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## Exploitation- and exploration-based innovations: The role of knowledge in inter-firm relationships with distributors

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### ABSTRACT

Learning capacity is a critical factor for a firm's innovation and competitiveness. This study explores the issue of how knowledge in inter-firm relationships with distributors influences manufacturers' exploitation- and exploration-based innovations and performance. The empirical model examines the effect of three different types of knowledge-related issues in inter-firm relationships: (i) the acquisition of substantial knowledge (about products, technology, or markets) from distributors; (ii) the learning about collaborating with each distributor as the relationship evolves; and (iii) the general firm's knowledge about managing distributors. A model of learning—innovation—performance is developed and tested in a sample of 201 firms in the food and beverages sector. The results reveal that: (i) knowledge about managing distributors promotes continuous learning from them; (ii) learning to collaborate is critical, as it favours knowledge acquisition and both types of innovations (exploitation- and exploration-based); (iii) learning from distributors weakens firms' tendency to stress one type of innovation strategy over another; and (iv) knowledge in inter-firm relationships with distributors affects performance in a completely mediated way, that is, through innovation. Theoretical and managerial implications of these findings are discussed in the conclusion of the paper.

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### 1. Introduction

This study's purpose is to examine how the manufacturers' knowledge in inter-firm relationships with distributors influences their exploratory and exploitative innovations and performance. Its interest lies on the fact that the last decades of research have demonstrated that innovation is an important source of competitive advantage (Adner and Kapoor, 2010; Song and Thieme, 2009). Among the different factors that may contribute to innovation success (see for instance, Song and Parry, 1997) knowledge- and learning-related issues have entered in the literature in more recent times, as knowledge is recognised as a vital resource—not only for the development of specific innovations in products and processes but also for the effective implementation of other resources in the overall innovation process (Garcia et al., 2003). In particular, learning from external relationships is important, as it expands the firm's knowledge base (Amara et al., 2008; Bierly et al., 2009), so that the firm's ability to recognise the value of new information from external relationships and then apply it to commercial ends—which constitutes a firm's so-called 'absorptive capacity' (Cohen and Levinthal, 1990)—is increasingly associated with successful innovation (e.g., Lane et al., 2006; Spithoven et al.,

2010; Zahra and George, 2002). This highlights the importance of external knowledge sourcing with regard to the development of the innovative capability of a firm (Li and Tang, 2010).

Whereas research on this topic has notably increased lately, there are issues that still require clarification. First, empirical studies have tended to focus on knowledge transfer and its internalisation by the firm (e.g., Kale et al., 2000) with relatively little consideration of the multiple types of knowledge-related issues involved in inter-firm relationships. This study addresses this gap in the literature by taking into account three types of knowledge: (i) acquisition of substantial knowledge related to product, technology, or markets; (ii) the learning about how to collaborate with specific relationships; and (iii) the firm's accumulated knowledge about the management of inter-firm relationships.

Secondly, although the literature highlights the importance of external learning in promoting innovation (Dyer and Singh, 1998), empirical investigation of the extent to which inter-firm learning influences exploration- and exploitation-based innovations is scarce and very recent (Gobbo and Olsson, 2010; Holmqvist, 2009; Bierly et al., 2009). Therefore, this study is one attempt to give an answer to Holmqvist's (2009) call "to extend the small but growing inter-organisational learning literature by empirically linking inter-organisational learning processes to the problem of exploitation and exploration" (p. 282).

Moreover, although knowledge is of the utmost importance for any firm that wishes to sustain a competitive advantage through

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product, process, and/or organisational innovation (Wernerfelt, 1984; Grant, 1996; Garcia et al., 2003), empirical work concerning the impact of inter-firm knowledge-related issues on a firm's competitiveness is scarce. For instance, Yeoh (2009) has recently stated that testing the effects of inter-organisational learning on firms' performance still remains intellectually challenging.

Finally, research on inter-firm learning is frequently concentrated in the area of strategic alliances (e.g., Kale et al., 2000), especially with regard to R&D collaborations in high-tech industries (e.g., Lane and Lubatkin, 1998), whereas traditional industries have captured a marginal degree of attention (see Spithoven et al., 2010 for one exception). The study of this phenomenon in supply-chain, vertical relationships in mature industries like the food and beverages industry is scarce, even though inter-organisational learning is an important contributor to supply chain relationships' performance (Hernandez-Espallardo et al., 2010) and the food and beverages industry is of high economic and social relevance (Pfitzer and Krishnaswamy, 2007).

Innovation activity is very important in this industry, with a strong emphasis on product innovations addressing new and differentiated demands as well as health, safety and quality concerns, with market dynamics dominating the reasons for innovations (Hauknes, 2001). Moreover, process innovations are commonplace as the result of supply chain integration initiatives directed to reduce costs and improve efficiency. The food and beverages supply chain is in the front line with respect to supply chain practices like EDI (Electronic Data Interchange), VMI (Vendor Managed Inventory), QR (Quick Replenishment), CM (Category Management), or CPFR (Collaborative Planning, Forecasting and Replenishment) (Van Donk et al., 2008). Particularly interesting is the adoption of ECR initiatives that not only encompass logistical process-oriented improvements but also collaborative frameworks between distributors and manufacturers to optimise new product developments (Corsten and Kumar, 2005; ECR Europe, 2005). Therefore, this industry is a clear example of a demand-oriented industry and, as a result, knowledge inputs regarding markets and trends are central elements in its innovations (Stewart and Martinez, 2002). As a result, the channel of distribution acquires a great relevance as an

external source of innovation for food and beverages manufacturers (Hauknes, 2001).

