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Customer pressure and innovativeness: Their role in sustainable supply chain management

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ABSTRACT

This work investigates how sustainable supply chain management develops within a company and evolves from internal to external practices. Specifically, the relationships among sustainable process management (internal practices), sustainable supply management (external practices), customer pressure and innovativeness are elaborated in a conceptual model, which is tested using a survey approach. Partial least squares (PLS) methodology is applied to data collected from a sample of 77 Italian manufacturing firms. Our results highlight that customer pressure and innovativeness positively and significantly affect SPM. We also observe that SPM fully mediates the relationships between such factors and SSM. Finally, innovativeness negatively and significantly moderates the effect customer pressure has on SPM. This study is relevant because it shows what driving and enabling factors influence the development of SSM, providing guidance for companies that wish to achieve further social and environmental improvements in their supply chains.

1. Introduction

Sustainability is a key issue for firms (MIT, 2009). Academic contributions on this topic have typically been limited to individual firms and how they should behave to limit their non-economic impacts. Recently, however, attention has focused on sustainable supply chains (Krause et al., 2009; Linton et al., 2007). The greater the extent to which companies rely on supply chains to source and manufacture, the greater the extent to which their environmental and social sustainability depends on their suppliers.

Sustainable supply chain management (SSCM) is far from being a novel subject, and hundreds of works have been published over the last decade highlighting the relevance of this topic (Ahi and Searcy, 2013; Carter and Rogers, 2008; Seuring and Muller, 2008; Srivastava, 2007). However, it remains unclear how SSCM develops within a company and evolves from internal to external practices as well as what driving and enabling factors influence this process. First, the literature recently identified two distinct groups of SSCM practices. Sustainable process management (SPM) comprises four environmental and social practices that are commonly employed without direct supplier involvement (e.g., EMS, Eco-design, Health and safety, social campaigns) (Gavronski et al., 2011; Zhu et al., 2012, 2013). Practices that include transactions with suppliers (e.g., sustainable supplier assessment and collaboration) are instead part of sustainable supply management (SSM) (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011; Vachon and Klassen, 2006). Research on the relationship between these two distinct groups of practices can be enriched as it remains unclear whether adopting SPM benefits SSM (Darnall et al., 2008; Gavronski et al., 2011; Klassen and Vachon, 2003; Meehan et al., 2006; Pagell and Wu, 2009; Zhu et al., 2012, 2013). Second, the literature does not provide conclusive results regarding the role that customer pressure plays in the development of sustainable supply chains. While certain authors consider customer requirements to be an important motivator for SPM practices (e.g., Ateş et al., 2011; Christmann, 2004; Deephouse and Heugens, 2009; González-Benito and González-Benito, 2006), the link between customer pressure and SSM practices has yet to be completely explored (e.g., Carter and Jennings, 2004; Ehrgott et al., 2011; Zhu et al., 2013). As it has been suggested that "a firm is only as sustainable as its suppliers" (Krause et al., 2009), the question becomes whether customers are able to drive companies towards the adoption of SSM (external practices). Third, in addition to other enablers, such as top management support and organisational commitment, Innovativeness or a company's willingness/ability to change processes, products and management systems, mainly through architectural/radical innovation, is frequently cited in the literature on sustainability (Christmann, 2000; Klassen and Vereecke, 2012, Nidumolu et al., 2009; Pagell and Wu, 2009; Porter and Van der Linde, 1995; Wu and Pagell, 2011). For instance, Porter and Van der Linde (1995) suggested

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that "ignorance" and "a static mind-set" prevent companies from understanding that environmental (and social) performance can be improved while reducing costs, thus constraining the development of SSCM practices. More recently, based on case data, Klassen and Vereecke (2012) suggested that innovation capability is becoming critical for the management of social issues in operations. This preliminary evidence call for further empirical investigation on the relationship between innovativeness and sustainability and on the role of the former in shaping organizational responses to social and environmental pressure.

Therefore, the aim of this study is to shed further light on the way SSCM develops within a company and evolves from internal to external practices, and we contribute to the literature by addressing the following research questions:

RQ1. To what extent does sustainable process management impact the development of sustainable supply management?

RQ2. To what extent do customers drive the development of sustainable process management and sustainable supply management?

RQ3. To what extent does innovativeness assist or sustain the development of sustainable process management and sustainable supply management? Does innovativeness affect a company's response to customer pressure?

To answer these research questions, this study develops and empirically tests a conceptual model linking sustainable supply management, sustainable process management, customer pressure and innovativeness. We argue that this research is relevant because it clarifies how SSCM develops and what driving and enabling factors influence this development, thereby providing the basis for further research. According to the World Bank (2003), the International Chamber Of Commerce (2007) and recent literature (e.g., Zhu et al., 2012), enhancing the understanding of how SSCM develops is critical for guiding companies to augment their ability to deliver further social and environmental improvements in their supply chains.

2. Background and hypothesis development

Drawing from the literature, in this section, we describe the constructs of interest (i.e., SPM, SSM, customer pressure, and innovativeness) and our conceptual model.

2.1. Sustainable supply chain management

Essentially, for companies, "sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today [shareholders, customers, employees, suppliers, government and local communities] while protecting, sustaining and enhancing the human and natural resources that will be needed in the future" (International Institute for Sustainable Development (1992)). Increasingly, practitioners and researchers in different fields consider the implications that business sustainability has on traditional practices. Supply chain management (SCM) is one of these areas.

Since its introduction in the early 1980s, SCM has been used to describe the planning and control of materials, information flows, and the manufacturing and logistics activities coordinated internally within a company and externally between companies (Cooper et al., 1997; Gibson et al., 2005; Mentzer et al., 2001; Stock and Boyer, 2009). A key characteristic of SCM has always been the distinction between, and coordination of, internal and external practices. For example, supply chain management was described by many researchers (Harland, 1996; Harland et al., 1999; Tan, 2001) as managing business activities and relationships both internally within an organisation and externally with suppliers. The literature clearly demonstrates that the most successful manufacturers have carefully linked their internal processes to external suppliers (and customers) (Flynn et al., 2010; Frohlich and Westbrook, 2001).

Sustainability pressures have led to the emergence of Sustainable SCM (SSCM). While there is currently no consensus regarding its definition, SSCM is advocated as a new archetype for companies to meet stakeholder requirements and improve profitability and competitiveness while improving ecological efficiency and social responsibility in their supply chains (e.g., Ahi and Searcy, 2013; Zhu et al., 2005). Mirroring SCM, SSCM can be observed at the level of internal and external practices (Darnall et al., 2008; Gavronski et al., 2011; Meehan et al., 2006; Pagell and Wu, 2009; Zhu et al., 2012).

