Research paper

Inter-organizational governance, learning and performance in supply chains

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Abstract

Purpose – Inter-firm knowledge sharing and learning constitute one of the main avenues to improve supply chains' performance in today's business environment. This paper aims to examine how effective different governance mechanisms are in promoting knowledge transfer, learning and performance in supply chains.

Design/methodology/approach – Following on from the literature in inter-organizational learning, transaction costs economics, business-to-business relational marketing, and supply chain management, a model is presented and tested using structural equations modeling. Data were collected from 219 Colombian apparel manufacturers.

Findings – This paper finds that from more influential to less, social mechanisms of governance, hostages and behavioral control favor knowledge sharing, learning and performance in supply chains. Output control exerts a negative influence on learning in supply chains.

Research limitations/implications – Governance has a key role in promoting transparency and learning in supply chains. Future research should analyze whether it impacts on the firms' learning intent.

Practical implications – Knowledge sharing and learning have a positive influence on the supply chain's performance. Results of the study suggest that the supply chain's competitiveness lies in the adequate governance of the interfirm relationships, i.e. by using trust, hostages and behavioral control to support knowledge exchange.

Originality/value – Compared with studies that limit their analysis to the impact of one specific type of governance mechanism, generally trust, the paper for the first time jointly examines the role of several types of governance on knowledge-sharing in supply chains, on learning and on performance. This allows a comparison of the different mechanisms in terms of their safeguarding and coordination role.

Keywords Knowledge management, Learning, Performance management, Governance, Textile industry

Paper type Research paper

Introduction

A supply chain is a network of firms connected by upstream and downstream linkages and engaged in the activities that produce value in the form of products and services at the final customer's disposition (Christopher, 1994). For individual firms, the importance of considering the supply chain's perspective lies in the fact that, in nowadays business environment, competition is not among organizations but among supply chains. In this sense, supply chain management is generally associated with managing the procurement channel across the boundaries of enterprises, such as between firms and their suppliers (Jain *et al.*, 2006).

In this type of relationships, buyers have different options to manage their sourcing relationships. In its extent work, Cox (2004a) describes four: 1) supplier selection, 2) supply chain sourcing, 3) supplier development and 4) supply chain management, which represent different options according to the proactive (3, 4) vs reactive (1, 2) focus on relationship management and the first-tier (1, 3) whole supply chain (2,4) level of work scope with supplying levels. Although supply chain management, i.e. a proactive management orientation toward the whole supply chain, could represent the maximum level of operational efficacy, it also demands to the buyer an

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often unattainable level of involvement, investments, transaction costs, competencies and power. This makes other options like supplier development, where the buyer adopts a proactive management style with the first-tier supplier, a more feasible way for buyers to improve supplying operations.

Analyzing the inter-organizational interface of supply chain firms is therefore one of the alternative ways of drawing conclusions about supply chains (Cambra-Fierro and Polo-Redondo, 2008). Recent research published in *Supply Chain Management: An International Journal* adopts this dyadic perspective by researching specific buyer-seller supply chain relationships (Cambra-Fierro and Polo-Redondo, 2008; Cheng *et al.*, 2008; Pimentel *et al.*, 2006; Sanzo *et al.*, 2007). This literature indicates that the "factors determining company-supplier relationships have to be thoroughly studied and additional models explaining these relationships have to be tested" (Cambra-Fierro and Polo-Redondo, 2008, p. 212).

Particularly, "interorganizational knowledge sharing within a supply chain has become a common practice, because it enhances the competitive advantage of the supply chain as a whole" (Cheng *et al.*, 2008, p. 283). Organizational customers-distributors have been found to be the most common source of external learning for manufacturers, ahead of suppliers, the scientific community, other industries, competitors, partnerships and consultants (Bierly and Daly, 2007). This study analyses how this upstream interfirm knowledge transfer from distributors to their suppliers (manufacturers) can be governed and its effects on learning and supply chain's performance in the empirical context of the apparel industry.

The textile and apparel value chain is defined by most of the analysts as a market-driven (Guercini and Runfola, 2004) or buyer-driven value chain:

> Though the chain spans across fibre supply, yarn manufacturing, fabric weaving, processing, apparel making, aggregators, retailers, the clout is in the hands of the front-end (Business Line, 2004).

This power is consequence not only of the fact that generally distributors/retailers have more size and are less numerous than manufacturers in the supply chain (Teng and Jaramillo, 2006). It is also a consequence of the legitimacy that their proximity to the final market give to them to direct the supply chain to satisfy the final customers' demands (Guercini and Runfola, 2004).

In a context characterised by global competition and global sourcing, retailers and their supply chains are "pressured to shorten cycle times, drive down inventory costs, and keep styles fresh in stock" (Terry, 2008). Supply chain relations are, therefore, high on the strategic agenda of most retailers, who are now seeking collaborations with channel partners for increasing efficiency and containing costs (*The Hindu Business Line*, 2004), many times by "putting more feet on the ground – either their own local personnel or in-country logistics or sourcing partners" (Terry, 2008). In consequence, a proactive attitude of supplier development (Cox, 2004a) by sharing of experience and knowledge between distributors/retailers and their suppliers/manufacturers in the supply chain is, first, possible because of the power and capabilities conditions of the supplying relationships (Cox *et al.*, 2004) and, second, necessary as a substantial characteristic of the collaboration is to improve the supply chain efficiency. As a result, distributors may need to help their supply chain suppliers/manufacturers to develop logistic and supply chain capabilities by providing training programs and sharing their knowledge on the topic, so that the value created has the potential to benefit the whole supply chain competitiveness. Confirming this assumption, Rao *et al.* (2006) found that the upstream flow of knowledge in supply chains is the most relevant in terms of contribution to the whole supply chain's competitiveness.

However, "as such, firms would rather not share knowledge if they feel that what they gain from cooperation is outweighed by losses from relinquishing their monopoly over the knowledge" (p. 284). To address this issue, we develop and empirically test a model with knowledge-sharing and learning in apparel supply chains as the central element, interorganizational governance as its facilitator, and supply chain's performance as the consequence.

The remainder of the paper is organized as follows. We begin by providing the conceptual framework in which a set of research hypotheses is formulated. We then discuss the research design, including the research setting, the data collection, and the measurement properties. The results of the hypotheses test are then reported and, finally, discussed along with their theoretical and managerial implications.