This sector has evolved in recent decades in the direction of a greater degree of influence of distributors (Cosgrove, 2003). In this study, we use the term 'distributors' with a wide perspective to refer to those independent firms that participate in the manufacturer's channel of distribution, which may include manufacturers' local agents, wholesalers and retailers. With respect to innovation in the industry, the distributors participate actively not only in initiatives to get operational efficiencies through the expansion of process innovations (e.g., CM) but also on the manufacturers' product innovation programs with the purpose of getting products better fitted to the distributors' strategy and final market demands (Deromedi and Körber, 2003). This type of collaboration relationship-based innovation between distributors and suppliers has therefore been recognised as a major supply chain trend (Ganesan et al., 2009) and is accompanied by a call to perform research on the role and influence of supermarkets on the R&D agenda of manufacturers (Estrada-Flores, 2008). The present research represents one effort in this direction.

The remainder of this paper is arranged as follows. The next section presents the conceptual model for the study and explains the hypothesised relationships among the constructs in the proposed model. Later, we present the empirical test of the model and the results. The paper concludes with a discussion of the main results and their managerial implications.

## 2. Theory development and hypotheses

The focus of this article is therefore on: (i) the manufacturers' application of knowledge obtained from distributors regarding exploitation- and exploration-based innovations, (ii) the role played by the manufacturers' expertise in managing relationships with distributors and (iii) the effects on the manufacturers' performance. The proposed conceptual model for the present study is shown in Fig. 1. The constructs within the model and the hypothesised relationships between them are discussed below.

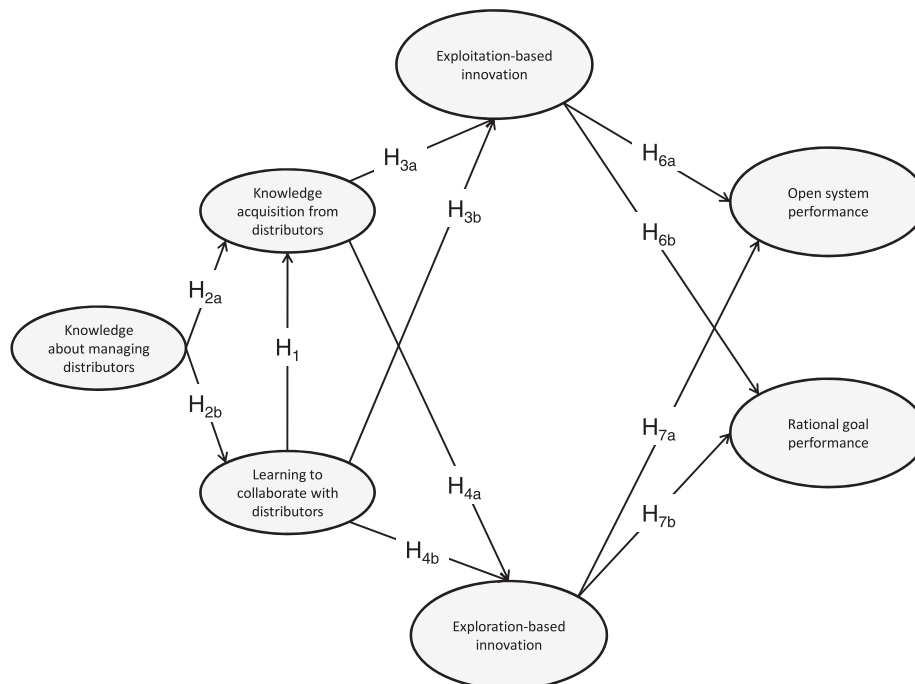


Fig. 1. A model of knowledge in inter-firm relationships with distributors, innovation, and performance.

### 2.1. Knowledge in inter-firm relationships with distributors

During the last two decades, a growing number of organisational learning studies have analysed inter-organisational learning processes under the assumption that inter-organisational relationships are unique learning entities (Holmqvist, 2009). A review of the literature suggests that three interrelated constructs should appear in any proposed model with regard to knowledge in inter-firm relationships with distributors: (i) knowledge acquisition from distributors; (ii) learning to collaborate with distributors; and (iii) knowledge about managing distributors (Kale et al., 2000; Hibbert and Huxham, 2005; Zollo et al., 2002).

*Knowledge acquisition from distributors* refers to the extent to which one organisation acquires knowledge from its distributors, disseminates it internally, and uses it for organisational change. This definition adopts the perspective of organisational learning as a process of knowledge internalisation, dissemination, and deployment (Huber, 1991). Research in alliances (Kale et al., 2000; Zollo et al., 2002) describes the outcome of this type of learning as the firm's internalisation and use of substantial knowledge obtained from its partners about product-, technological-, or market-related issues. In relationships with distributors, this knowledge is acquired as the result of a process of (i) adapting to environmental changes in every distributor's market, (ii) adjusting the visions about how to understand the environment and to take actions accordingly, and/or (iii) developing a knowledge base about the activities involved, its outcomes and their adequacy (Lukas et al., 1996). The value of this type of knowledge resides in the fact that it offers an alternative perspective to the current knowledge base of the manufacturer (Grant and Baden-Fuller, 2004), thus enhancing market knowledge (Sinkula, 1994) and value for customers through improved market sensing and intelligence sharing (Day, 1994; Hult et al., 2000). Because of the closeness of distributors to the market, they can offer manufacturers a more accurate description of the end consumer's current demands and dynamics as well as market intelligence on competitors and other agents that might influence manufacturers' success in the market (Hernández-Espallardo and Arcas-Lario, 2003).