In line with previous published research (Gavronski et al., 2011; Zhu et al., 2012, 2013), SPM refers to a firm's institutionalisation of four environmental and social practices that are commonly employed without direct supplier involvement. This institutionalisation essentially includes environmental management systems (ISO 14001) (Daily and Huang, 2001; Darnall et al., 2008), environmentally friendly eco-design (e.g., Design for Environment, Life cycle assessment) (Zhu and Sarkis, 2004), health and safety certifications (Robson et al., 2007) and social campaigns (e.g., codes of conduct, corporate social activities) (Zairi and Peters, 2002). By undertaking SPM, companies develop a set environmental and social capabilities, defined as the set of physical, financial, human, technological and organisational resources coordinated by organisational routines and deployed within a company to improve its environmental and social performance (e.g., Gavronski et al., 2011).

According to several authors (e.g., Ageron et al., 2012; Awaysheh and Klassen, 2010; Gavronski, et al., 2011; Large and Gimenez Thomsen, 2011; Lee and Klassen, 2009; Zhu et al., 2012), SSM refers to two complementary sets of activities that are implemented at the firm level and require transaction with suppliers to assess and improve their environmental and social performance: supplier assessment and supplier collaboration. The first comprises those activities using markets or arm's-length transactions conducted by the buying organization to assess (and control) suppliers' sustainability performance (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011, Vachon and Klassen, 2006). Typical activities are establishing supplier assessment criteria, gathering and processing supplier information, and evaluating the environmental and social performance of suppliers. In contrast, the second consists of the direct involvement of the firm in its suppliers to build their capabilities to improve the environmental and social impacts of products and operations (i.e., supplier collaboration) (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011, Vachon and Klassen, 2006). Typically, supplier collaboration consists of activities such as undertaking joint development efforts for greener product design or process modification, reducing logistical waste, sponsoring supplier summits to encourage the sharing of sustainability information and the management of environmental and social risks.

Some studies indicate a link between internal and external environmental investments, suggesting that the latter fosters the former (Vachon and Klassen, 2008; Zhu et al., 2012). For instance, Zhu et al. (2012) argue that developing collaborative relationships with suppliers is favorable for the adoption and development of internal environmental technologies. That is, external green practices affect internal ones, which in turn, influence manufacturer performance. Although there is some merit in that causal claim, it opposes the findings of other studies in both the SCM literature (e.g., Flynn et al., 2010) and the SSCM literature (Gavronski et al.,

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2011; Klassen and Vachon, 2003; Zhu et al., 2013), suggesting that internal practices form the foundation for the development of externally oriented activities. For instance, Klassen and Vachon (2003) found that collaborative environmental activities with suppliers do not result in pollution prevention directly in the buying firm, but instead in the suppliers. Similarly, Gavronski et al. (2011) suggest that supplier collaboration is an higher-order capability which can be derived from a unique combination of capabilities arising from a standardized set of green manufacturing processes adopted in house. This lack of consensus calls for further investigation into the linkage between internal and external SSCM.

2.2. Customer pressure

Increasing demands from a variety of stakeholders have driven companies to adopt sustainable supply chain management (Sharma and Henriques, 2005). Stakeholder theorists such as Clarkson (1995) distinguish between primary stakeholders—without the participation and support of which the organisation cannot survive (e.g., customers, suppliers and regulators) – and secondary stakeholders – which affect and are affected by the organisation but are not engaged in transactions with it and are not essential for its survival (e.g., the media, non-governmental organisations). This study focuses on customer pressure (CP), which refers to the requests and requirements of end consumers and business customers, i.e., important groups of primary stakeholders, for the firm to improve its environmental and social performance (Ateş et al., 2011; Ehrgott et al., 2011).

As it has been suggested that "a firm is only as sustainable as its suppliers" (Krause et al., 2009), the question becomes whether customers are able to drive companies towards the adoption of SSM (external practices). Recent developments in the SCM field demonstrate that internal practices provide a vital link between customers and suppliers, without which companies are unable to reap the full benefits of their supply chain management efforts (Flynn et al., 2010). Further theoretical and empirical research is needed to understand whether this consideration also applies in the context of sustainability, thus suggesting that customer pressure is essential to stimulate sustainability at the company level but cannot translate into externally oriented practices if internal capabilities are lacking.

2.3. Innovativeness

Innovation is generally understood as the generation, acceptance and implementation of new ideas, processes, products or services (Thompson, 1965). In the same vein, the management literature conceives innovativeness as an organisation's willingness/ability to change processes, products and management systems (e.g., Calantone et al., 2002; Hurt et al., 2006). Also, as recently pointed out by Klassen and Vereecke (2012), Innovativeness does not focus "on coordinating and executing previously established products, systems and performance standards", rather it "is more akin to the architectural and radical innovation characterized by Henderson and Clark (1990) with significantly new markets, management systems and performance outcomes". Innovativeness, in fact, comes from a company's future orientation and learning orientation. Future orientation refers to a company's propensity to analyse long-term prospects in business environments, markets and new technologies as well as their implications for strategy and innovation (Ruff, 2006). Learning orientation, in contrast, refers to the set of organisational values (i.e., commitment to learning, shared-vision and memory) that influence the firm's propensity to create and use knowledge (Sinkula et al., 1997).

Porter and Van der Linde (1995) suggested that "ignorance" and "a static mind-set" prevent companies from understanding that environmental (and social) performance can be improved while reducing costs, thus constraining the development of SSCM practices. Innovative thinking, instead, seems key to addressing sustainability-related challenges. Christmann (2000), for instance, proposed that innovativeness was a complementary asset that enables companies to overcome the trade-off between costs and respect for the environment. Its presence may be not sufficient to ensure the achievement of high performance, but its absence may hinder, retard or even constrain environmental management. Based on their case data, Klassen and Vereecke (2012) argue that, "while innovation has long been regarded as critical for other operational performance dimensions, such as cost and quality, it also may become a valuable capability for social issues in operations". Others have supported this view, suggesting that innovative companies perform best at sustainability (Nidumolu et al., 2009; Pagell and Wu, 2009; Wu and Pagell, 2011). Despite this preliminary argument, the recent literature calls for further empirical evidence regarding the enabling role of innovativeness in the context of SSCM (van Bommel, 2011).

2.4. The conceptual model

In this section, we elaborate each construct defined in Sections 2.1 to 2.3 and develop hypotheses regarding their mutual relationships.