Theory, model and hypotheses

Two prevailing management theories are being used to study the performance consequences of managing supply chain relationships: transaction cost economics (TCE) (e.g. Williamson, 2008) and resource based view (RBV) (e.g. Wang and Wei, 2007). TCE concentrates on governance structures to control opportunistic behaviors, i.e. "self-interest seeking with guile" (Williamson, 1985), when specific investments, i.e. specialized investments made to support a particular transaction that lose value if they were redeployed to any other purpose, are involved (Williamson, 1975, 1985). This study develops the construct of knowledge-sharing routines in interfirm relationships, considered as one investment in specific asset (Dyer and Singh, 1998), and empirically tests the effects of interorganizational governance mechanism to safeguard from the risk of opportunism. Although TCE's original framework poses the governance question as a discrete choice between market exchange and internal organization (hierarchy) (Williamson, 1975), the current version of the theory explicitly acknowledges that hybrid mechanisms can be used to safeguard specific investments without complete integration (Williamson, 1985). Our research question related to TCE is, therefore, "what is the impact of different governance mechanisms on knowledge-sharing in interfirm supply chain's relationships?"

From the RBV perspective, interorganizational governance is concerned with the management of resources in a supply chain to create relational rents (Dyer and Singh, 1998) therefore increasing the competitive advantage of the partners (Wang and Wei, 2007). Under the assumption that a firm's critical resources may extend beyond the firm's boundaries and may be embedded in interfirm routines and processes, relational rents are possible when firms in a supply chain business relationship combine, exchange, or invest in idiosyncratic assets, knowledge, and resources or capabilities, and when they employ effective governance mechanisms that permit the realization of rents through the synergistic combination of assets, knowledge, or capabilities (Dyer and Singh, 1998). According to this, a second research

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question is "what is the impact of different governance mechanisms on learning and performance in interfirm supply chain's relationships?" Next we explore these research questions.

Learning and its effects on supply chains' performance

Knowledge, and the capacity to create it through learning is a key productive resource in terms of contribution to value added, strategic significance, and competitive advantage (Grant, 1996). Since the creation of value typically requires the application of different types of specialized knowledge that many times might be outside the firm's boundaries, learning from other organizations in the supply chain is a feasible way to access to that knowledge (Dyer and Singh, 1998). Knowledge arising from distributors, due to their closeness to the final market, generally offers an accurate description of the final market's current demands and dynamics, therefore facilitating their suppliers' market orientation (Hernández-Espallardo and Arcas-Lario, 2003; Sanzo *et al.*, 2007; Wagner and Bukó, 2005).

The fact that a good share of the distributors' competitiveness in the final market lies in their suppliers' effectiveness, will make that a good share of the interest in knowledge-sharing will be intended to increasing their competitiveness in terms of costs of serving, cycle time, coordination of activities and competitive advantage (Hult *et al.*, 2004), with these as the main components of performance in supply chains.

In short, learning from their supply chains' relationships improves the suppliers', i.e. the student firms' ability to perform their roles more efficiently (Grant, 1996). Additionally, the knowledge received serves to educate them about operations within the chain as well as about their customers' needs and preferences (Hult *et al.*, 2002). Finally, interfirm learning develops a shared meaning in the relationship, which is a critical mechanism that facilitates coordination and, therefore, supply chain's performance (Lane *et al.*, 2001). Accordingly:

H1. Suppliers' supply chain performance increases when learning from their customers increases

Inter-firm knowledge-sharing routines

Knowledge transfer between firms is the process by which the knowledge of one firm is acquired by another (Wu, 2008) and it is the result of the student firm's internalization of the other's knowledge as a consequence of (Hamel, 1991): the student's learning intent (or absorptiveness); and the teacher's transparency, for example by dedicating time and efforts to inter-firm knowledge-sharing routines, defined as regular patterns of business-to-business interactions in the supply chain that permit the transfer, recombination, or creation of specialized knowledge (Dyer and Singh, 1998). Therefore:

H2. Suppliers' learning from their supply chain's customers increases when customers invest in knowledge-sharing routines.

Sharing knowledge in supply chains is required because knowledge may be an important source of coordination and, thus, be critical to create value in the supply chain (Hult *et al.*, 2004). For instance, knowledge sharing with the suppliers is part of the supplier development programs intended to increase their competence (Giannakis, 2008), and a network of competent suppliers is a straightforward way to improve purchasing performance (Sánchez-Rodríguez *et al.*, 2005). However, the use of knowledge-sharing routines is neither free of costs nor free of risks because a great deal of time and resources may be required to support the transfer (Dyer and Nobeoka, 2000). Moreover, these investments are relationship specific, creating a lock-in condition that represents vulnerability because the teaching firm cannot leave the relationship with the student without incurring economic losses (Wathne and Heide, 2000). Finally, one firm's internalization of the other's knowledge represents a "potential danger of turning collaborators into competitors" (Hamel, 1991). For instance, in collaborative product development Littler *et al.* (1995) found 33 per cent of respondents concerned about giving proprietary information which may comprise all or part of the firm's unique contribution to its competitive position as the major risk in this type of collaboration. Another 11 per cent of respondents mentioned the risk that collaborators can become competitors. This demonstrates the existence of a paradox in interfirm learning that Mohr and Sengupta (2002) describes as "while one wants to learn as much as possible from one's partners in order to maximize the effectiveness and efficiency of the partnership, one also must limit transparency and leakage of information in the partnership so as not to dilute the firm's sources of competitive advantage" (p. 283). *H1* presented the "upside potential of intefirm learning". Now, *H3* deals with the mechanisms that can be used to "mitigate the downside risks" of a opportunistic use of this knowledge[1].

Governance strategies must be adopted to reduce these risks of opportunism (Mohr and Sengupta, 2002), facilitating, in consequence, the investments in knowledge-sharing routines (Dyer and Singh, 1998). Different authors have proposed their own lists of governance mechanisms in interfirm relationships, sometimes from a theoretical point-of-view (e.g. Dyer and Singh, 1998; Heide, 1994; Mohr and Sengupta, 2002; Wathne and Heide, 2000) other times empirically (e.g. Cai *et al.*, 2009; Chelariu and Sangtani, 2009; Hernández-Espallardo and Arcas-Lario, 2003; Wathne and Heide, 2004). Table I presents their proposals about the governance mechanisms in interfirm relationships and their main conclusions. Out of all of them, Wathne and Heide (2000) is the reference that more explicitly presents a direct relationship between each governance mechanism and its potential for reducing the risk of opportunism. This is the reason for using their list in this research. The authors propose incentives, socialization, monitoring and selection as the governance mechanisms that can be used to reduce opportunism. However, in already established and ongoing relationships, selection has not role to play so that the first three governance mechanisms are used in this research.