Concerning *learning to collaborate with distributors*, as a manufacturer develops closer collaborative relationships with one distributor over time, it learns "about the partner's intended and emergent goals, how to redefine joint tasks over time, and how to manage the *inter-firm* interface" (Kale et al., 2000, p. 220). Therefore, learning to collaborate refers to the manufacturer's adaptation of the processes and structures of collaboration as the relationship progresses (Ring and Van De Ven, 1994), and the manufacturer gradually learns about the distributor's internal organisational structures and decision-making styles (Mayer and Argyles, 2004). This includes knowledge about its purposes and processes of collaboration, its language, culture, traditions, its distinctive strengths (or weaknesses), its resources and external and internal environment (Hibbert and Huxham, 2005). It also includes knowledge about the tasks involved in the collaborative relationship, their interactions, skills involved, and goals intended (Doz, 1996). In this regard, Gulati (1995) finds that firms in business relationships learn to collaborate more efficiently over time, and Zollo et al. (2002) demonstrate that this has a positive impact on the relationship's performance.

Learning to collaborate with one distributor may favour knowledge acquisition. As a manufacturer learns to collaborate with a distributor, partner-specific absorptive capacity increases, as the relationship develops an overlapping knowledge base and the manufacturer becomes informed about who knows what and where the critical expertise resides within the distributor (Lane and Lubatkin, 1998). Moreover, both the frequency and intensity

of interactions increase as interpersonal trust develops, which enhances transparency and knowledge-sharing in the business relationship (Zollo et al., 2002). This is important not only to get information and knowledge from the relationship in the first place but also to maintain the learning stream in the long run, as learning to collaborate will contribute to avoiding such negative issues as the "learning race" or the "co-operators that turn into competitors" (Hamel, 1991). Therefore, absorptive capacity and transparency, both preconditions to inter-firm knowledge acquisition (Hamel, 1991), increase when manufacturers learn to collaborate with distributors. This leads to the following hypothesis:

**H<sub>1</sub>.** Learning to collaborate with distributors positively influences manufacturers' acquisition of knowledge from distributors.

An increasing number of studies in the area of business alliances focus on the firm's ability to manage the process of formation and maintenance of business relationships, which receives the name of alliance capability (e.g., Kale et al., 2002; Draulans et al., 2003). In the specific context of the relationships that one manufacturer maintains with its distributors, we use the term *knowledge about managing distributors* to refer to the company's accumulated stock of knowledge and ability to manage business relationships with distributors. This capability is the result of the manufacturer's accumulation of experience in forming and developing long-term, close, and collaborative relationships with other firms in general and with distributors in particular (Anand and Khanna, 2000; Hibbert and Huxham, 2005). It is boosted "by pursuing a set of explicit processes to accumulate and leverage the *inter-firm* management know-how associated with the firm's prior and ongoing *relationship* experience" (Kale and Singh, 1999, p. 220). In consequence, one part of this knowledge consists of the transfer of collaborative experiences within and between relationships. More generally, the manufacturer's knowledge about managing distributors is determined by the amount and depth of the firm's relationship networks, the use of relationships' performance evaluation methods, training in collaborative relationships themes and the presence of specialists (e.g., key accounts, trade managers, category managers) (Draulans et al., 2003).

It is therefore an organisational capability that translates into improved performance in the multiple activities and processes involved in the relationship the manufacturer maintains with every specific distributor. In this research, we focus on the effects on knowledge acquisition from the distributor and learning to collaborate with that distributor. In alliance theory, Zollo et al. (2002) use Cohen and Levinthal's (1990) concept of absorptive capacity to propose that the more experience and accumulated knowledge a firm has about managing alliances, the more successful it will be in its alliances and the more satisfied it will be with the knowledge acquired. The ability to learn from a particular relationship is enhanced by past learning experiences with the same and other business relationships (Anand and Khanna, 2000), as continuous exposure to a variety of external contacts increases the firm's new knowledge integration skills and thereby the speed and depth of subsequent learning (Zahra and George, 2002). This suggests a positive impact of knowledge about managing distributors on the manufacturer's knowledge acquisition from distributors.

The same kind of influence is expected on the manufacturer's learning to collaborate with distributors. Individuals within a manufacturer who have been exposed to a broad repertoire of experiences with distributors will find it easier to respond to new unforeseen contingencies in the current relationships with distributors (Anand and Khanna, 2000), smoothing the progress of the collaboration, that is, facilitating learning to collaborate.

This idea is further developed by Hibbert and Huxham (2005). On one side, knowledge about managing distributors is a general accumulated knowledge that is applicable across a range of collaborative relationships: “Thus though managers are encouraged to use this learning in their own specific collaborative situations, the learning itself is intended to be transferable to other circumstances” (p. 60). On the other hand, learning to collaborate is about understanding the particular collaborative situations and, therefore, it draws on knowledge about managing distributors “where this is relevant, but customises it to the specific circumstances of the particular situation” (p. 61). According to the authors, learning to collaborate “is concerned with the process by which people take account of the idiosyncrasies of the particular situation and modify whatever general understanding they may have (even though they may not be aware of having any) to fit the individual circumstance” (p. 61). Therefore, drawing on knowledge about managing distributors is the basis on which subsequent episodes of learning to collaborate in specific relationships may happen as a general understanding of the management of distributors is helpful for managerial actions in more particular and idiosyncratic relational settings. This is particularly relevant because “the constant potential for change as particular situations develop implies a continual need to learn, adjust and apply such understandings” (p. 61). Altogether, the preceding reasoning allows us to propose the following:

**H<sub>2</sub>.** The manufacturers’ knowledge about managing distributors positively influences manufacturers’:

- a. knowledge acquisition from distributors,
- b. learning to collaborate with distributors.