2.4.1. The relationship between SPM and SSM

Zhu et al. (2012) argued that although green purchasing is important for manufacturers to help improve their environmental performance, it is difficult to provide design specifications to suppliers without eco-design when environmental requirements are an important consideration for their purchased items. Moreover, without environmental and social standards, firms may be reluctant to perform environmental and social evaluations of their suppliers. Conversely, firms with ISO 14001 or OHSAS 18001 certification are required to identify important environmental and social issues in their relationships with suppliers. Furthermore, when implementing SSM, an organisation might need to aid suppliers in acquiring new resources and developing new capabilities. For instance, when developing sustainability policies and tactics, strategic trade-offs among economic, environmental and social elements of the triple bottom line have to be carefully balanced (e.g., Wu and Pagell, 2011). Organisations that have already addressed with this issue to design and implement SPM may have developed the ability to balance priorities effectively and can then transfer this ability to suppliers. Thus, a context marked by the extensive application of SPM helps the organisation develop capabilities in rethinking its policies, procedures and operations. These capabilities are also transferable to SSM. In line with this argument, Christmann (2000) suggests that product stewardship and environmental collaboration (practices that can be included in our definition of SSM) are more likely to be developed by firms with sophisticated management systems, as they are based on learning- and knowledge-intensive processes that require substantial effort. In fact, supplier collaboration should be considered as a higher-order capability which can be derived from a unique combination of capabilities arising from a standardized set of green manufacturing processes adopted in house (Gavronski et al., 2011). Therefore, we propose the following hypothesis:

H1. Sustainable process management has a positive effect on sustainable supply management.

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2.4.2. The driving role of customer pressure

The literature frequently refers to the role that social and environmental aspects such as workplace safety, working conditions and polluting emissions play in customers' purchase decisions (e.g., Christmann, 2004). Henriques and Sadorsky (1996) posited that customer pressure is a major determinant of whether firms have an environmental plan. The shift in customer behaviour towards being "responsible" is capturing the attention of firms and their plant managers, encouraging them to develop responsible practices (Klassen and Vachon, 2003). Accordingly, the literature finds that one of the most important reasons for the continued use of expensive recycled materials and adoption of environmental and social certifications were the requirements of industrial customers (e.g., González-Benito and González-Benito, 2006). Also, normative pressure from customers have been shown to cause organizations to pursue internal eco-design initiatives (Zhu et al., 2013). Therefore, we propose the following hypothesis:

H2a. Customer pressure has a positive effect on sustainable process management.

Deephouse and Heugens (2009) argued that the increasing customer awareness of social conduct is not limited to scrutiny of a firm's own manufacturing activities but extends to its social behaviour and indirect impacts on society. As a company's supply chain generates negative environmental and social impacts (i.e., negative externalities), customers can respond by increasing pressure on the firm, which is held responsible for supplier environmental and social performance. Empirical research has demonstrated that firms in industries with a footprint that is salient to primary stakeholders track information along their entire supply chain and rely on environmental and social audits to evaluate their suppliers to a greater extent (Darnall et al., 2009). Zhu and Sarkis (2007) stated that customers encouraged Chinese suppliers to implement green supply chain management practices. Ateş et al. (2011) recently substantiated this argument by providing empirical evidence on the relationship between customer pressure and both internal and external environmental investments. Therefore, we propose the following hypothesis:

H2b. Customer pressure has a positive effect on sustainable supply management.

Given H2a and H2b, the question becomes the extent to which customer pressure drives SSM directly. The link between customer pressure and SSM can be the result of an increase in SPM driven by customer pressure. As we suggested in the previous section, without the proper capabilities necessary to be "internally" sustainable, efforts to develop SSM might not be successful. Therefore, customer pressure might not be a particularly effective means of encouraging sustainable supply management because a firm needs to develop preliminary capabilities before addressing the firms upstream in its supply chain. In conclusion, in the conceptual model presented in Fig. 1, customer pressure affects SSM and this direct relationship is mediated by SPM.

2.4.3. The enabling role of firm innovativeness

A second factor is expected to influence the development of SSCM: innovativeness. Innovative firms, by definition, are accustomed to developing effective and efficient systems to foresee opportunities, share and re-examine information using these systems, and overcome organisational inertia (Ruff, 2006). These capabilities can be exploited when developing SPM. Indeed, when a new organisational approach that accommodates the triple bottom line concept must be pursued, the "violation" of identity codes, ways of thinking, or practices previously taken as granted typically initiates cascades of changes that require firms to have sufficient capabilities (or develop new ones) to move towards a new business paradigm (Gavetti, 2012).

Accordingly, Christmann (2000) demonstrated that capabilities for process innovation represent complementary assets for firms seeking to develop and exploit pollution-prevention technologies. An organisation can only capture the economic value associated with these complementary assets and foster their adoption when they are available to be leveraged in the firm's environmental strategy. Pagell and Wu (2009) contributed to this perspective by arguing that innovative companies leverage their ability to generate useful information concerning stakeholders' needs and concerns with the aim to effectively develop new sustainability strategies and practices. Therefore, we propose the following hypothesis:

H3a. Innovativeness has a positive effect on sustainable process management.

The literature highlights that firms are more likely to undertake SSM when they develop (i) a shared-vision regarding how different priorities should be balanced (e.g., costs *vs.* environmental protection) (Bowen et al., 2001; Wu and Pagell, 2011), (ii) appropriate levels of industrial knowledge (Bowen et al., 2001; Pagell and Wu, 2009), and (iii) partnering approaches with high supplier integration (Ageron et al., 2012; Bowen et al., 2001; Vachon and Klassen, 2006). All of these elements are highly available when the level of innovativeness in a firm is high. For instance, innovative firms extensively rely on cross-functional teamwork and incentivise cooperation between multiple members of an organisation (Ruff, 2006). This generates opportunities for reciprocal understandings and mutual development, which represent solid foundations for the development of SSM.

Highly innovative organisations, then, typically comprise members that value and promote learning for the long-term benefit of the system (Sinkula et al., 1997; Calantone et al., 2002). Given the strong learning orientation that characterises their organisations, innovative firms have the capacity to access, understand and, if necessary, acquire external knowledge (Beske, 2012, p. 381). Innovativeness is thus likely to result in greater stocks of industrial knowledge, which can be exploited when developing SSM.

Hult (1998) suggested that because innovativeness is embedded in the culture of an organisation, it affects the way the company manages its suppliers. Hult and Ketchen (2003) contributed to this perspective by demonstrating that partnering approaches develop best when a strong learning and future orientation permeates the organisation. Innovativeness, in this sense, creates an environment in which chain integration and success are more valued and SSM can develop more easily. Therefore, we propose the following hypothesis:

H3b. Innovativeness has a positive effect on sustainable supply management.

Given the two hypotheses above, the question becomes to the extent to which a firm's level of innovativeness directly contributes to sustainable supply management. The link between innovativeness and SSM may be the result of an increase in SPM.

2.4.4. The moderating effect of innovativeness

The question of whether innovativeness influences the relationship between customer pressure and sustainable supply chain management practices is addressed here. Given the potential for mediation effects, we limit our discussion to relationships involving SPM.