One "general approach to managing the problem caused by specific investments is to design an incentive structure that discourages opportunistic behavior by the other party" (Stump and Heide, 1996, p. 432). Incentives are used to guarantee that the student firm perceives that the long-term gains from maintaining the relationship with the teaching firm exceed the short-term gains from potential opportunism (Wathne and Heide, 2004). For instance, the student firm's

Table I Governance mechanisms

Article	Governance mechanism	Article's type and conclusions
Cai *et al.* (2009)	Legal contract, joint problem solving, joint planning and collaborative communication	Empirical. Governance mechanisms are more used in more interdependent relationships and they improve performance and commitment
Chelariu and Sangtani (2009)	Qualification, monitoring and enforcement	Empirical. The three types of e-marketplaces, i.e. independent exchanges, consortia, and private exchanges are characterized by the use of different interfirm governance processes
Dyer and Singh (1998)	Third-party enforcement mechanisms (contract) and self-enforcing mechanisms (countervailing specific investments, financial, and trust-reputation)	Interfirm governance generates relational rents because it influences transaction costs (e.g. the risk of opportunism) and the parties' disposition to engage in value-creation initiatives (e.g. by sharing knowledge)
Heide (1994)	Market governance, unilateral and bilateral	Theoretical. Each form of interfirm governance is distinct from the others according to how the relationship starts, roles are specified, nature of planning and adjustments, monitoring procedures, incentive systems, means of enforcement, and how relationship ends
Hernández-Espallardo and Arcas-Lario (2003)	Formalization, participation, input control, behavior control and output control	Governance helps firms to improve market orientation
Mohr and Sengupta (2002)	Information exchange, operational linkages, cooperative norms, specific investments and contract	Theoretical. Appropriate goveranance mechanisms must be crafted which maximize the benefits of learning and minimizes the risks
Wathne and Heide (2000)	Monitoring, incentives, selection and socialization	Theoretical. Governance mechanisms must be aligned with the type of opportunism that has to be managed
Wathne and Heide (2004)	Qualification and hostages	Empirical. Flexibility in dyadic relationships depends on how other connected relationships in the firm's larger supply chain are governed

investment in assets which that are specific to the relationship with the teaching firm have potential to create a hostage in the form of assets that have limited salvage value in other relationships (Williamson, 1983). According to this idea, the teacher's investments in knowledge-sharing routines would be safeguarded from the student firm's opportunism by means of the potential economic loss that the latter, who has invested in their own specific assets, would incur in case the relationship finished (Wathne and Heide, 2000); i.e. the teaching firm manages the hazards that could be derived from its investments in knowledge-sharing routines by increasing the learning firm's dependence[2].

Second, social enforcement, which relies on personal trust relations or reputation (Dyer and Singh, 1998), favors the investments in knowledge-sharing routines since it reduces the likelihood that opportunism will take place, regardless of the level of vulnerability (Wathne and Heide, 2000). In this sense, trust functions as an ongoing social control mechanism and risk reduction device, fostering the amount of knowledge exchanged (Cheng *et al.*, 2008).

Finally, monitoring is a process consisting of setting goals, supervising and evaluating progress, providing feedback, and reinforcing (or forcing a change) on the basis of performance (Challagalla and Shervani, 1996). Output and behavior controls are different types of formal controls since they represent firm initiated mechanisms which are respectively linked to specific outcomes and behaviors (Aulakh *et al.*, 1996). The teacher's monitoring of the student firm reduces opportunism because it enhances the ability to detect opportunism by reducing information asymmetry. Moreover, it places uncomfortable social pressure on the controlled firm and lately it increases the ability to match rewards and sanctions to the controlled firm's display of proper behaviors, including not behaving opportunistically (Wathne and Heide, 2000). In this sense, monitoring has also incentive properties since the controlled firm is impelled to avoid opportunistic behaviours as they could be discovered and enforced. As a result:

H3. Customers' investments in knowledge-sharing routines in supply chains increase when: (a) suppliers' investments in relationship specific assets increase; (b) inter-firm social enforcement increases; (c) monitoring of the suppliers through output control increases; (d) monitoring of the suppliers through behavior control increases.

The preceding analysis focuses on the safeguarding effects of the different governance mechanisms. However, each mechanism is a coordinating tool (Heide, 1994) with the capacity to produce second-order effects beyond controlling opportunism (Wathne and Heide, 2000). The following section explores these effects.

Effects of governance on learning and performance

Investment in relationship-specific assets is generally the result of the firm's assumption that they will be productive what generally happens after a process of interfirm interaction and mutual communication targeted, first, to convince the

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investor about proceeding with the investment and, latter, to direct the process of investment in a proper form. Therefore, expansion of contact intensity and information sharing will occur, increasing the firms' absorptive capacity with the result of a higher ability to learn from the relationship (Cohen and Levinthal, 1990; Walter and Ritter, 2003). In line with this, Pimentel *et al.* (2006) found a positive direct relationship between the investments in specific assets and the amount of joint efforts in the relationship, which allow the firm to learn important insider information, becoming "knowledgeable about the firm's products and applications to buyer's needs" (p. 218). This suggests that the effects in terms of learning can be significant, and these remain even if the relationship ends.

As regards inter-firm social enforcement, it will promote learning from supply chain relationships because it needs time to develop, thus increasing familiarity between the supply chain members. Moreover, it also influences the assumption of common norms and values and, lastly, it helps to develop a common dominant logic among the firms (Dyer and Singh, 1998). According to Lane *et al.* (2001), all these are important pre-conditions to promote learning in business-to-business relationships.

Finally, the learning effects of monitoring may be derived from the exchange of market and procedural knowledge from the controller to the controlled firm (Hernández-Espallardo and Arcas-Lario, 2003). Specifically, output control:

- shifts the risk to the controlled firm, favoring in consequence a loner attitude on its part (Aulakh *et al.*, 1996);
- does not require the controller's knowledge of the transformation process, but only output measurability and the controller's power to reward and/or sanction (Ouchi and Maguire, 1975);
- has been associated with the controlled firm's search for immediate payoffs at the expense of long term issues like learning; and
- tends to be linked to dysfunctional behaviors which erode the relationship climate, the exchange of information and the cooperation between the parties (Ramaswami, 1996).

In line with these arguments, Koza and Lewin (1998) proposed that output control is better suited to exploit knowledge than to exploring new knowledge by learning. Hernández-Espallardo and Arcas-Lario (2003) provides another demonstration of this, obtaining a non-significant effect of the use of output control on the controlled firm's market orientation.