## 2.2. Influence on exploitation- and exploration-based innovations

In this study, we examine the effects of learning from distributors on: (i) the enhancement or refinement of existing products and processes (exploitation-based innovations) and (ii) the development of new technologies, products, or services that could make existing ones obsolete or non-competitive (exploration-based innovations) (Bierly et al., 2009). In particular, exploitation-based innovations include such things as refinement, choice, production, efficiency, selection, implementation, and execution (March, 1991). Levinthal and March (1993, p. 105) define exploitation as “the use and development of things already known” so that firms pursuing an exploitation strategy will essentially search market opportunities in their surrounding landscape (Armagan and Ferreira, 2005). On its side, exploration-based innovations include elements captured by such terms as search, variation, risk taking, experimentation, play, flexibility, and discovery, and they are associated with experimentation with new ideas that lead the old one to become obsolete (March, 1991).

The impact of inter-organisational knowledge on exploitation- and exploration-based innovations is an issue that has not received empirical attention until very recently (e.g., Bierly et al., 2009; Holmqvist, 2009), although that inter-organisational learning creates conditions for intra-organisational exploration and exploitation is an older assumption in literature (e.g., Holmqvist, 2003). In more general terms, several studies have shown the important role played by close relationships between firms sharing overlapping knowledge on innovation (Von Hippel, 1988; Cohen and Levinthal, 1990), and knowledge acquisition from distributors contributes to develop this overlapping knowledge. About learning from distributors, it is important to innovation because it: (i) enhances the breadth and depth

of relation-specific knowledge available to the firm, thereby increasing the potential for innovative combinations; (ii) enhances the speed of product development through reduced development cycles; and (iii) increases the willingness of the manufacturer to develop new products or processes for its key distributors (Yly-Renko et al., 2001).

Moreover, organisational factors explain a positive effect of learning in relationships with distributors on manufacturers’ innovations (Menon and Pfeffer, 2003). From a resource-dependence perspective, it is conceivable that the personnel and groups involved in any phase of the innovation process will give preference to one source of knowledge, such as distributors, insofar as they recognise its value to cope with critical problems (Pfeffer and Salancik, 1978). For instance, Song and Zhao (2004) find that the manufacturers’ dependence on distributors ranks first among other relational factors on the former’s awareness of the need to cooperate with the latter in the new product development process. In addition, as the channel of distribution becomes critical for the manufacturer’s innovation success, the departments and personnel in contact with the channel (e.g., key account managers and trade marketing departments) are given the authority to compel the organisation to incorporate the knowledge obtained from the distributors to innovate (Menon and Pfeffer, 2003). They will argue that adaptation to distributors’ demands is critical to obtaining their support in getting the product at the final consumers’ disposal (Deromedi and Körber, 2003) and that their information, due to their closeness to the final markets, is of great value for sustaining market orientation (Hernandez-Espallardo and Arcas-Lario, 2003). At the same time, these organisational structures will strive to introduce their learning from distributors into the firm’s innovation processes as a means to justify their presence and increasing power within the organisation (Menon and Pfeffer, 2003).

All these arguments support a positive effect of knowledge acquired from distributors and learning to collaborate with distributors on exploitation-based innovations.

**H<sub>3</sub>.** Manufacturers’ exploitation-based innovations are:

- a. positively influenced by knowledge acquisition from distributors,
- b. positively influenced by learning to collaborate with distributors.

The same rationale presented to defend a positive influence of both types of learning in inter-firm relationships with distributors on exploitation-based innovations might also be used for exploration-based innovations. However, the latter are substantially different than the former and, therefore, we can expect differential effects of learning in inter-firm relationships on each one (Song and Thieme, 2009). Actually, in the area of alliances, marketing or commercial alliances are defined as exploitative, as it is difficult for them to defy the manufacturers’ current practices, compared to R&D or even supplying relationships (Rothaermel and Deeds, 2004). Moreover, knowledge acquisition means the internalisation of knowledge, a process in which knowledge from distributors is sought, found, and moulded by own knowledge, values and preconceptions of the manufacturers (Zahra and George, 2002). Therefore, it is foreseeable that, knowledge acquisition from distributors positively influences exploitation-based innovations (H<sub>3a</sub>), whereas the effect on exploration-based innovations may be non-significant.

From the manufacturer’s perspective, learning to collaborate with distributors refers to improving the knowledge about the process of collaboration with specific distributors and is therefore

related to improvements in the cooperation with them (Child, 2001). This is a particularly important factor for exploration-based innovations, where effective collaboration with distributors plays a prominent role. First, learning to collaborate determines the manufacturer's ability to use the distributor's resources, capabilities and knowledge to complement its own resources and capabilities in the collaborative value-creation process (Grant and Baden-Fuller, 2004; Hibbert and Huxham, 2005). More radical or exploratory innovations will emerge as a consequence of this combinative process. In support of this idea, Im and Rai (2008) state that as the relationships mature, partners are likely to experience a greater need to address new problems and discover sources of value from exploratory innovation. Learning to collaborate is a precondition for the relationship maintenance and progression (Ring and Van De Ven, 1994). Second, exploration-based innovations are more risky, in part because the consumers' acceptance is uncertain, and distributors may play a critical role in this issue by supporting the product in the channel of distribution (Sikdar and Prakash, 2010). Distributors may be reluctant to stock the product if they fear slow sales due to consumers' resistance to the innovation (Garcia et al., 2007): "Distributors do not recognise that they may be propagating the slow takeoff of products through their own resistance" (p. 84). Therefore, as learning to collaborate with distributors increases, collaboration becomes more effective, distributors become more committed and, therefore, the risks associated with exploratory innovation initiatives decrease. In consequence, we propose the following:

**H<sub>4</sub>.** Manufacturers' exploration-based innovations are:

- a. non-significantly influenced by knowledge acquisition from distributors,
- b. positively influenced by learning to collaborate with distributors.