Innovative firms are able to capture weak signals from the market and may wish to have some influence over the process by which customers establish their expectations (Sinkula et al., 1997). Because of their high willingness/ability to change, innovative

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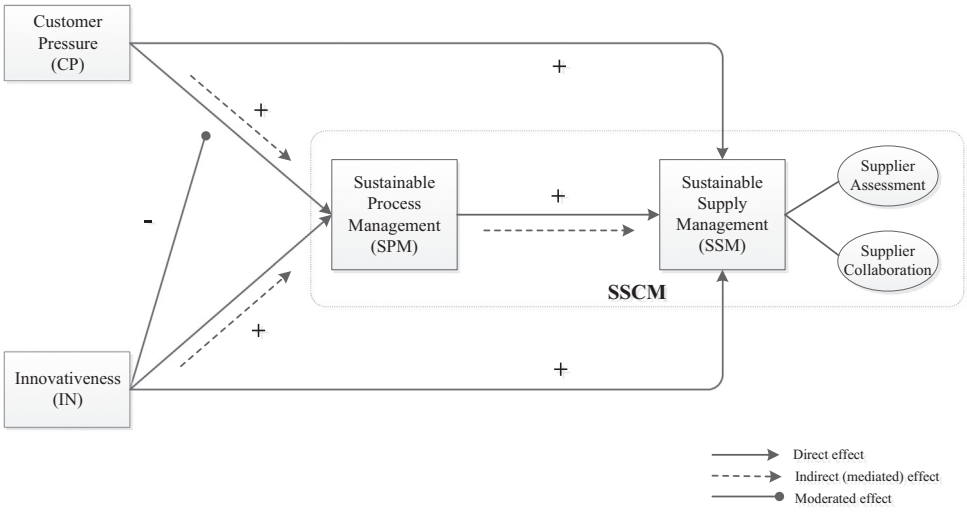

Fig. 1. Conceptual model.

firms are generally more proactive in their general business strategy: they do not simply initiate changes in their strategic policies before they are asked to, but they instead proactively engage with stakeholders to improve their confidence in the possible effects of firm strategies, thereby achieving higher performance (Calantone et al., 2002). Innovative firms are able to generate comprehensive insights into the future development of the environment, which in turn induce ideas for new products, services and processes and allow their commercial and technological viability to be assessed (Ruff, 2006).

For all of these reasons, innovativeness is expected to weaken the impact of customer pressure on the extent to which SSCM develops. Given their abilities (e.g., higher stocks of knowledge; an ability to generate new strategies and evaluate their viability; the ability to overcome organisational inertia and trade-offs), innovative firms are more likely to accrue the potential benefits of SSCM (i.e., quality, efficiency, reduced risk) and might be willing to adopt SSCM even before customers demand it. Firms' reactions to direct market stimuli for sustainability are thus expected to be weaker. This line of reasoning aligns with the findings of Aragón-Correa (1998) and Klassen and Vachon (2003), who showed that firms with more proactive business strategies have more advanced approaches to the natural environment that anticipate stakeholder requirements. Similarly, Henriques and Sadorsky (1999) showed that the salience of stakeholder environmental pressure is lower when the organisation has a stronger strategic attitude. In the same vein, Clemens and Douglas (2006) demonstrated that the capability to develop new "sound" strategies helps firms address external pressures from external stakeholders and negatively moderates the impact of such pressures on the extent to which green practices develop. Therefore, we propose our final hypothesis:

H3c. Innovativeness negatively moderates the positive effect customer pressure has on sustainable process management.

3. Methodology

3.1. Sample and data collection

The data were collected through a survey approach (Forza, 2002). First, we obtained an original sample of 500 manufacturing firms randomly selected from the Aida database (i.e., a database containing information on over 700,000 companies operating in Italy; http://www.aida.bvdep.com). We focused on manufacturing sectors: supply chains in these industries directly and indirectly relate to economic wealth creation and are responsible for impacts on the natural and human environment along all stages of a product's life cycle (Brickman and Ungerman, 2008). To ensure high external validity, we developed a stratified random sample according to the expected proportion of manufacturing firms in each industry provided by the Italian statistics agency (ISTAT).

To minimise key-informant bias, firms were contacted by telephone to identify a reference person (i.e., a purchasing manager or plant manager) and describe the research to this individual (Dillman, 2007). An electronic version of the questionnaire was provided to the respondents who agreed to participate in the survey, and where appropriate, a reminder was sent after a few weeks. A total of 77 companies provided useful and complete information for this research. The effective response rate is 15.4%, which although low, is considered sufficient for studying the research hypotheses (Hair et al., 1998). The sample is heterogeneous in terms of firm size (Table 1). Although different manufacturing sectors were considered, the companies primarily belonged to the machinery and equipment manufacturing sector. Generalisability limitations concerning our final sample are addressed in the last section of the article.

Table 1
Descriptive statistics in terms of (a) size and (b) industrial sector (ISIC codes).

(a)			(b)		
Size*	***n***	**%**	**ISIC****	***n***	**%**
Less than 100	4	5.02	20	3	3.90
100–249	28	36.36	22	4	5.19
250–500	18	23.38	25	7	9.09
Over 500	27	35.06	26	5	6.49
Total	**77**	**100**	27	16	20.78
			28	33	42.86
			29	6	7.79
			30	3	3.90
			Total	**77**	**100**

* Firm size is measured in number of employees.

** ISIC codes. ISIC 20: Manufacture of chemicals and chemical products; ISIC 22: Manufacture of Rubber and Plastics products; ISIC 25: Manufacture of fabricated metal products, except machinery and equipment; ISIC 26: Manufacture of computers and electronic and optical products; electro-medical equipment, metering equipment and watches; ISIC 27: Manufacture electrical equipment and non-domestic electric appliances; ISIC 28: Manufacture of machinery and equipment not elsewhere classified; ISIC 29: Manufacture of motor vehicles, trailers and semi-trailers; ISIC 30: Manufacture of other means of transport.

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3.2. Construct measurement

The development of the survey instrument (Table A1) followed the stepwise procedure suggested by Churchill (1979). Before data collection, content validity was established by grounding the model in the existing literature and identifying existing and appropriate measures for the survey instrument (Ateş et al., 2011; Awaysheh and Klassen, 2010; Calantone et al., 2002; Ehrgott et al., 2011; Gavronski et al., 2011; Gimenez et al., 2012; Large and Gimenez Thomsen, 2011; Pagell et al., 2007; Vachon and Klassen, 2006). Pre-testing the model and the measurement instrument before the collection of data added further validation in terms of face, trait and content validity. Specifically, we conducted several field interviews to gain deeper insights into the domain of the research framework and assess the questionnaire (see Table A2 in the appendix for details on firms and interviewees). Experts were asked to complete the instrument in the presence of the researchers and follow a "think aloud" method (Benbunan-Fich, 2001). The method prescribes that when the respondents undertake a task (completing the questionnaire), they should put into words any issues or ambiguities to provide insight to the problematic area. This procedure was interactively repeated, and the manager of the last firm recommended no changes, thus indicating that the model and questionnaire had reached a steady state.

