IR	EP	CP
China (Sample)						
SP	1					
SDIST	0.884**	1				
SD	0.736**	0.684**	1			
IR	0.136*	0.126*	0.171**	1		
EP	0.788**	0.748**	0.724**	0.396**	1	
CP	0.518**	0.709**	0.392**	0.133*	0.575**	1
	SP	SDIST	SD	IR	EP	CP
Iran (Sample)						
SP	1					
SDIST	0.816**	1				
SD	0.712**	0.674**	1			
IR	0.124*	0.114*	0.164**	1		
EP	0.746**	0.726**	0.702**	0.376**	1	
CP	0.488**	0.686**	0.374**	0.129*	0.564**	1

Notes: ** indicates significance at the level 0.01 and * significance at the 0.05 level;
SP = Sustainable Procurement; SDIST = Sustainable Distribution; SD = Sustainable Design;
IR = Investment Recovery; EP = Environmental Performance; CP = Cost Performance

The high correlation between the independent variables, i.e. sustainable procurement (SP), sustainable distribution (SDIST), sustainable design (SD), and investment recovery (IR), raised concerns regarding their potential multicollinearity. Therefore, the study examined the variance inflation factors (VIF[1]) values as part of the subsequent regression analyses. The VIF values ranged from 1.025 to 2.074, well below the 10.0 threshold (Hair et al., 2006),

[1] The variance inflation factor (VIF) quantifies the severity of multicollinearity in regression analyses (Hair et al., 2006).

suggesting that multicollinearity does not pose a problem when interpreting the regression results. This confirms that collinearity is not a problem for our model.

In the next step, this paper reports the results related to individual hypotheses tests using multiple linear regression analyses. A summary of the hypotheses tested with the associated regression weights and directions is provided in Table 5.

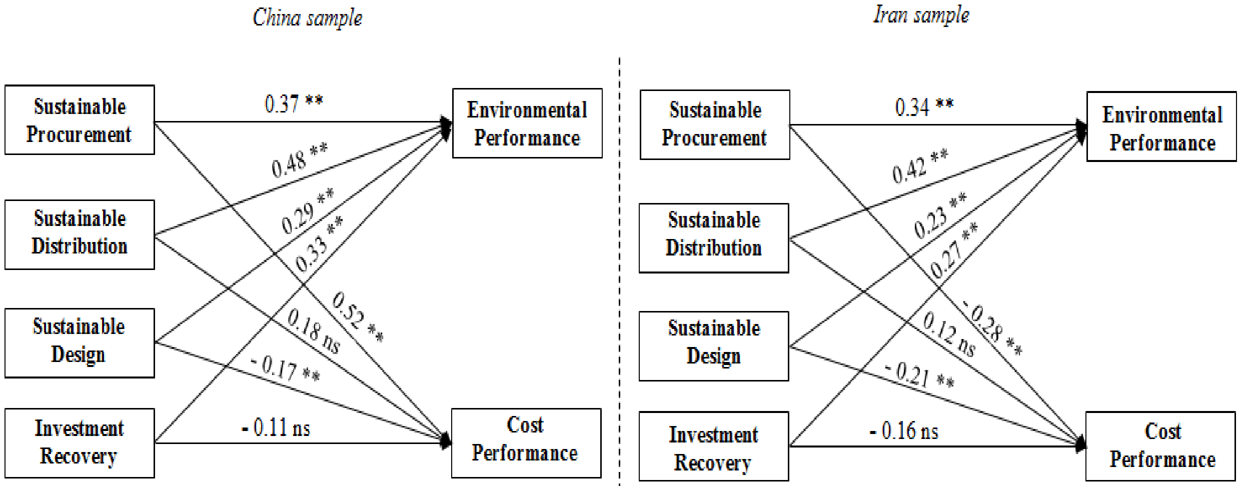
Table 5. Summary of hypotheses testing.

	China Sample		Iran Sample	
Model link	**Std coefficient**	**Support**	**Std coefficient**	**Support**
Hypotheses tests				
SP →				
EP	0.41 **	H1a: supported	0.34 **	H1a: supported
CP	0.52 **	H2a: supported	– 0.28 **	H2a: not supported
SDIST →				
EP	0.48 **	H1b: supported	0.42 **	H1b: supported
CP	0.18 ns	H2b: not supported	0.12 ns	H2b: not supported
SD →				
EP	0.29 **	H1c: supported	0.23 **	H1c: supported
CP	– 0.17 **	H2c: not supported	– 0.21 **	H2c: not supported
IR →				
EP	0.33 **	H1d: supported	0.27 **	H1d: supported
CP	– 0.11 ns	H2d: not supported	– 0.16 ns	H2d: not supported