Both exploration and exploitation are necessary for the long-term survival of a firm. Firms that neglect exploration and focus on exploitation may lack the capability to adapt to an evolving environment, whereas firms that disregard exploitation and focus on the exploration of new and uncertain possibilities may face severe difficulties to compete in the current market (March, 1991). Together, H<sub>3</sub> and H<sub>4</sub> propose that learning in relationships with distributors simultaneously favours both types of innovation strategies. However, a review of literature on the issue of exploitation and exploration strategies shows that there are other factors that may cause a conflict between the two innovation strategies (Im and Rai, 2008). For example, they compete for scarce resources, so that resources devoted to one innovation strategy may be at the cost of under-investing in the other (March, 1991). Moreover, the activities involved in the deployment of each innovation strategy are inherently self-reinforcing, causing a "success trap", when success at exploitation creates resistance to exploration of new alternatives, or a "failure trap", when exploration drives out exploitation in a sequence of exploratory innovations that fail and are substituted by other exploratory ideas (Levinthal and March, 1993). Finally, each innovation strategy involves different routines and cognitive schemes that, once implemented, present resistance to change and adaptation (Levinthal and March, 1993). According to this, once the effects of learning in inter-firm relationships with distributors have been considered, we expect a negative intercorrelation between both innovation strategies:

**H<sub>5</sub>.** Once the effects of knowledge acquired from distributors and learning to collaborate with distributors on exploitation and exploration-based innovations have been taken into account, exploitation- and exploration-based innovations are inversely related.

### 2.3. The effects on performance

Organisational performance is defined as the firm's degree of attainment of its organisational goals. Because goals can be heterogeneous and conflicting, the firm must try to get a reasonable level of achievement of every goal without hampering the accomplishment of the others (Quinn and Rohrbaugh, 1983). In this study, we use Quinn and Rohrbaugh's (1983) criteria of organisational effectiveness to consider two separate dimensions of performance. *Open system performance* is the degree to which the manufacturer gains external acceptance and adaptation to the changing market conditions. On the other hand, *rational goal performance* is the degree to which the manufacturer gets previously established benchmarks on such issues as productivity and efficiency or, stated alternatively, maximising outputs relative to pertinent conditions such as obstacles and costs (Quinn and Rohrbaugh, 1983). Some studies have approached these objectives with such indicators as profits, sales, or market share (e.g., Kumar et al., 1992).

Innovation capability ranks among the top determinants of firms' performance, and many empirical studies have found this relationship to be significant (e.g., Calantone et al., 2002). March (1991) proposes exploration and exploitation as major components of any effort to improve organisational performance and strengthen competitive advantage, and organisational theorists believe that both strategies are crucial to understanding the adaptation and evolution of organisations (Levinthal and March, 1981). In line with this, Lewin et al. (1999) applied the concept of co-evolution to explain organisational adaptation with and within its environment, based on the combination of exploitation and exploration activities. More recently, He and Wong (2004) have found that performance is sustained by continuous exploitation- and exploration-based innovations. Therefore, we propose the following:

**H<sub>6</sub>.** Exploitation-based innovations have a positive effect on:

- a. open system performance,
- b. rational goals performance.

**H<sub>7</sub>.** Exploration-based innovations have a positive effect on:

- a. open system performance,
- b. rational goals performance.

However, the distinction between the 'exploration of new possibilities' and the 'exploitation of old certainties' captures a number of fundamental differences in a firm's behaviours and strategies (March, 1991) that may have different consequences on performance (He and Wong, 2004). Because innovation and organisational capabilities co-evolve (Helfat and Raubitschek, 2000) the innovation strategy pursued by a firm can serve as a vehicle for the renewal and accumulation of its competences (Danneels, 2002). Compared to exploitation-based innovation strategy, exploration-based innovation strategy is a second-order competence, described as "the ability to identify, evaluate, and incorporate new technological and/or customer competences into the firm" (Danneels, 2002, p. 1097). According to this, we expect that the effects on the performance of exploration-based innovations are higher than those derived from exploitation-based innovations:

**H<sub>8</sub>.** The effect of exploration-based innovations is higher than the effects of exploitation-based innovations for:

- a. open system performance,
- b. rational goals performance.

Finally, we propose that manufacturers' knowledge in inter-firm relationships with distributors impacts their performance as far as it is applied to sustain new and improved products or processes, that is, to sustain innovation. Zahra and George (2002) differentiate between potential absorptive capacity (the acquisition and assimilation of knowledge) and realised absorptive capacity or the ability to transform and exploit knowledge. The latter dimension is of vital importance, as it explains the manufacturer's use of knowledge for commercial ends. That is, successful inter-firm knowledge results in the manufacturers accessing knowledge new to them and applying it to sustain innovations (Yeoh, 2009).

According to this, we adhere to the idea that the effect of external knowledge on performance is mediated by the way and extent to which this knowledge is integrated in the firm's strategies and activities (Kraaijenbrink and Wijnhoven, 2008). This suggests that manufacturers' learning from their distributors influences performance but that this influence is transmitted by the knowledge actually applied to both exploitation- and exploration-based innovations. The logic is that while learning abilities are important, it is the outcome of its application to innovating that really matters for performance. This leads us to propose the following:

**H<sub>9</sub>.** The manufacturers' exploitation- and exploration-based innovations mediate the relationship between knowledge in the relationship with distributors and performance.