An assumption of this study is that environmental and social practices are strongly interlinked. Thus, the measures that capture the adoption of SPM and SSM refer to both social and environmental practices. Recent literature provides strong evidence that these two dimensions substantially overlap. For instance, Zeng et al. (2007) suggest that environmental and social certifications are more effective when developed jointly. Accordingly, the literature proposes a conceptualisation of environmental investments and capabilities that considers environmental management systems and health and safety systems (Gavronski et al., 2011; Pagell et al., 2007). Hollos et al. (2012) propose a scale for sustainable supplier co-operation that considers formal systems to track ecological and social standards. The measures are detailed below.

3.3. Sustainable supply management

Consistent with several authors (e.g., Ageron et al., 2012; Awaysheh and Klassen, 2010; Gavronski, et al., 2011; Large and Gimenez Thomsen, 2011; Lee and Klassen, 2009; Zhu et al., 2012), SSM refers to two complementary sets of activities that are implemented at the firm level and require transaction with suppliers to assess and improve their environmental and social performance: supplier assessment and supplier collaboration. Specifically, *supplier assessment* consists of those activities using markets or arm′s-length transactions conducted by the buying organization to assess (and control) suppliers′ sustainability performance (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011; Vachon and Klassen, 2006). To capture this construct we employed a three-item, five-point Likert scale that captures the effort the company devotes to (i) sending questionnaires to evaluate suppliers′ socially and environmentally friendly practices, (ii) employing environmental and social criteria in periodic evaluations of suppliers, and (iii) performing environmental and social audits of suppliers′ plants. *Supplier collaboration* consists of the direct involvement of the firm in its suppliers to build their own capabilities to improve the environmental and social impacts of products and operations (i.e., supplier collaboration) (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011, Vachon and Klassen, 2006). This construct is also measured using a three-item, five-point Likert scale that captures the effort the company devotes (i) cooperating with suppliers to reduce the social and environmental impacts of their products and activities, (ii) collaborating with them to develop socially and environmentally friendly products and operations, and (iii) engaging in joint planning to anticipate and resolve sustainability-related problems. Thus, we operationalised SSM as a second-order, formative construct consisting of the first-order constructs *supplier assessment* and *supplier collaboration*. Constructs and items are defined and formulated according to empirical literature (Gavronski et al., 2011; Klassen and Vereecke, 2012; Large and Gimenez Thomsen, 2011, Vachon and Klassen, 2006). The use of a second-order factor is in line with our research question concerning the relationship between SPM and SSM.

3.4. Sustainable process management

In line with recently published literature (e.g., Gavronski et al., 2011; Zhu et al., 2012, 2013), it refers to a firm′s institutionalisation of four environmental and social practices that are commonly employed without direct supplier involvement (i.e., internal SSCM). On the environmental side, this institutionalisation includes environmental management systems (ISO 14001) (Daily and Huang, 2001; Darnall et al., 2008) and environmentally friendly eco-design (e.g., Design for Environment, Life cycle assessment) (Zhu and Sarkis, 2007). Drawing parallels with environmental management, two practices can be developed to manage social issues: health and safety certifications (Robson et al., 2007) and social campaigns (e.g., codes of conduct, corporate social activities) (Zairi and Peters, 2002). Thus, a four-item, five-point Likert scale is employed that captures the extent to which effort is devoted to (i) developing environmental management systems (ISO 14001), (ii) improving workplace health and safety (OHSAS 18001), (iii) designing environmentally friendly products and (iv) improving corporate responsibility through social campaigns. The first two items are formulated according to previous studies (Gavronski et al., 2011; Pagell et al., 2007) and essentially refer to the practices described by several authors cited in our literature review (Daily and Huang, 2001; Robson et al., 2007; Zeng et al., 2007). The third item is formulated according to Ateş et al. (2011), who built on research by Zhu and Sarkis (2007). Previous studies (e.g., Gimenez et al., 2012) have employed the last item to capture internal social practices, as described by Zairi and Peters (2002).

3.5. Customer pressure

Consistent with the previous literature (Ateş et al., 2011; Ehrgott et al., 2011), customers′ requests and requirements to improve a firm′s environmental and social performance have been measured using a three-item, five-point Likert scale, which captures the extent to which customers (i) prefer to purchase from companies with a strong social image, (ii) establish specific environmental and social requirements and (iii) require detailed information on sustainability performance.

3.6. Innovativeness

In line with Thompson (1965), the management literature (Hurt et al., 2006) and recent developments in the sustainability literature (Klassen and Vereecke, 2012), Innovativeness refers to company′s willingness/ability to change processes, products and management systems, mainly through architectural/radical innovation. According to Calantone et al. (2002), this construct has been measured using a three-item, five-point Likert scale that captures the extent to which the firm (i) attempts new ideas and solutions, (ii) seeks out new ways to perform tasks, and (iii) launches new products and services.

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3.7. Control variables

Two control variables are employed in this work. First, we control for company size. Indeed, the development of SSCM practices might be explained by this factor, rather than the relationships modelled below. For instance, large firms might have substantial resources to invest in SSCM and face greater external pressure from a larger variety of stakeholders (e.g., Vachon and Klassen, 2006). In this study, company size is measured as the natural logarithm of the number of employees. The second possible confounding effect relates to the importance that senior management places on environmental and social issues (Gavronski et al., 2011). Top management importance is measured by the relative importance of sustainability compared to five other priorities (cost, quality, delivery, flexibility and innovation).

3.8. Assessment of biases

Non-response bias was assessed by comparing the number of employees across responders and a randomly selected group of non-responders. Furthermore, under the assumption that later respondents would be more similar to non-respondents (Armstrong and Overton, 1977), late-respondent bias was also assessed by comparing our theoretical variables between later respondents ($nlr=24$) and earlier respondents ($ner=24$). Because the survey was managed smoothly (i.e., no waves of telephone calls but rather a constant effort), these groups were identified based on the earliest and the latest 30% of collected questionnaires. *T*-test analyses reveal that these groups (responders *vs.* non-responders; earlier respondents *vs.* later respondents) did not differ from each other at the 0.01 level of statistical significance.

Further, the study was tested for common method variance, which can pose problems for survey research that relies on self-reported data. An important concern in such cases is that common bias may artificially inflate observed relationships between variables. Ex-ante, to minimise common method variance, the dependent variables were placed after the independent variables in the survey instrument, which helps diminish, if not avoid, the effect of consistency artefacts (Podsakoff et al., 2003). Ex-post, a Harman's single factor test was also conducted (Harman, 1976). If common method variance existed, either a single factor would emerge from a factor analysis of all questionnaire measurement items or one general factor that accounted for the largest share of the variance would emerge. The exploratory factor analysis revealed three factors with eigenvalues greater than 1 that accounted for the 75.18% of the total variance. This result suggested that common method variance does not represent a serious problem in this study.