Most of the arguments presented above that justify a negative influence of the use of output control on learning can be reversed in the case of the use of behavior control. Essentially, behavior control requires the controller's disposition of procedural knowledge (Ouchi and Maguire, 1975) and its active involvement and assumption of risks (Aulakh *et al.*, 1996), therefore supporting a more cooperative stance toward the relationship and increasing the parties' openness, exchange of information and learning (Aulakh *et al.*, 1996). This makes behavior control more useful in exploration alliances, since it emphasizes knowledge creation and teaching-learning processes (Koza and Lewin, 1998). These positive effects are confirmed by Hernández-Espallardo and Arcas-Lario (2003) which find that the use of behavior control significantly increases the controlled firm's degree of market orientation. Thus:

H4. Suppliers' learning from their supply chain's customers: (a) increases when suppliers' investments in relationship specific assets increase; (b) increases when inter-firm social enforcement increases; (c) decreases when monitoring of the suppliers through output control increases; (d) increases when monitoring of the suppliers through behavior control increases.

Finally, governance has also potential to directly influence performance, above and beyond their indirect effects through learning. First, productivity and competitive gains in the value chain are possible when firms make transaction-specific investments since they are the vehicle through which firms in a supply chain's relationship are able to generate relational quasi rents (Dyer and Singh, 1998).

Other studies stress the important role of trust in successful business-to-business relationships because it reduces the costs of conflict and other transaction costs and it is more efficient than other governance mechanisms in allowing the relationship to find and develop their potential synergies (Aulakh *et al.*, 1996; Dyer and Singh, 1998).

About the direct effects of output and behavior control on performance, a positive relationship can be consequence of the uncertainty reduction associated to legal contracts and the explicit set up of rules and commands in the relationship (Cai *et al.*, 2009). On its side Hernández-Espallardo and Arcas-Lario (2003) discuss the motivational effects of supervision on the controlled firm's performance essentially because monitoring set up explicit rules that reduce the target's perceived ambiguity, motivating the target to achieve the results (extrinsic motivation) or to follow the procedures (intrinsic motivation). However, some studies support an alienation theory consisting on the fact that monitoring the target's outputs and behaviors can be viewed as an expression of a lack of trust in the target and a restriction of its autonomy and self-control, motivating the target's adoption of dysfunctional behaviors which erode the relationship climate and cooperation between the parties (Ramaswami, 1996). Therefore, these contradictory effects make us to propose a non-significant direct effect of monitoring on performance.

As a result of the preceding discussion about the direct effect of governance on the firm's supply chain performance we propose:

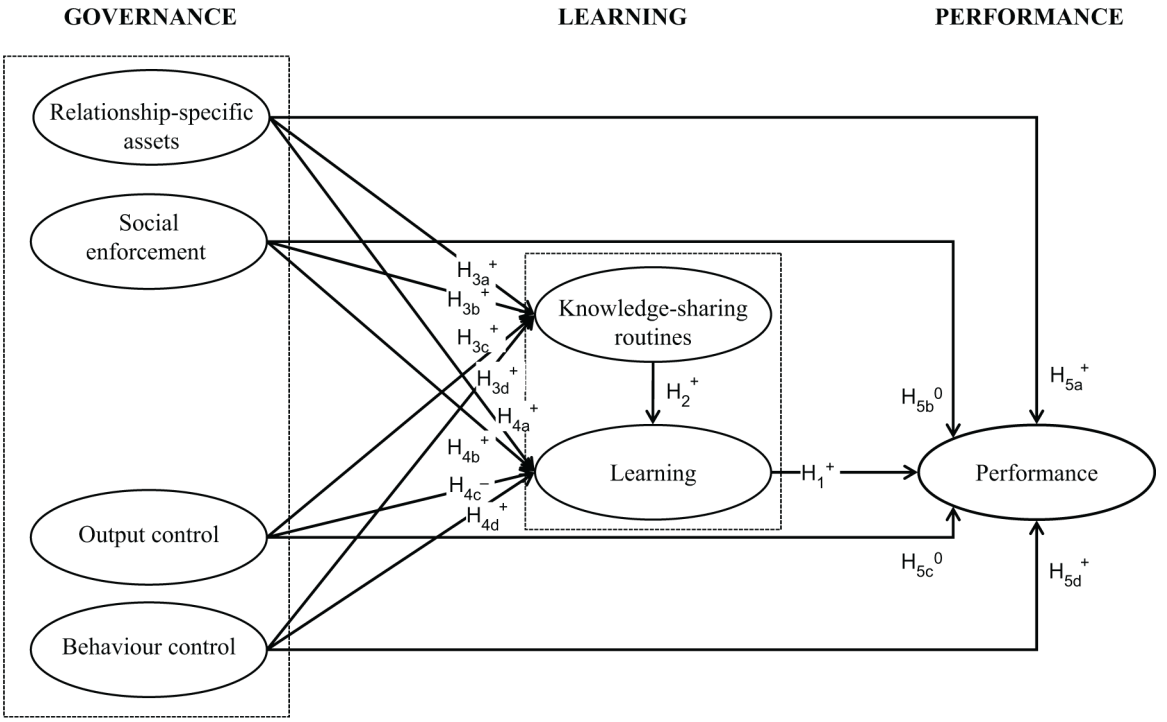
H5. The suppliers' supply chain performance: (a) increases when suppliers' investments in relationship specific assets increase; (b) increases when inter-firm social enforcement increases; (c) is not significantly influenced by monitoring of the supplier through output control; (d) is not significantly influenced by monitoring of the supplier through behavior control.

Figure 1 graphically depicts the set of relationships indicated in *H1* through *H5*.

Method

Data for the study were obtained from a sample of Colombian manufacturers of apparel. The apparel industry is one of Colombia's most important in terms of value added, employment, internationalization and competitiveness. In total, 865 manufacturers of final products produce around 4 per cent of the total Colombian industrial production. They account for 12.4 per cent of the employees and export 5 per

Figure 1 Governance, learning, and performance in supply chain relationships



cent of the total figures of the manufacturing sector, with exports exceeding imports in a ratio of 10 to 1 (DANE, 2008). The sector is then internationally open with clients ranging among the top world's retailers. Manufacturers are, therefore, exposed to most of the actual global trends in the sector, i.e. short product lifecycle, high volatility, large variance in demand, a high number of stock-keeping units, and the global retailers' propensity to "lean retailing" (Jin, 2006; Richardson, 1996). Under these forces, the saying that competition involves the entire supply chain is truest than ever, and the Colombian apparel industry is in a continuous process of modernization with most of firms adjusting their structures to be more customer-oriented (Teng and Jaramillo, 2006).