### 3. Methodology and results

#### 3.1. Data collection, sample and measures

We collected the data for the study from a sample of companies in the Spanish food and beverages industry. The Spanish agrofood industry ranks fifth in the European Union, just behind Germany, France, United Kingdom, and Italy, representing 13.3% of the Spanish industrial production, with more than 380,000 employees (MITYC, 2010). Although small- to medium-sized firms are the majority in the industry, there are firms that are market leaders and have the size and competencies that allow them to continuously redefine their offers to the market (AECOC, 2007). Because of their strategic importance in the sector and the fact that they are the most innovative firms, these firms represent the target of our data collection.

A total of 591 manufacturers were identified using the SABI database provided by the national market information leader INFORMA D&B. They were asked to participate in the study by a letter directed to the firm's CEO. After a follow-up telephone call, 201 (for a participation rate of 34.01%) firms did agree to participate and offered the name of the senior manager with most knowledge about strategic behaviour, business strategy, and overall firm performance (the key informant) (Huber and Power, 1985). The response rate is within the typical range for this type of study (e.g., Gatignon and Xuereb, 1997; Olson et al., 2005).

Standardised personal interviews were conducted by scheduled appointments with the key informant of each firm. We used this data collection method to ensure that the actual respondent is a person with effective knowledge about the matter, that the questionnaires are fully completed, and that we obtain an acceptable number of respondents representing the most important manufacturers of food and beverages in Spain. To ensure the proper implementation of the procedure, first, the authors pre-tested the questionnaire with face-to-face interview with five executives of the industry. Second, we used a specialised market research firm with trained interviewers who had experience in face-to-face interviews. The authors personally met and trained the team of interviewers (11) about the meaning of the items

used in case the respondent had any question. Finally, two assistants of the authors (doctoral students) made the follow-up of the interviews by auditing 25% of the questionnaires randomly selected. In particular, we assessed whether the person interviewed was actually the one indicated in the questionnaire by his position in the firm and we repeated the last question about the experience of the interviewee. The 201 questionnaires finally used in this research comply with the three conditions. Only two questionnaires were not used because of uncertainty about its adequate completion due to differences in the experience items. Because the two questionnaires belonged to the same interviewer, we further audited the rest of his questionnaires and did not find any additional incoherence. Face-to-face data collection methods may suffer from subjectivity or biases induced by the presence of the interviewer; consequently, we performed ANOVA to assess whether systematic bias exists among interviewers. Of the 32 items considered, we found only 3 with values significantly different among interviewers at  $p < 0.10$  (none at  $p < 0.05$ ). This indicates the absence of any systematic influence of the interviewers on the respondents' answers.

The distribution of the key informants' positions is the following: marketing managers 35.8%, vice-CEOs (chief executive officers) 28.9%, CEOs 23.4%, and Production or R&D managers 11.9%. We used ANOVA to analyse whether the organisational position of the respondent influences his response. Only 4 of the 32 items present a significantly different response ( $p < 0.10$ ), showing that this bias is not a problem in our data. The informants had a significant experience (the average experience in the sector was 18.9 years, with 15.3 years of experience in the firm). They also self-assessed their knowledge of the issues treated in the questionnaire from 0 (no knowledge at all) to 10 (absolute knowledge). The average of this item is 7.9, and none of the cases received less than 5 in the scale.

Due to on-site data collection, a test for response bias is not appropriate (Atuahene-Gima, 2005). Instead, we compared participating and non-participating firms. We used firm size, measured by the number of employees, to control for the greater complexity in decision making in larger firms (Atuahene-Gima and Murray, 2004). The analysis of variance test was not significant for the number of employees ( $F=0.815$ ;  $p > 0.1$ ) or for revenues ( $F=0.0$ ;  $p > 0.1$ ).

Table 1 presents the set of items measuring the theoretical concepts and their bibliographical sources. The values 0 (strongly disagree) to 10 (strongly agree) were the anchors used for all of the scales except the measures of performance. In Spain, educational assessment is made on this scale, with 5 representing the minimum value indicating success in the assessment. Because of this, people understand this range more easily than any other, such as the 5- and 7-point scales commonly used in research conducted in English-speaking countries. In the case of the dependent variables, rational goal performance and open system performance, we switched to a 5-point scale, with 1 signifying "not at all" and 5 signifying "completely" to introduce variations in the potential dynamics of the interviewee that could lead to common-method bias (Podsakoff et al., 2003).

Our measure of knowledge acquisition from distributors deserves one specific explanation. In accordance to the definition of the concept, which adopts the view of organisational learning process, we used items inspired by the measures of "learning from alliances" by Kale et al. (2000) and "relationally focused learning" by Weerawardena et al. (2006). Kale et al.'s measure is primarily focused on the importance of knowledge acquired in one alliance for the firm's improvement of its own set of competencies and skills. Weerawardena et al.'s measure is about the firm's orientation with regard to the acquisition and internalisation of knowledge proceeding from inter-firm relationships.