4. Data analysis and results

To test our model, we relied on partial least squares (PLS) (Chin, 1998). We performed PLS algorithms as implemented in the SmartPLS 2.0 software (Ringle et al., 2005). PLS is most appropriate when sample sizes are small, assumptions of multivariate normality and interval-scaled data cannot be made, and the researcher is primarily concerned with predicting the dependent variable. PLS is a relatively new method in the operations management literature; nevertheless, it has been used by a growing number of researchers from a variety of disciplines (Peng and Lai, 2012). While it is possible to test our proposition using a standard procedure (e.g., explanatory factor analysis and OLS regressions), this may not be considered completely appropriate, as the model proposed in Fig. 1 involves independent equations that need to be estimated simultaneously. Consequently, to obtain unbiased and consistent estimates, our model must be analysed using a multivariate estimation technique such as two-stage least squares (Pindyck and Rubinfeld, 1981) or PLS. While both techniques will provide acceptable parameter estimates, the former requires the use of single measures for all dependent variables. In contrast, PLS permits multiple measures of both the dependent and independent variables. Moreover, our sample size does not allow us to use a structural equation model based on the covariance matrix. For all of these reasons, a partial least squares analysis was adopted to test our research model.

The general rule of thumb regarding appropriate sample size when using PLS is to multiply the highest number of paths leading to a dependent variable by ten (Peng and Lai, 2012). In this study, the highest number of paths leading to a dependent variable is seven (i.e., sustainable supply management), meaning that a minimum sample size of 70 cases would be necessary. To further ensure that our sample size is adequate for the analysis, we used the G*Power 3 software (Faul et al., 2007) to conduct a power analysis, as proposed by Cohen (1988) for the *F*-test, pertaining to the R^2 value for the endogenous constructs. Assuming a medium effect size ($f^2=0.25$) for seven predictors, a significance level of 0.05 and a desired power of 0.80, our analysis would require a sample of 65.

We present our results in two stages. In the first stage, we ensured that the measures employed to operationalise the underlying constructs are both reliable and valid. Once convinced of the adequacy of the measurement model, we can then proceed to test our model and interpret the resulting coefficients.

4.1. Measurement model

A confirmatory factor analysis was not reasonable because of the small sample size (Gagné and Hancock, 2010). Many criteria, however, were considered to guarantee the reliability and validity of our measures. First, the reliability of individual items in our case is testified by the measures' consistently loading on their respective construct at nearly or greater than 0.7 (Table 2). Second, the convergent validity and uni-dimensionality (Fornell and Larcker, 1981) of all of the constructs were confirmed by the significant standardised item loadings on their underlying constructs in a simultaneous estimation of the measurement and structural models in PLS (Anderson and Gerbing, 1988). Lending support to the constructs' convergent validity, the Average Variance Extracted (AVE) of our constructs was consistently higher than the recommended minimum of 0.5 (Fornell and Larcker, 1981) (Table 2). This finding means that the items share most of their variance with their assigned construct and not with the error term or other latent factors (Chin, 1998). Composite reliability was then assessed by considering construct reliability (i.e., Cronbach's alpha) (Nunnally et al., 1967) and internal consistency (Fornell and Larcker, 1981). According to the literature, the results demonstrate that all items consistently refer to their respective constructs.

The loadings or weights of our formative construct need to be evaluated differently. Because SSM is a formative measure, the weights indicate the contribution of each item to the formation of the construct. In our case, because the significant weights are 0.52 for supplier assessment and 0.53 for supplier collaboration, it can be interpreted that these constructs contribute equally to SSM.

Finally, concerning to discriminant validity (Hulland, 1999), Table 3 indicates that the correlations among the different constructs in the lower left off-diagonal of the matrix are lower than the square roots of the average variance extracted values calculated for each of the constructs along the diagonal (i.e., diagonal elements). This testifies to the discriminant validity of our measures.

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Table 2
Summary of measurement scales.

Construct name and source	*Items*	*Mean*	*SD*	*Loading*	*Composite reliability*	*Alpha*	*AVE*
Supplier assessment (Awaysheh and Klassen, 2010; Large and Gimenez Thomsen, 2011; Vachon and Klassen, 2006)	SA1	2.68	1.34	0.90	0.94	0.91	0.85
	SA2	2.41	1.22	0.94			
	SA3	2.40	1.24	0.91			
Supplier collaboration (Awaysheh and Klassen, 2010; Large and Gimenez Thomsen, 2011; Vachon and Klassen, 2006)	SC1	2.60	1.20	0.92	0.95	0.93	0.87
	SC2	2.56	1.13	0.93			
	SC3	2.69	1.18	0.95			
Sustainable process management (Ateş et al., 2011; Gavronski et al., 2011; Gimenez et al., 2012; Pagell et al., 2007)	SPM1	3.43	1.41	0.84	0.91	0.86	0.72
	SPM2	2.84	1.42	0.81			
	SPM3	3.00	1.28	0.83			
	SPM4	3.05	1.18	0.87			
Customer pressure (Ateş et al., 2011; Ehrgott et al., 2011)	CP1	2.96	1.00	0.86	0.92	0.87	0.79
	CP2	2.71	1.02	0.92			
	CP3	2.84	1.02	0.89			
Innovativeness (Calantone et al., 2002)	IN1	3.88	1.05	0.96	0.93	0.88	0.81
	IN2	3.94	0.86	0.93			
	IN3	3.80	1.05	0.79			

Table 3
Constructs validity.

	SSM	SPM	CP	IN
Sustainable supply management	**n.a**			
Sustainable process management	0.81	**0.85**		
Customer pressure	0.49	0.48	**0.89**	
Innovativeness	0.37	0.39	0.30	**0.90**

Note: The square root of the AVE is reported on the diagonal. The latent construct correlations are reported off-diagonals.

4.2. Structural model

The PLS structural model was assessed by examining the path coefficients (similar to the standardised beta weights in regression analysis) and their statistical significance. To study moderation effects, we included an interaction term in the model and examined its path coefficient (Henseler and Fassott, 2010). Then, bootstrapping was employed to test the statistical significance of the model paths. This procedure entails generating 500 subsamples of cases that are randomly selected, with replacement, from the original data set. The 'bootstrap' sample size was set equal to the number of data points (i.e., 77).

Different models were also tested to verify whether alternative causal relationships among the variables could increase the explained variance of the exogenous factors. The analysis revealed that our model represents the best solution. The Goodness of Fit was calculated following Tenenhaus et al. (2005). In our model, this fit is 0.63, which is above the large effect size cut-off value of 0.36 (Fornell and Larcker, 1981). The results concerning the tests of the propositions are presented in Table 4.

First, the impact of sustainable process management on sustainable supply management is positive and highly significant, supporting H1. It is noteworthy that when estimating the model, the direct paths from customer pressure and innovativeness to sustainable supply management were not significant, providing no evidence to support H2b or H3b.