Manufacturers of apparel were identified using the directory of Inexmoda (Institute for exports and fashion) and the directories of the Chambers of Commerce. 392 firms were identified in the five main productive areas (Cali, Medellín, Bogotá, Barranquilla, and Ibagué) and later asked to participate in the study and to provide the name of the person in the firm with most knowledge about the relationship with its larger customer-distributor. A total of 219 valid questionnaires were obtained through personal interviews with the firm's general manager or owner (48.9 per cent), the marketing or sales manager (32.4 per cent), the general manager's assistant (7.8 per cent) and the marketing or sales manager's assistant (10.9 per cent).

The firms in the sample are in average 19 years old, have 150 employees, $2.5 million turnover and they export around 40 per cent of their production. Agreeing with Teng and Jaramillo's (2006) description of the Colombian apparel's manufacturers, firms in our sample can be described as small-to-medium sized firms, generally contrasting with the bigger size of their main customers/distributors. The average duration of the relationship maintained with their main customer is 12 years, representing around 44 per cent of their production. These data confirms the importance of the relationships analyzed in the study as they constitute strong links in the supply chain of apparel in Colombia. A total of 55 per cent of the firms sell their own brand to their main customer, 18 per cent "whole package" and 14 per cent final assembling. The rest offer their customers a combination of the preceding typologies.

Measures of the constructs were developed based on the existing literature and adapted to our empirical setting on the basis of the results obtained, first, from six in-depth interviews made to executives of six of the main Colombian firms. In depth interviews were also used to collect opinions from managers and researchers of the Chamber Fabrics-Textiles-Apparel of the ANDI (National Association of Manufacturers), of Cidetexco (Center for Research and Technology of the Colombian Textile-Apparel Industry) and Inexmoda. In a second phase, the questionnaire was pretested with 16 executives from different firms.

Table II presents the list of items used and their sources. Moreover, Tables III and IV provides an overview of the constructs' means, standard deviations, and correlations.

Analyses and results

Measures validation

Unidimensionality was assessed by means of a confirmatory factor analysis (Anderson and Gerbing, 1988) with results that suggest a good fit (see Table II). Reliability of the measures is guaranteed because for all the measures the composite reliability index is higher than 0.6 and the average variance extracted index is higher than 0.5. Additionally, all items load on their hypothesized factors, and the estimates are

Table II Constructs measurement summary: confirmatory factor analysis and scale reliability

Item description (reliability; SCR[1], AVE[2])	Standardized loading *
Relationship specific assets (anchors: 1 = strongly disagree to 7 = strongly agree; Joshi and Stump, 1999). SCR = 0.85, AVE = 0.65	
1. Your firm has made significant investments in resources dedicated to this client	0.74
2. Your operating processes have been tailored to meet the requirements of dealing with this client	0.84
3. This client has some unusual technological norms and standards that have required extensive adaptation on your part	0.84
Interfirm social enforcement (anchors: 1 = strongly disagree to 7 = strongly agree; Gilliland and Bello, 2002). SCR = 0.90, AVE = 0.76	
1. Both firms keep their promises to each other because they value their partnership	0.89
2. The strength of the relationship will keep the parties honest in dealing with each other	0.90
3. Both sides are willing to make cooperative changes when differences arise	0.82
Output control (anchors: 1 = strongly disagree to 7 = strongly agree; based on Challagalla and Shervani, 1996). SCR = 0.88, AVE = 0.64	
1. Your client tells you about the level of achievement expected for certain outcomes on your part	0.87
2. Your client monitors your progress in achieving these targets	0.88
3. Your client ensures that you are aware of the extent to which your firm attains the targets	0.84
4. Your firm would be sanctioned if the targets were not achieved	0.58
Behaviour control (anchors: 1 = strongly disagree to 7 = strongly agree; based on Challagalla and Shervani, 1996). SCR = 0.88, AVE = 0.65	
1. Your client tells you about how your firm has to perform certain activities	0.83
2. Your client monitors how your firm performs these activities	0.89
3. Your client ensures that you are aware of the extent to which your firm complies with the specifications	0.85
4. Your firm would be sanctioned if the specifications were not followed	0.62
Knowledge-sharing routines. Your client invests time, resources and energy in ... (anchors: 1 = no amount at all to 7 = a great amount; based on Dyer and Nobeoka, 2000; Inkpen and Dinur, 1998; Richardson, 1996). SCR = 0.89, AVE = 0.63	
1 ...the exchange of know-how and innovations in processes and products	0.78
2 ...improving the management and performance of some of your firm's departments and functions	0.81
3 ...sharing knowledge with your firm to improve the quality and productivity of your plant	0.77
4 ...exchange of information for production and distribution decision making	0.86
5 ...sharing relevant market information with your firm	0.74
Learning from the interfirm relationship (anchors: 1 = strongly disagree to 7 = strongly agree; based on Kale *et al.*, 2000). SCR = 0.87, AVE = 0.69	
1. Your personnel is acquiring important information from this client	0.76
2. Your personnel is learning new abilities from your client	0.90
3. The relationship with this client enhances the capacities of your management team to compete in the market	0.83
Performance. As a consequence of the relationship with your client, your firm ... (anchors: 1 = strongly disagree to 7 = strongly agree; Spekman *et al.*, 2002). SCR = 0.94, AVE = 0.76	
1 ...is more competitive in total costs of supplying customers	0.86
2 ...is more able to perform a speedy response in manufacture and distribution	0.91
3 ...has organized the activities of production, inventory and shipping more efficiently	0.77
4 ...is developing capacities that can be used to make other relationships more productive	0.89
5 ...has gained benefits that enable it to compete more effectively in the marketplace	0.92

Notes: Fit statistics for measurement model of 27 indicators for seven constructs: $\chi^2_{(303)} = 700.15$ ($p < 0.00$); GFI = 0.81; RMSEA = 0.077; SRMR = 0.057; CFI = 0.97; TLI (NNFI) = 0.96; *All loadings are significant at $p < 0.001$. The lowest *t*-student value is 9.10; [1]Scale composite reliability ($\rho_c = (\Sigma\lambda_i)^2$ var (ξ)/$[(\Sigma\lambda_i)^2$ var(ξ)+$\Sigma\theta_{ii}]$; Bagozzi and Yi (1988); [2]Average variance extracted ($\rho_c = (\Sigma\lambda_i^2$ var (ξ)/$[\Sigma\lambda_i^2$var (ξ)+$\Sigma\theta_{ii}]$; Fornell and Larcker (1981)

Table III Constructs and items correlation matrix

Construct	Mean	SD	Correlation matrix 1	2	3	4	5	6
1. Relationship specific assets (RSA)	4.27	1.77						
2. Interfirm social enforcement (ISE)	5.37	1.62	0.30					
3. Output control (OC)	3.70	1.79	0.57	0.35				
4. Behaviour control (BC)	3.52	1.77	0.57	0.28	0.76			
5. Knowledge-sharing routines (KSR)	2.84	1.60	0.46	0.35	0.51	0.52		
6. Learning (LEA)	4.05	1.77	0.54	0.44	0.49	0.63	0.67	
7. Performance (PER)	4.99	1.56	0.53	0.66	0.51	0.47	0.48	0.66

positive and significant (the lowest *t*-student is 9.10), which provides evidence of convergent validity. Finally, discriminant validity was confirmed since for each scale the average variance extracted by the underlying construct is larger than the shared variance (i.e. the squared intercorrelation) with any other latent construct.