**Table 1**  
Constructs measurements summary: confirmatory factor analysis and scale reliability.

Item description	Standardised loading	T-value	Reliability (SCR <sup>a</sup> , AVE <sup>b</sup> )
<b>Knowledge acquisition from distributors</b> (Adapted from Weerawardena et al., 2006 and Kale et al., 2000) <sup>c</sup>			SCR=0.90 AVE=0.69
1. Relationships with distributors are important sources of knowledge for your firm	0.82	13.90	
2. Shares knowledge acquired from distributors within the firm	0.92	16.88	
3. Knowledge acquired from distributors is key in developing innovations (*)	–		
4. The knowledge acquired from your distributors have contributed to improve the firm's capacity to compete	0.87	15.28	
5. Knowledge acquisition from distributors is an activity explicitly planned in your firm	0.68	10.70	
<b>Learning to collaborate with distributors</b> (Inspired by Doz, 1996). Your firm makes a great deal of effort to... <sup>c</sup>			SCR=0.94 AVE=0.79
1. ...get to know the distributor's external environment	0.93	17.16	
2. ... get to know the corporate and strategic situation of the distributor	0.92	17.04	
3. ...study how to improve the specific tasks performed with each distributor	0.86	15.09	
4. ...refine the interaction with each distributor to improve coordination	0.85	14.78	
5. ...figure out what can be learned from each distributor (*)	–		
6. ...uncover the distributor's goals about your firm's category of products (*)	–		
<b>Knowledge about managing distributors</b> (Adapted from Draulans et al., 2003) <sup>c</sup>			SCR=0.86 AVE=0.62
1. Your firm has a long tradition of treating distributors as strategic partners	0.76	12.35	
2. Your firm has many distributors considered as strategic partners (*)	–		
3. Your firm's personnel dedicated to the relationship with the distributors are experts in managing relationships with the channel	0.87	15.08	
4. Your firm has procedures to transfer between teams dedicated to key distributors account the information obtained from each distributor	0.72	11.44	
5. Your firm conducts periodic reviews of the key distributors to understand what is being done right and what is being done wrong	0.78	12.75	
<b>Exploitation-based innovation</b> (Adapted from Atuahene-Gima, 2005). In the past four years, your firm... <sup>c</sup>			SCR=0.86 AVE=0.60
1. ...has based its strategy on knowledge and abilities your firm was already familiar with (*)	–		
2. ...has invested mainly in enhancing skills in exploiting mature technologies	0.75	11.84	
3. ... has searched for solutions to customer problems that were near to existing solutions rather than to completely new solutions.	0.83	13.56	
4. ...has upgraded skills in product development processes in which the firm already possesses significant experience	0.79	12.75	
5. ...has targeted the effort to improve the efficiency of the innovation processes rather than to initiate new adventures radically different from what the firm were familiar with	0.72	11.08	
<b>Exploration-based innovation</b> (Adapted from Atuahene-Gima, 2005). In the past four years, your firm... <sup>c</sup>			SCR=0.92 AVE=0.75
1. ...has acquired manufacturing technologies and skills entirely new to the firm	0.82	13.96	
2. ...has learned product development skills and processes (such as product design, prototyping new products, timing of new product introductions, and customising products for local markets) that are entirely new	0.88	15.56	
3. ...has acquired entirely new managerial and organisational skills that are important for innovation (such as forecasting technological and customer trends, identifying emerging markets and technologies, coordinating and integrating R&D, marketing, manufacturing, and other functions or managing the product development process	0.88	15.57	
4. ...has learned new skills in areas such as funding new technology, staffing R&D, training and development of R&D, and engineering personnel for the first time (*)	–		
5. ...has strengthened innovation skills in areas where it had no prior experience	0.86	15.03	
<b>Open system performance</b> (Adapted from Kumar et al., 1992 and Quinn and Rohrbaugh, 1983). To what extent in the past four years has your firm... <sup>d</sup>			SCR=0.76 AVE=0.52
1. ... improved the quality of its products	0.67	9.85	
2. ... increased its ability to adapt to the changing needs of the markets	0.66	9.71	
3. ... improved the image of the firm and its products	0.82	12.51	
<b>Rational goals performance</b> (Kandemir et al., 2006, Kumar et al., 1992 and Quinn and Rohrbaugh, 1983). To what extent in the past four years has your firm... <sup>d</sup>			SCR=0.81 AVE=0.77
1. ... increased sales	0.92	16.64	
2. ... increased market share	0.93	16.98	
3. ... increased profitability	0.77	12.64	

Fit statistics for measurement model of 26 indicators for 7 constructs:  $\chi^2_{(278)}=575.43$ ; GFI=0.82; RMSEA=0.074; SRMR=0.064; CFI=0.97; TLI (NNFI)=0.96.

<sup>a</sup> Scale composite reliability ( $\rho_c = (\sum \lambda_i)^2 \text{var}(\xi) / [(\sum \lambda_i)^2 \text{var}(\xi) + \sum \theta_{ii}]$ ; Bagozzi and Yi, 1988).

<sup>b</sup> Average variance extracted ( $\rho_c = (\sum \lambda_i^2 \text{var}(\xi)) / [(\sum \lambda_i^2 \text{var}(\xi) + \sum \theta_{ii})]$ ; Fornell and Larcker, 1981).

<sup>c</sup> Anchors: 0=strongly disagree; 10=strongly agree.

<sup>d</sup> 1=anchors: in no extent at all; 5=completely (\*) Item deleted during the scale-validation process.

It includes such actions as sharing knowledge acquired from inter-firm relationships within the firm and planning explicitly such a type of knowledge acquisition.

We employed a time framework for measuring innovation strategy (exploitation- and exploration-based innovations) and performance (open system and rational goals performance).

Atuahene-Gima (2005) measures exploitation- and exploration-based innovation in a period of three years to gauge the firm's commitment to innovation avoiding circumstantial actions and benefits that may take place in the particular moment of data collection. Pre-test interviews with executives of the industry suggested that a four-year period would be a better alternative. On the other part, Atuahene-Gima (2005) does not consider an explicit number of years when measuring actions related to customer orientation, competitor orientation and interfunctional coordination. They represent a cultural orientation of the firm, and, as such, they involve the history of the firm without making one explicit reference to a time framework. The same occurs with learning. As Crossan and Henry (1999) state, learning occurs over time and across levels and it is built over time by accumulating more experience (Anand and Khanna, 2000; Kale et al., 2000). To clarify this perspective of a cultural orientation of the firm with regard to the relationship maintained with its distributors, we introduced the items measuring knowledge acquisition, learning to collaborate, and knowledge about managing distributors with the following description: "Please rate from 0 (strongly disagree) to 10 (strongly agree) the following statements as descriptors of the typical way your firm deals with knowledge-related issues in the relationships with its distributors".