Customer pressure was significantly linked to sustainable process management, thus providing support for H2a. To test for a possible mediating effect, we adopted the procedure proposed by Baron and Kenny (1986). First, an assessment of the path between customer pressure and the mediating variable (SPM) is necessary: the path is positive and significant ($p < 01$). The second step is to assess the direct path from customer pressure to SSM when SPM is not included in the model: the path is also positive and significant, supporting H2b. The result in Table 4 indicates that the path between customer pressure and sustainable supply management in the full model (including all paths) is not significant: when combined with the result of the first two steps, we can conclude that this is a fully mediated effect. A Sobel test was also conducted to confirm that the indirect path was significant (Holcomb et al., 2009). The test was significant, thus corroborating the mediating effect (Sobel *t*-statistic: 4.06).

A similar procedure was applied to innovativeness. When the direct path between innovativeness and sustainable supply management was assessed without including SPM in the model, it was positive and significant ($p < 05$). The observation that the direct path becomes non-significant when SPM is included in the model indicates a mediating effect. The Sobel test was also significant (Sobel *t*-statistic: 2.86).

H3c is supported: innovativeness significantly and negatively moderates the effect exerted by customer pressure. In other words, the impact of customer pressure on SPM is weaker for innovative companies because they tend to anticipate stakeholder requests and requirements. The effect, however, is weak because the moderating variable produces a small effect size (Table 4). Table 5 provides a synthetic overview of the research hypotheses.

5. Discussion

Following the SCM literature (Flynn et al., 2010; Harland, 1996; Harland et al., 1999; Tan, 2001) and SSCM literature (Gavronski et al., 2011; Klassen and Vachon, 2003; Pagell and Wu, 2009; Zhu et al., 2012, 2013), we developed a conceptual framework positing that internal practices foster external practices. Our analysis, then, provides evidence that SPM (i.e., internal practices) positively and significantly impact SSM (i.e., external practices). Environmental and social standards (i.e., ISO 14001, SA8000) require the identification of relevant environmental and social aspects and drive firms to develop specific knowledge associated with those issues. Therefore, once internal aspects are addressed and the firm has reached advanced stages of environmental and social management, supply managers are in a position to consciously seek out opportunities upstream in their supply chains and find appropriate support within their organisations. When addressing SSM, for instance, firms address short-term pressures to remain economically viable while implementing newly modelled supply chains. By undertaking SPM, firms develop the capacity to address the strategic trade-offs among the economic, environmental and social elements of the triple bottom line and facilitate efforts to

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Table 4
Results for the structural model.

Paths	*Direct and indirect effects*		*Direct, indirect and moderated effects*	
	Standardized coefficient	*t*-value	Standardized coefficient	*t*-value
SPM → SSM	**0.740**	10.953	**0.740**	11.863
CP → SPM	**0.394**	4.378	**0.440**	4.684
CP → SSM	0.123	1.494	0.123	1.483
IN → SPM	**0.274**	2.960	**0.230**	2.377
IN → SSM	0.044	0.598	0.044	0.588
IN × CP → SPM	–	–	−**0.144**	1.748
Variance explained in SPM	29.5%		31.3%	
Variance explained in SSM	68.6%		68.6%	
Effect size of IN × CP → SPM			0.057*	

* The effect size is calculated using the equation $f^2=(R^2_{\text{included}}-R^2_{\text{excluded}})/(1-R^2_{\text{included}})$.

Table 5
Research hypotheses.

Research hypothesis	*Description*	*Result*
H1	Sustainable process management → sustainable supply management	Supported
H2a	Customer pressure → sustainable process management	Supported
H2b	Customer pressure → sustainable supply management	Not supported
H3a	Innovativeness → sustainable process management	Supported
H3b	Innovativeness → sustainable supply management	Not supported
H3c	Negative moderation effect of Innovativeness on 'CP → SPM'	Supported

confront similar trade-offs when managing suppliers. Thus, our finding complements prior research (Flynn et al., 2010; Gavronski et al., 2011; Klassen and Vachon, 2003; Zhu et al., 2013), which suggested that "having your house in order and building internal resources usually sets the stage for increased requirements and adoption for external environmentally [and socially] oriented organizational practices" (Zhu et al., 2013).

Based on recent literature (e.g., Ateş et al., 2011; Carter and Jennings, 2004; Ehrgott et al., 2011; Zhu and Sarkis, 2007), we included the driving role of customer pressure in our framework. We found that customer pressure represents an important driver for SPM that in turn initiates the development of SSM. On the one hand, our finding supports studies arguing that customer pressure exerts a positive and significant effect on SPM (e.g., Christmann, 2004; González-Benito and González-Benito, 2006). On the other hand, this study suggests that the pressure applied by customers might not directly result in the adoption of sustainable supply management when internal capabilities for coping with environmental and social issues are not substantially developed. Our analysis, in fact, reveals that the direct relationship between customer pressure and SSM is fully mediated by SPM. This finding contrasts prior findings in the literature, which suggested a direct impact of customer pressure on SSM (Ateş et al., 2011; Deephouse and Heugens, 2009; Zhu and Sarkis, 2007). However, it is consistent with the scarce support that previous authors have found for the relationship between the intensity of customer pressure and the adoption of supplier socially responsible practices (Carter and Jennings, 2004; Ehrgott et al., 2011). It is also consistent with Zhu et al. (2013), which demonstrate that pressures for environmental management and their effects vary across different group of sustainable practices.

Based on Porter and Van der Linde (1995) and most recent SSCM literature (Klassen and Vereecke, 2012; Pagell and Wu, 2009; van Bommel, 2011), we included the enabling role of innovativeness in our framework. Borrowing theoretical arguments from the innovation literature (Calantone et al., 2002; Ruff, 2006; Sinkula et al., 1997), strategic literature (Aragón-Correa, 1998; Christmann, 2000; Clemens and Douglas, 2006; Henriques and Sadorsky, 1999) and SCM literature (Hult, 1998; Hult and Ketchen, 2003; Klassen and Vachon, 2003), our framework suggested that innovativeness assists firms in successfully developing SSCM and anticipating customer pressure. Our analysis, indeed, provides evidence of the enabling role played by innovativeness, although its impact on SSM is fully mediated by SPM. Interestingly, we found evidence that the interaction between innovativeness and customer pressure negatively impacts SPM. Because of the innovative companies' ability to anticipate/influence stakeholders' requests and requirements, customer pressure has less of an impact on the extent to which SPM develops when innovativeness is high.

6. Conclusions, limitations and future research

This study improved our understanding of how SSCM develops within a company and evolves from internal to external practices. The results suggest that sustainable process management forms the foundation for the development of sustainable supply management. Customer pressure is found to be an essential driver that motivates firms to begin and sustain the SSCM development process. Innovativeness is instead an essential enabling factor, which also helps companies in anticipating/shaping stakeholders' requests and requirements for sustainability. Such antecedents, however, cannot translate into externally oriented sustainable practices if internal ones are lacking.