Notes: ** significant at the level 0.01; * significant at the 0.05 level; ns: not significant
China: Chi-Square Ratio = 1.742; RMSEA = 0.068; NFI = 0.81; NNFI = 0.91; CFI = 0.92; IFI = 0.92
Iran: Chi-Square Ratio = 1.892; RMSEA = 0.084; NFI = 0.81; NNFI = 0.89; CFI = 0.91; IFI = 0.90
SP = Sustainable Procurement; SDIST = Sustainable Distribution; SD = Sustainable Design;
IR = Investment Recovery; EP = Environmental Performance; CP = Cost Performance

All of the hypotheses are positive and significant with the exception of *H2b* (SDIST → CP), *H2c* (SD → CP), *H2d* (IR → CP) for both sample groups, and *H2a* for the Iran sample. For both samples, *H1a* through *H1d*, which predict positive association between SSCM practices and environmental performance, are positive and significant as expected, indicating that SSCM implementation in the context of emerging Chinese and Iranian manufacturers leads to higher levels of environmental performance. *H2a* through *H2d*, which predict a positive association between SSCM practices and cost performance, are not positive and significant with the exception of the sustainable procurement to cost performance link for the China sample. Sustainable distribution and investment recovery do not significantly impact on cost performance, while sustainable design negatively impacts on cost performance. Fig. 3

illustrates the theoretical model including the results relating to the individual hypothesis tests for the China and Iran samples.



Notes: ** significant at the level 0.01; * significant at the 0.05 level; ns: not significant
Chi-Square Ratio = 1.742; RMSEA = 0.068; NFI = 0.81; NNFI = 0.91; CFI = 0.92; IFI = 0.92

Notes: ** significant at the level 0.01; * significant at the 0.05 level; ns: not significant
Chi-Square Ratio = 1.892; RMSEA = 0.084; NFI = 0.81; NNFI = 0.89; CFI = 0.91; IFI = 0.90

Fig. 3. SSCM performance model with results.

The results enable this paper to effectively answer the proposed research question. The results demonstrate a significant linkage between the implementation of sustainable supply chain management practices and the environmental performance of manufacturing firms operating in China and Iran. However, the results related to the linkage between SSCM practices and the cost performance is less clear-cut. While there are significant linkages between the implementation of SSCM practices and cost performance through sustainable procurement and sustainable design, there are no significant linkages between the cost performance and sustainable distribution and investment recovery.

Overall, the results suggest that the adoption of SSCM practices leads to higher levels of environmental performance, resulting in environmental improvements, but does not necessarily lead to improved cost performance, as only sustainable procurement is positively and significantly linked to cost performance.

5. Discussion of findings and their relevance to emerging economies

The results show that the impact of the implementation of SSCM practices on the performance implications is roughly similar irrespective of the sample group. Hence, we can conclude that there are more similarities than differences between SSCM practices and their associated effect on performance in these two emerging economies. As the model depicts (see

Fig. 3), all of the main SSCM initiatives lead to improved environmental performance. This indicates that SSCM practices including sustainable production lead to higher levels of environmental performance and greater environmental improvements in two emerging economies on different trajectories, China and Iran. These results are in line with the works of Zhu and Sarkis (2007) and Green et al. (2012a). The results surrounding the impact of SSCM implementation on cost performance are less clear-cut. Specifically, the results associated with sustainable design for both samples are problematic, as is that for sustainable procurement for the Iran sample, which is deemed the only significant difference between the two samples.

In terms of Chinese manufacturing firms, sustainable procurement positively and significantly impacts on both environmental and cost performance. This can be explained by the fact that the practice of sustainable procurement is focused on decreasing the levels of environmental pollutants. From an economic perspective, sustainable procurement may lie with the supplier rather than the manufacturer, and thus it is potentially less costly for manufacturers to implement than other SSCM practices (Zhu et al., 2008a). However, the results associated with sustainable procurement for the Iran sample are different. While sustainable procurement within Iranian manufacturing firms is positively associated with environmental performance, it is negatively associated with cost performance. This can be explained by the fact that the SSCM approach has only recently begun to emerge in Iran, and therefore there are few suppliers with green resources and expertise that are capable of providing environmental friendly materials or services to manufacturers in Iran, compared to China. Hence, the practice of sustainable procurement is considered to be costly in the context of emerging Iranian manufacturers, as environmentally friendly suppliers tend to give higher price quotations than those not comparatively environmentally friendly, due to the lack of sufficient green suppliers.