Hypotheses testing

The model depicted in Figure 1 was tested using structural equation modeling (Table V).

Learning from the interfirm customers significantly impacts the manufacturer's performance (0.34; $p < 0.01$) confirming *H1*. The results also confirm *H2* about the positive effect of the customers' investments in knowledge-sharing routines on the manufacturers' learning (0.41; $p < 0.01$).

The effects of governance on the customer's investment in knowledge-sharing routines are mostly positive. The manufacturer's investment in relationship specific assets (0.18; $p < 0.05$), social enforcement (0.16; $p < 0.05$), and behavior control (0.24; $p < 0.05$) all seem to exert a safeguarding role on the customer investment in knowledge-sharing routines confirming, respectively, *H3a*, *H3b*, and *H3d*. As regards the use of output control the coefficient obtained is non-significant, thus not confirming *H3c*.

Governance has also been found to exert a direct influence on learning. It is positive and significant in the case of the manufacturer's investment in relationship specific assets (0.18; $p < 0.05$), social enforcement (0.18; $p < 0.01$), and behavior control (0.42; $p < 0.01$). In the case of output control, it has been found to deteriorate the manufacturer's attribution of learning to the customer (-0.21; $p < 0.05$). All these results fully confirm *H4*.

Finally, the direct effect of the manufacturer's investment in relationship specific assets on the manufacturer's performance is positive and significant (0.22; $p < 0.01$). The same result is found in the social enforcement → manufacturer's performance relationship (0.45; $p < 0.01$). About the direct effects of monitoring on performance, as expected, they are not significant both for output control (0.15; $p > 0.10$) and behavior control (-0.09; $p > 0.10$). These results are in accordance with *H5* predictions.

Discussion and conclusions

If members of a supply chain are to succeed jointly they must acknowledge that learning environment improves the overall effectiveness of the supply chain as well as the abilities of the individual members (Spekman *et al.*, 2002):

> However, … acquiring and using information from alliance partners offers benefits to a firm, but the downside risks of inter-firm learning must also be accounted for … possibly, the greatest risk comes in the *teaching firm's* potential loss of tacit knowledge to a partner, in which a firm's source of competitive advantage is diluted when its partner (*the student firm*) acquires or internalizes its knowledge and skills … hence, learning in inter-firm relationships poses a paradox for managers and scholars (Mohr and Sengupta, 2002; p. 283; italics added).

In the area of research in supply chains, considering Cox's descriptions of the firm's options to manage their sourcing relationships (e.g. Cox, 2004a), this research presents how supplier development through knowledge-sharing can be governed to improve supplying performance. We find that the learning paradox is attenuated when interfirm trust, the amount of investments in relationship specific assets, and the use of behavioral control are, from more to less, used to create a relational environment that favors knowledge-sharing, learning and, finally, supply chain's performance. From a theoretical point of view this research is the first to relate a complete list of governance mechanisms with learning and performance in supply chains, therefore mixing the marketing, organizational, and supply chain management bodies of knowledge. Governance is treated, for the first time in its dual role, i.e. according to TCE, as a set of safeguarding tools of knowledge-sharing in supply chains (Wathne and Heide, 2000) and also, considering the RBV perspective as set of coordination tools (Heide, 1994), with their direct impact on learning and supply chain performance.

Specifically this research contributes to the existing literature by considering the governance strategies proposed by Wathne and Heide (2000): incentives (in the form of investment in relationship specific assets), socialization (social enforcement or trust) and monitoring. To date socialization has been the subject of most of the empirical research in the area (e.g. Cheng *et al.*, 2008; Joshi and Stump, 1999; Kwon and Suh, 2005) and studies where trust is considered simultaneously with the rest of mechanisms are missing. The results obtained in this study confirm the important role played by trust in interfirm relationships. It does not only facilitate knowledge sharing in supply chains relationships, but it also exerts a direct influence on learning and supply chain's performance. The investments in relationship specific assets play a similar role, although, compared to the effect of trust, the size of the impact is lower. Finally, monitoring is the less influential governance tool; only behavior control significantly favors knowledge sharing and learning, whereas output control has a non-significant effect on knowledge-sharing and performance, and a negative effect on learning. This result serves to improve our knowledge about the use of monitoring as a safeguarding tool (Wathne and Heide, 2000), at least in the specific context of the use of knowledge-sharing routines.