The main theoretical contribution of this paper is the complex interaction between different groups of SSCM practices (i.e., SPM and SSM) and their driving and enabling antecedents (i.e., CP and IN). No previous study considered such an interaction to explain how SSCM develops. On the basis of our results, we suggest that when theorising and testing the impact of various drivers and enablers on the development of SSCM, the interdependency among different types of SSCM practices should be taken into account to gain a richer understanding of what actually drives sustainability in the supply chain. Moreover, although explorative in its nature, our study of innovativeness provides new insights to explain why certain firms are more effective than others in developing SSCM and responding to external pressure. Our theoretical arguments and empirical evidence form the basis for a more in-depth exploration of the processes that enhance or constrain a firm's ability to identify and respond to emerging environmental and social issues.

The study is also important for management because it provides managers with some understanding of how SSCM should

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be developed. First, we recommend that managers acknowledge growing stakeholder awareness and prepare themselves to address customers' strict environmental and social requirements. Furthermore, we recommend that firms seeking to develop sustainable supply chains first invest in their organisations. Environmental management systems, eco-design, health and safety certifications and social campaigns are relevant to the development of specific capabilities that can be fully exploited when undertaking supply chain oriented practices. Moreover, managers are advised to be open-minded, which will enhance the innovativeness of their organisations. Innovative firms not only face fewer obstacles to the development of new sustainable practices (i.e., SPM), but they are also better equipped to cope with the pressure exerted by primary stakeholders.

Although this study makes an important contribution to research and practice, it has some limitations that should be highlighted. First, our results suggest that sustainable process management has a mediating role. However, our research design, a cross-sectional survey, does not provide the temporal sequence necessary to assess mediation. Future research should include longitudinal designs to provide conclusive support for our model. Moreover, our research suggests that both external pressure and internal capabilities are essential for the development of SSCM. Accordingly, future research is advised to combine stakeholder theory (Freeman, 1984) and a resource-based perspective (Barney, 1991). This would provide a more holistic view to address the development of SSCM.

Second, our sample only includes Italian companies, a large proportion of which operate in the machinery and equipment manufacturing sector. Thus, even if the data collection process were properly and accurately designed, a country or an industry effect could nevertheless be possible. For instance, recent research shows that companies operating in the electronics sector are less active in terms of environmental supply chain investments relative to chemical businesses (Wiengarten et al., 2012). Future studies could test similar models in different countries and industries to increase our understanding of country and industry effects on the way SSCM develops. Third, this study does not differentiate between B2C and B2B contexts. Both the intensity and influence of customer pressure, however, might significantly change in those contexts. For instance, the intensity of customer pressure might change because of distinct purchasing behaviours: while business customers are typically more conservative, once consumers become aware of the availability of an innovative feature (such as a safer or more efficient technology), they may be unwilling to purchase any product or service not possessing the desired feature. Thus, the intensity of customer pressure could be significantly higher in the B2C context. Research differentiating between these two contexts would enrich the current literature on sustainability in the supply chain. A final issue is associated with the number of firms providing complete answers to our survey. Obviously, a wider sample would allow us to verify the reliability of our results.

Future research should attempt to overcome the aforementioned limitations. We also suggest that future research further explore the role of innovativeness in the context of SSCM. To pursue this purpose, however, a more refined conceptualisation of the innovativeness construct is needed. The operational definition of innovativeness employed here, although consistent with previously published works (Calantone et al., 2002; Hurt et al., 2006; Klassen and Vereecke, 2012; Thompson, 1965), is quite general. Our model could be tested by employing alternative constructs, which may refer to specific forms of innovativeness (i.e., the ability to introduce product/service innovations; the ability to introduce process innovations; the ability to introduce organisational innovations, etc.) or to its antecedents (e.g., learning orientation and future orientation). This would allow future researchers to refute or support our results.

Appendix A

See Tables A1 and A2.

Table A1
Survey items used in the multi-items scales.

Indicate your level of agreement about the following statements (1=strongly disagree; 5=strongly agree)	
CP	CP1.Customers prefer to purchase from companies with a strong social image
	CP2. Pressure to meet environmental and social requirements set by our main customers.
	CP3. Customers require detailed information to assure our environmental compliance
Indicate the effort put into implementing the following action programs in the last three years (1: none; 5: high)	
SSM	SSM1. Sending questionnaires to suppliers in order to assess their environmental and social performance
	SSM2. Having supplier environmental and social criteria in periodic evaluation
	SSM3. Auditing suppliers' plant to assess their environmental and social performance
	SSM4. Working together with suppliers to reduce social and environmental impacts of products
	SSM5. Collaborating with suppliers to reduce social and environmental impacts of processes and operations
	SSM6. Conducting joint planning to anticipate and resolve sustainability related problems
SPM	SPM1. Developing environmental management systems (e.g., ISO 14001)
	SPM2. Improving workplace health and safety (e.g., OHSAS 18001)
	SPM3. Designing Environmentally friendly products (e.g., Design for Environment, Life cycle analysis)
	SPM4. Improving corporate responsibility through social campaigns (e.g., Codes of conduct, corporate social activities)
Indicate your level of agreement about the following statements (1=strongly disagree; 5=strongly agree)	
IN	IN1. Our company frequently tries out new ideas and solutions
	IN2. Our company seeks out new ways to do things
	IN3. Our company is often the first to market with new products and services
Size	Approximately, how many employees (full-time equivalent) work in your company?
Importance of sustainability	*For each of the following competitive goals, please indicate the importance senior management places on each for your company. Allocate 100 points across the six priorities below to indicate their relative importance:* (i) Manufacturing cost (ii) quality, (iii) delivery speed and timeliness, (iv) manufacturing flexibility, (v) new product design/innovation, (vi) sustainability

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Table A2
Details about field interviews.

Details	Field interviews									
	Firm A	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**	**Firm G**	**Firm H**	**Firm I**	**Firm J**
Foundation	1955	2000	1966	1870	1964	1975	1836	1988	1899	1956
Industry and products	ISIC 34 light-heavy duty cranes	ISIC 29 weaving systems and healed frames solutions	ISIC 34 cabs, driver units for track loaders	ISIC 29 cutting machine tools and energy solutions	ISIC 29 pneumatic equipment for the automation	ISIC 31 domestic appliances	ISIC 31 network connectivity systems and circuit breakers	ISIC 31 network connectivity systems and circuit breakers	ISIC 32 home automation, and medical systems	ISIC 29 air cooling and conditioning equipment
Employees	450	545	648	283	383	1000	700	7624	2439	220
Interviewees	Plant manager	Operations manager	Purchasing manager	Senior buyer	Plant manager	Strategic sourcing manager	Purchasing manager	Sustainability director	Plant manager.	Purchasing manager

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