On the other hand, the practice of sustainable design positively impacts environmental performance, and negatively and significantly impacts cost performance within both samples. These results are in line with the findings of Zhu and Sarkis (2007) and Green et al. (2012a), which consolidates our findings in seeking to reach conclusive results. According to Grote et al. (2007, p. 4100), the aim of sustainable design is to “reduce a product’s environmental impacts without creating a negative trade-off with other design criteria, such as functionality and costs”. It appears, then, that sustainable design has not fully accomplished the intended aim. We would argue that this may be because sustainable design methodologies require further development and improvement. In addition, the capacity of sustainable design to reduce environmental pollutants is counterbalanced by increases in the associated costs, perhaps related to materials purchases (Green et al., 2012a).

Sustainable distribution directly impacts environmental performance but does not significantly impact cost performance in both samples. This can be explained by the fact that the practice of sustainable distribution is focused on decreasing the levels of environmental pollutants, which potentially has the capacity to enhance the environmental performance. From an economic perspective, the lack of appropriate infrastructures in these two developing countries hinders the benefits of SSCM practices such as sustainable distribution from being reaped in terms of profitability and financial performance. This necessitates further infrastructure investment in order to tackle the potential lack of green resources and capabilities in these two emerging economies. While the study of Zhu and Sarkis (2007) did not find sustainable distribution to be significantly linked to either cost or environmental performance, a recent study by Green et al. (2012a) reported that sustainable distribution directly impacts environmental performance, which is similar to our findings. This consolidates the position of our findings, which are consistent with recent studies, reflecting conclusive results as more studies report similar findings.

Investment recovery positively impacts environmental performance but does not significantly impacts cost performance for both samples. This may be explained by the fact that the practice of investment recovery has received much less attention in China and Iran than in developed countries such as the UK and US (Zhu et al., 2008a). Zhu and Sarkis (2007) generally found the opposite of our findings on investment recovery practices. They reported that while investment recovery is positively associated with economic performance, it is not significantly associated with environmental performance. The difference in results may be attributed to differences in the samples employed in terms of size and segment. However, our results are consistent with the findings of more recent work by Zhu et al. (2008a) and Green et al. (2012a), which solidifies the position of the findings of this paper.

6. Conclusions

The findings of this study effectively answer the proposed research question, reflecting that the adoption of SSCM practices result in a higher level of environmental performance but may not ultimately lead to improved cost performance in emerging economies. The results of this study suggest a number of interesting insights concerning SSCM. First, this paper adopted conceptual footing from RDT for SSCM practice implementation to investigate the trade-offs between the environmental and cost performance. The contribution to SCM theories is to demonstrate the linkage between the organisational theory of RDT and SSCM. Second, this research extends the literature on SSCM performance and the implementation of SSCM practices. The contribution of this research is significant in that it is one of a few empirical studies that attempted to use diverse samples from emerging economies on different trajectories, which reported conclusive results by reaching consensus over the recent findings conducted by various authors.

In essence, this study theorised and empirically assessed an integrated SSCM performance model which is underpinned by RDT theoretical anchors. While not all of the individual hypotheses are supported, the theoretical model holds together reasonably well. In addition, based on the relative good fit of our model, we believe that our theorised model is a good representation of the relationships among the study constructs. Using a multiple regression analysis, our results show that there are more similarities than differences concerning the impact of SSCM adoption on the performance of manufacturers operating in China and Iran.

The results suggest that SSCM practices including sustainable production positively and significantly impact the environmental performance of manufacturing firms in these two developing countries. This study concludes that the adoption of sustainable practices across the supply chain leads to higher levels of environmental performance for manufacturing firms in both samples, resulting in environmental improvements. However, it provides evidence that the adoption of SSCM practices in the context of emerging economies does not necessarily lead to improved economic performance, as only sustainable procurement is positively and significantly linked to cost performance.

The result of this research investigation clarifies the proposition that SSCM practices are indeed environmentally necessary but that their benefits might not be being reaped in terms of short-term profitability. Firms operating in developing countries must undertake environmental initiatives with a broader consideration of the firm's overall economic objectives. In other words, firms need to undertake SSCM practices in a bearable and equitable sense that do not harm their financial bottom line. This promises to allow firms in developing countries to balance existing in a growing economy with environmental protection. Furthermore, this ensures a win-win situation for the supply chain partners and minimises trade-offs between the environmental and cost performance. Therefore, we can conclude that sustainable supply chain practices can be successfully adopted in emerging economies if it is commercially viable to be able to take a long-term view on the profits gained.