Table IV Constructs and items correlation matrix

Item	Correlation matrix*																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1. RSA1	1.98																										
2. RSA2	0.64	1.99																									
3. RSA3	0.61	0.70	2.11																								
4. ISE1	0.25	0.16	0.18	1.74																							
5. ISE2	0.24	0.23	0.19	0.81	1.68																						
6. ISE3	0.28	0.22	0.25	0.73	0.71	1.91																					
7. OC1	0.37	0.41	0.43	0.27	0.24	0.31	2.09																				
8. OC2	0.33	0.44	0.45	0.28	0.27	0.32	0.79	2.07																			
9. OC3	0.31	0.38	0.39	0.24	0.28	0.32	0.71	0.74	2.14																		
10. OC4	0.28	0.35	0.33	0.04	0.14	0.09	0.46	0.47	0.55	2.17																	
11. BC1	0.33	0.37	0.42	0.16	0.17	0.29	0.57	0.49	0.50	0.42	2.06																
12. BC2	0.34	0.47	0.41	0.14	0.18	0.24	0.60	0.56	0.54	0.45	0.77	1.98															
13. BC3	0.37	0.39	0.42	0.25	0.28	0.32	0.58	0.58	0.60	0.45	0.68	0.75	2.12														
14. BC4	0.27	0.27	0.33	0.12	0.18	0.16	0.37	0.44	0.44	0.67	0.49	0.54	0.58	2.17													
15. KSR1	0.28	0.26	0.34	0.21	0.18	0.27	0.34	0.26	0.30	0.11	0.35	0.31	0.33	0.14	1.87												
16. KSR2	0.19	0.22	0.29	0.12	0.11	0.26	0.38	0.32	0.34	0.18	0.31	0.35	0.30	0.16	0.69	1.81											
17. KSR3	0.33	0.32	0.31	0.20	0.19	0.32	0.40	0.43	0.37	0.20	0.41	0.47	0.39	0.21	0.56	0.69	1.90										
18. KSR4	0.31	0.39	0.40	0.24	0.25	0.40	0.39	0.40	0.41	0.18	0.46	0.41	0.43	0.21	0.64	0.67	0.67	1.98									
19. KSR5	0.26	0.24	0.22	0.37	0.34	0.46	0.35	0.31	0.38	0.10	0.27	0.25	0.38	0.10	0.60	0.56	0.49	0.70	2.00								
20. LEA1	0.30	0.30	0.34	0.28	0.23	0.32	0.36	0.38	0.35	0.18	0.44	0.43	0.48	0.20	0.44	0.37	0.45	0.42	0.38	1.94							
21. LEA2	0.40	0.37	0.47	0.28	0.28	0.35	0.40	0.39	0.32	0.20	0.54	0.52	0.52	0.28	0.46	0.44	0.53	0.53	0.37	0.70	2.03						
22. LEA3	0.35	0.31	0.42	0.41	0.42	0.45	0.37	0.32	0.33	0.18	0.37	0.34	0.43	0.29	0.48	0.42	0.39	0.50	0.50	0.61	0.75	1.98					
23. PER1	0.42	0.42	0.48	0.41	0.50	0.52	0.30	0.37	0.41	0.28	0.39	0.37	0.39	0.36	0.34	0.26	0.34	0.37	0.32	0.41	0.49	0.56	1.77				
24. PER2	0.36	0.36	0.39	0.45	0.55	0.55	0.38	0.39	0.39	0.23	0.38	0.34	0.40	0.31	0.33	0.27	0.32	0.38	0.36	0.41	0.49	0.56	0.83	1.74			
25. PER3	0.30	0.26	0.32	0.46	0.53	0.54	0.37	0.42	0.42	0.25	0.28	0.28	0.34	0.26	0.31	0.26	0.27	0.36	0.40	0.42	0.41	0.55	0.63	0.71	1.72		
26. PER4	0.37	0.42	0.41	0.46	0.55	0.53	0.35	0.43	0.44	0.27	0.35	0.35	0.44	0.30	0.30	0.27	0.36	0.38	0.40	0.41	0.53	0.60	0.73	0.80	0.68	1.72	
27. PER5	0.33	0.36	0.42	0.50	0.58	0.59	0.33	0.41	0.43	0.28	0.32	0.27	0.39	0.30	0.32	0.32	0.37	0.41	0.43	0.40	0.48	0.59	0.78	0.82	0.72	0.84	1.76

Note: *Items' standard deviation are listed in the diagonal

Table V Structural model

Linkages in the model	Hypotheses Number	Sign	Standardized parameter estimates Estimate	*t*-value
Effects of learning on performance				
Learning → performance	*H1*	+	0.36	4.51[a]
Effects of knowledge-sharing routines on learning				
Knowledge-sharing routines → learning	*H2*	+	0.40	5.33[a]
***Effects of governance on knowledge-sharing routines* (KSR)**				
Relationship specific assets → KSR	*H3a*	+	0.18	2.07[c]
Social enforcement → KSR	*H3b*	+	0.16	2.36[c]
Output control → KSR	*H3c*	+	0.17	1.42
Behaviour control → KSR	*H3d*	+	0.24	2.14[c]
Effects of governance on learning				
Relationship specific assets → learning	*H4a*	+	0.18	2.39[c]
Social enforcement → learning	*H4b*	+	0.20	3.35[a]
Output control → learning	*H4c*	–	−0.22	−2.17[c]
Behaviour control → learning	*H4d*	+	0.42	4.09[a]
Effects of governance on performance				
Relationship specific assets → performance social	*H5a*	+	0.18	2.51[c]
Enforcement → performance output	*H5b*	+	0.43	6.90[a]
Control → performance	*H5c*	0	0.15	1.62
Behaviour control → performance	*H5d*	0	−0.09	−0.90

Notes: Model diagnostic: $\chi^2_{(304)} = 700.38$ ($p < 0.00$); GFI = 0.81; SRMR = 0.057; RMSEA = 0.077; CFI = 0.97; TLI (NNFI) = 0.96; [a]$p < 0.001$; [b]$p < 0.01$; [c]$p < 0.05$

Future research should analyze whether these results stand in other situations where opportunism may arise.

Taken together, these results constitute one of the few empirical confirmations of the theoretical suggestions presented in the literature about the use of self-enforcement mechanisms of governance (socialization and hostages in the form of investments in specific assets) being more productive and preferred than the use of unilateral mechanisms like monitoring (Dyer and Singh, 1998).

From a managerial point-of-view our results can be used to justify the need to use adequate governance mechanisms to foster knowledge-sharing, learning and performance in supply chains. Data show how customers can improve supply chain performance by transferring knowledge from the market upstream and governing adequately their relationships with their suppliers.

Even though their viability lies in factors like the power circumstances in the relationship and the parties' competence endowment (Cox, 2004a), research in the topic has confirmed that in the current business environment, firms in supply chains have generally realized that competitive negotiation stances against their business relationships are limited in terms of the amount of benefits that can be obtained and their duration compared to collaborative stances directed to create more value in the relationship (Jap, 1999). In this empirical study in the setting of manufacturer-customers of apparel it has been demonstrated that the customers may contribute to increase their suppliers' supply chain effectiveness and competitiveness. This can be done by investing in knowledge-sharing routines by using behavior instead of output control, and by promoting self-enforcement mechanisms of governance such as those considered in this research. This pie-expansion effect is a necessary condition to improve competitiveness in supply chains. But managers have also to pay attention to pie-sharing (Cox, 2004b) in order to maintain conflict in manageable levels if continuation in the collaborative process is intended in the long-run (Jain *et al.*, 2006). As a consequence, supply chain management should include transferring knowledge and governance as critical to improve competitiveness. As a corollary, firms should look for relationships in supply chains with two basic conditions: learning orientation and customer (or relational) orientation.

As regards the use of output control, while from the controller firm's point-of-view it may have its interest as a control tool (Hernández-Espallardo and Arcas-Lario, 2003), our results show that it does not behave as a safeguarding tool and it decreases the controlled firm's attribution of learning to the controller. Firms must consider this when deciding whether to use output control or not.