The findings of this study are generally consistent with the majority of prior investigations, and where contradictory results exist, our findings stand with more recent studies reporting similar results. This consolidates our findings and diminishes any potential contradictory directions. Hence, we conclude that this paper has reported relatively conclusive results on the topic of “SSCM practices and their impacts on performance implications within emerging economies”.

6.1 Theoretical implications

From a theoretical standpoint, the resource dependence lens does a reasonably good job of explaining how firms outsource services to undertake environmental initiatives. This paper makes a contribution to the resource dependence theory by referring back to Pfeffer and Salancik (1978) original work and restating the RDT premise that implementation of SSCM practices are associated with inter-dependence resources. With the fierce competition in today’s economies and also amplified risks in firms’ supply chain, the assumption that firms can be internally self-sufficient with respect to their strategically critical resources is not valid. The spirit of resource dependence theory is to consider collaboration efforts between a firm and its suppliers that make the implementation of SSCM practices more feasible to perform. Within RDT perspective, there is a clear linkage to SSCM performance through interdependence among a firm and its partners, which can eventually impact the performance of the focal firm as it makes member firms dependent.

6.2 Managerial implications

In terms of practical implications, practitioners are provided with a validated framework for assessing the synergistic impact of SSCM practices on environmental and cost performance. In addition, the SSCM initiatives validated in this work can help manufacturing firms operating in emerging economies to identify those areas of SSCM that require improvement and the prioritisation of their green efforts. This work can be useful for manufacturing industries that need to convert their traditional supply chain management to SSCM. In the resource-constrained environment of China and Iran, our framework points to the key environmental initiatives in the supply chain which need to be implemented, i.e. sustainable procurement, sustainable design, sustainable distribution, and investment recovery. Collectively, the key SSCM initiatives can serve as an audit tool and later on as a benchmarking tool for managers to evaluate the perceptions of SSCM in their organisations. Developing countries should invest more in appropriate infrastructures that enhance green resources and capabilities. This will enable the benefits of SSCM practices to be reaped in terms of long-term profitability and financial performance in the emerging economy context.

6.3 Limitations and future direction

This study has some limitations that provide opportunities for further research. First, we acknowledge that the role of SSCM drivers was excluded in developing our research model. Future studies may test this model using a structural equation modelling methodology. Studies on SSCM are still at the early stage in developing appropriate measurements of SSCM organisational performance, particularly for economic performance (Tseng et al., 2015). Future research may use other economic factors than costs, such as sales performance. We chose China and Iran from emerging economies for data collection and analysis due to the recent stringent environmental regulations, and thus the results may not have strong position on generalization over the majority of emerging economies. To increase generalizability of the research, repeating this study for comparative analysis in different developing countries will be another research direction.

Furthermore, our sample is limited to certified manufacturing firms, most of which are large. Therefore, small and medium-sized enterprises (SMEs) are poorly represented. Because SMEs often lack the resources and expertise to deal with environmental issues, they may not be able to meet emerging environmental and social standards; hence, their motivations to undertake SSCM initiatives likely differ from those of large manufacturing firms. Further research should examine our results using SME samples. Moreover, future studies may examine other emerging markets to eliminate the potential effect of country-level variance such as market size, economic development, and legal systems. In addition, future research can examine developed markets and compare the findings from emerging economies and developed markets. Lastly, this research has been developed primarily with a focus on manufacturing firms, and no consideration has been given to other sectors such as the service sector. Therefore, future studies may examine the applicability of findings from this investigation for the service and other sectors.

Appendix A

Table A1. Questionnaire survey.

Screening Questions

1. Do you work at a manufacturing plant? Yes /No
2. Which of the following best categorises your position?
    a. Plant Manager
    b. Logistics Manager
    c. Operations Manager
    d. Purchasing Manager
    e. Sale Manager
    f. Industrial Waste Manager
    g. Supply Chain Manager
    h. Engineering Manager
    i. Non-manager

Demographic Questions

1. Title of your current position:_________________________
2. Years in your current position:_____
3. Number of full-time employees currently working at your organisation
4. Your organization's sales revenues for last year :_________
5. Identify the category for your organisation (UK Standard Industrial Classification). _____

UK Standard Industrial Classification (UK SIC) codes

10	Manufacture of Food Product
11	Manufacture of Beverages
12	Manufacture of Tobacco Products
13	Manufacture of Textile
14	Manufacture of Wearing Apparel
15	Manufacture of Leather and Related Products
16	Manufacture of Wood and of Products of Wood and Cork
17	Manufacture of Paper and Paper Products
18	Printing and Reproduction of Recorded Media
19	Manufacture of Coke and Refined Petroleum Products
20	Manufacture of Chemicals and Chemical Products
21	Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations
22	Manufacture of Rubber and Plastics Products
23	Manufacture of other Non-Metallic Mineral Product
24	Manufacture of Basic Metals
25	Manufacture of Fabricated Metal Products, except Machinery and Equipment
26	Manufacture of Computer, Electronic and Optical Products
27	Manufacture of Electrical
28	Manufacture of Machinery and Equipment
29	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
30	Manufacture of other Transport Equipment
31	Manufacture of Furniture
32	Other Manufacturing
33	Repair and Installation of Machinery and Equipment

6. Please add your company/organisation name for purpose of data classification (Optional). _________

7. Your email address or telephone number, should you wish to receive a copy of the research summary report (Optional). _________________________

Sustainable Procurement (Zhu et al., 2008a) Please indicate the extent to which you perceive that your company is implementing each of the following. (five-point scale: 1 = Not at all; 2 = To a small extent; 3 = To a moderate extent; 4 = To a relatively great extent; 5 = To a great extent)	
SP1	Eco labelling of products.
SP2	Cooperation with suppliers for environmental objectives.
SP3	Environmental audit for suppliers' internal management.
SP4	Suppliers' ISO 14000 certification.
SP5	Second-tier supplier environmentally friendly practice evaluation.
SP6	Providing design specification to suppliers that include environmental requirements for purchased item.
Sustainable Distribution (Zhu et al., 2008a; Green et al., 2012b) Please indicate the extent to which you perceive that your company is implementing each of the following. (five-point scale: 1 = Not at all; 2 = To a small extent; 3 = To a moderate extent; 4 = To a relatively great extent; 5 = To a great extent)	
SDIST1	Cooperation with customers for using less energy during product transportation.
SDIST2	Cooperation with customers for green packaging.
SDIST3	Use of renewable energy in any mode of products transportation.
SDIST4	Use of renewable energy in the process of products packaging.
SDIST5	Upgrade freight logistics and transportation systems (either software or hardware such as minimising empty miles, reducing container weight, improving refrigeration, etc.).
SDIST6	Tracking and monitoring emissions caused in products distributions (e.g., carbon footprint).
Sustainable Design (Zhu et al., 2008a; Esty and Winston, 2009) Please indicate the extent to which you perceive that your company is implementing each of the following. (five-point scale: 1 = Not at all; 2 = To a small extent; 3 = To a moderate extent; 4 = To a relatively great extent; 5 = To a great extent)	
SD1	Design of products for reduced consumption of material.
SD2	Design of products for reduced consumption of energy.
SD3	Design of products for reuse, recycle, recovery of material, component parts, and by-products.
SD4	Design of products to avoid or reduce use of hazardous materials in their manufacturing process.
SD5	Cooperation with customers for eco design.
SD6	Cooperation with customers for cleaner production.
Investment Recovery (Zhu et al., 2008a) Please indicate the extent to which you perceive that your company is implementing each of the following. (five-point scale: 1 = Not at all; 2 = To a small extent; 3 = To a moderate extent; 4 = To a relatively great extent; 5 = To a great extent)	
IR1	Sale of excess inventories or materials.
IR2	Sale of scrap and used materials or by-products.
IR3	Sale of excess capital equipment.
EP1	Reduction of air emission.
EP2	Reduction of waste emission.
EP3	Reduction of solid wastes.
EP4	Reduction of effluent wastes.
EP5	Decrease of consumption for hazardous/harmful/toxic materials.
EP6	Decrease of frequency for environmental accidents.
EP7	Improvement of an enterprise's environmental situation.
Cost Performance (Zhu et al., 2008a) Please indicate the extent to which you perceive that your company has achieved each of the following during the past year. (five-point scale: 1 = not at all; 2 = a little bit; 3 = to some degree; 4 = relatively significant; 5 = significant)	
CP1	Decrease of cost for purchased materials.
CP2	Decrease of cost for energy consumption.
CP3	Decrease of fee for waste treatment.
CP4	Decrease of fee for waste discharge.
CP5	Decrease of fine for environmental accidents.

Table A1. Questionnaire survey

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Highlights

- An integrated SSCM performance model is developed based on RDT theoretical anchors.
- A cross-country empirical comparison is conducted within two emerging economies.
- Adoption of SSCM practice results in higher levels of environmental performance.
- Adoption of SSCM practice does not necessarily lead to improved cost performance.
- SSCM is environmentally necessary but not being reaped in short-term profitability.