However, although out of the reach of this research, managers have to realize two characteristics of governance that influence the possibilities for using each mechanism according to the relationship's stage and both parties' situation. First, the feasibility of each type of governance evolves with the relationship cycle-time. Whereas monitoring is easier to implement and proper of asymmetrical relationships (Hernández-Espallardo and Arcas-Lario, 2003), investment in specific assets and the development of

social norms in the relationship will require more time and mutual commitment (Dyer and Singh, 1998). Second, the governance mechanisms considered in this research are not independent. Within a given relationship, these mechanisms can be combined in different ways (Heide, 1994). For instance, investments in specific assets are eased when social enforcement is used (Joshi and Stump, 1999), or the use of social enforcement may substitute the need of using monitoring, at least for a safeguarding purpose (Dyer and Singh, 1998). Other studies suggest that contracts and, especially, specific assets improve trust (e.g. Kwon and Suh, 2005; Handfield and Bechtel, 2002; Suh and Kwon, 2006) because both reduce the uncertainty about the parties intentions and the expectation of continuity.

In the context of the Colombian apparel industry, the results of this study support the contention that manufacturers should focus on strengthening the supply chain(s) in which they operate (Green *et al.*, 2008). Adoption of a supply chain management strategy requires a supply chain focus and efforts by managers to strengthen linkages with both customers and suppliers. In this sense, translating the knowledge acquired from the clients backward throughout the supply chain to the textile manufacturers and the fibre producers can be of great value to increase the whole Colombian textile and apparel industry. For instance, research has found that transfer of market knowledge beyond the manufacturer-distributor's dyad is common since market-oriented firms "not only seek to satisfy customer needs but, by definition, acquire and respond to information from customers … This information is likely to be relayed to suppliers to gain their support in responding to current and future needs of customers" (Baker *et al.*, 1999, p. 51).

Moreover, the fact that in Colombia manufacturing activities in the sector spans the entire supply chain from cotton growing, man-made fibre production, textile processing and the manufacturer of finished apparel makes this upward transfer of knowledge easier than if inputs had to be imported from distant locations (Textiles Intelligence, 2006). The level of verticalization of the Colombian textile and apparel industry is therefore important (*Textiles Outlook International*, 2008), and remains strong as trade agreements as the ATPDEA (Andean Trade Promotion and Drug Eradication Act) between Colombia and US favors shipments of apparel products to US free of duty if they are made with Colombian raw materials. Since apparel manufacturers have the relationship with the customers/distributors of this supply chain the results obtained in this research are important to understand some of the processes that happens in introduction of new knowledge from the final market into the whole supply chain. The intensification of a culture of orientation to the customers has been and continues to be a key recommendation to be able to compete against other countries in this very globalize and competitive sector (Teng and Jaramillo, 2006).

This research has as any other its own limitations and avenues for further research. To get a precise empirical evaluation of how interorganizational knowledge transfer and learning is facilitated by governance and their effects on supply chain's performance in this research the empirical setting was placed in the dyad formed by a manufacturer of finished products and its distributor in the supply chain of apparel. As has been justified earlier, the type and importance of this type of relationship and the current configurations of apparel supply chains, with retailer/distributors leading the chain, are indications of the relevance of the results from a supply chain perspective. However, confirmation of these results from a more holistic perspective remains open as an interesting research perspective to confirm or refine some of the results obtained here. Moreover this research must be seen as a partial representation of the total process of learning in inter-firm relationships. With the analysis of the investment in knowledge-sharing routines and of the role of governance we have explored the issue of transparency. A more comprehensive model should also consider the issue of learning intent (Hamel, 1991). Moreover, future research should be more exhaustive about the process of transferring knowledge in supply chain relationships; for instance: does inter-firm governance influence equally the transfer of tacit and explicit knowledge (Dawson, 2000)? What is the role of inter-organizational teams in knowledge creation and transfer (Wagner, 2003)? What is the specific type of knowledge already possessed by each firm and the redundancy in supply chains considering supplier-related factors, customer-related factors, and interface-related factors (Sivakumar and Roy, 2004)? Or what is the role of governance on the different types of organizational learning processes and the various strategies to improve learning (Preiss and Murray, 2005)? Finally, from a methodological point-of-view, data has been collected from a single source, what can present a certain bias (Kumar *et al.*, 1993). The purpose of accessing to a wide sample of manufacturers made triangulation of data from other sources for each of the interviewed firms a financially unaffordable task. To compensate this we were very thorough about the interviewee selection, searching for the person in the firm with most knowledge of the relationship with the main customer. However some bias can be present and future research with different sources of data could contribute to validate the results obtained in this study.

Notes

1 Opportunism is defined as "self-interest seeking with guile" or human behavior described as "calculated efforts to mislead, distort, disguise, obfuscate or otherwise confuse" (Williamson, 1985, p. 47). A simpler definition includes all the acts that suppose seeking self-interest at the expense of others (Love, 2005). Assumption of opportunism as a behavioral characteristic of individuals is important for TCE since in a world of opportunism, individuals cannot be assumed to keep their promises to fulfill their obligations and to respect the interests of their trading partners unless "safeguards" are in place (Klein, 2006). Whereas Williamson (1975) compares opportunism to stewardship behavior, i.e. the idea that people always keep their promises, Williamson (1985) introduces the concept of "self-interest" by distinguishing between opportunism as a "strong form" and the "semi-strong" form of the simple search of "self-interest" when "initial positions will be fully and candidly disclosed upon inquiry, state of the world declarations will be accurate, and execution is oath- or rule-bound" (p. 49). The critical postures about the assumption that every individual is always predisposed to behave opportunistically are not rare in the literature (e.g. Ghoshal and Moran, 1996; Love, 2005; Moschandreas, 1997). However, we do not

need to adhere to such extreme postulate (i.e. everyone is always opportunistic), not to the opposite, to affirm that, although governance structures can be used for other purposes, safeguards will always be required because in their absence contractual hazards will be present (Williamson, 1996).

2 From a theoretical point-of-view, other incentives can be used to manage opportunism in interfirm relationships. For instance, Dutta *et al.* (1994) show that manufacturers can pay their resellers margin premiums as an incentive to comply with assigned territorial restrictions. This type of incentive was considered in the phase of design of the research. However, interviews with experts in the Colombian apparel industry (see the method section) confirmed our initial expectation about that the customers' use of price compensations for not behaving opportunistically was missing in practice. Moreover, some respondents indicated that somehow, when monitoring was employed rewards and/or sanctions could be considered as incentives to show behaviors according to the customers' demands, including (although not exclusively) non opportunistic behaviors. This aspect is theoretically discussed next, when monitoring is analyzed.

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