We used structural equation modelling with conventional maximum likelihood estimation techniques to test the model with LISREL 8.8 (Jöreskog and Sörbom, 1996). With (i) a sample size of 201, which exceeds the threshold level of 100–150 cases, (ii) almost three cases per free parameter, and (iii) with more than three indicators for measuring each construct, we comply with all the conditions suggested by Bollen (1989) to gain proper parameter estimates with this methodology.

To assess unidimensionality, we conducted a confirmatory factor analysis (Anderson and Gerbing, 1988), which shows a reasonable fit to the data (Table 1). All of the measures show adequate reliability with composite reliability indices higher than 0.6 (Bagozzi and Yi, 1988) and average variance extracted (Fornell and Larcker, 1981) higher than 0.5. Furthermore, all of the items load on their hypothesised factors (see Table 1), and the estimates are very significant (the lowest *t*-value is 9.67), which provides evidence of convergent validity (Bagozzi and Yi, 1988). Discriminant validity was assessed by calculating the 99% confidence interval for each pair of constructs' correlations. None of them included one, confirming discriminant validity (Anderson and Gerbing, 1988). Table 2 presents the constructs' means, standard deviations and intercorrelations.

Because the data were collected from one single respondent, common-method variance is a potentially serious threat of bias that can artificially inflate the parameter estimations of the relationships between the different concepts (Podsakoff et al., 2003). To test for such a bias, we used Harman's one-factor test. Common-method variance is not present, as the unrotated factor

solution showed the presence of multiple factors and no one accounted for the majority of covariance. A more sophisticated test uses confirmatory factor analysis with a one-factor model in which all of the observable variables used in this research load on the same factor. This model yielded a  $\chi^2=2204.7$  with 299 degrees of freedom (compared with the  $\chi^2=575.43$  with 278 degrees of freedom for the measurement model—see Table 1). A chi-squared difference test (Anderson and Gerbing, 1988) suggests a considerably worse fit for the unidimensional model than for the measurement model. The results of these tests confirmed that common-method bias is not a serious threat in this study.

### 3.2. Results

Table 3 shows the results of the estimation of the structural model (see Fig. 1). The fit of the model is satisfactory (Anderson and Gerbing, 1988).  $H_1$  is confirmed, as learning to collaborate with distributors significantly influences knowledge acquisition from distributors ( $\beta_{12}=0.44$ ,  $p<0.01$ ).  $H_2$  is also confirmed because knowledge about managing distributors exerts a positive and significant influence on knowledge acquisition from distributors ( $H_{2a}$ ;  $\gamma_{11}=0.39$ ,  $p<0.01$ ) and learning to collaborate with distributors ( $H_{2b}$ ;  $\gamma_{21}=0.88$ ,  $p<0.01$ ). Regarding the learning-related factors that influence the exploitation-based innovations ( $H_3$ ) we find that both knowledge acquisition ( $H_{3a}$ ;  $\beta_{31}=0.22$ ,  $p<0.10$ ) and learning to collaborate ( $H_{3b}$ ;  $\beta_{32}=0.28$ ,  $p<0.05$ ) positively influence this type of innovation. However, as hypothesised, exploration-based innovations are not significantly influenced by knowledge acquisition ( $H_{4a}$ ;  $\beta_{41}=0.01$ ,  $p=n.s.$ ), whereas a positive and significant influence is present for learning to collaborate with distributors ( $H_{4b}$ ;  $\beta_{42}=0.40$ ,  $p<0.01$ ).

To assess  $H_5$ , which establishes a trade-off between exploitation-based and exploration-based innovation strategy, covariance between their structural errors ( $\psi_{43}$ ) was set free. Its estimation provided a value that was negative and significant  $-0.44$  ( $p<0.10$ ) confirming that, even though learning in inter-firm relationships with distributors exerts a positive influence on both exploitation and exploration, other factors not explicitly considered in our model might be determining the presence of dynamics of investments in exploitation by constraining exploration (and vice versa).

Both exploitation- and exploration-based innovations exert an influence on performance. Specifically, exploitation-based innovations positively affect open system performance ( $H_{6a}$ ;  $\beta_{53}=0.38$ ,  $p<0.01$ ) but do not significantly influence rational goals performance ( $H_{6b}$ ;  $\beta_{63}=-0.09$ ,  $p=n.s.$ ). The effect of exploration on performance is positive and significant for both open system performance ( $H_{7a}$ ;  $\beta_{54}=0.51$ ,  $p<0.01$ ) and rational goals performance ( $H_{7b}$ ;  $\beta_{64}=0.40$ ,  $p<0.01$ ).

**Table 2**  
Constructs' statistics.

Construct	Mean	S. D.	Correlations (phi estimates and standard errors) <sup>a</sup>							
			1	2	3	4	5	6	7	
1. Knowledge acquisition from distributors	5.92	1.90		0.03	0.04	0.07	0.07	0.07	0.07	0.08
2. Learning to collaborate with distributors	6.20	1.93	0.79		0.02	0.06	0.07	0.07	0.07	0.07
3. Knowledge about managing distributors	6.01	1.94	0.78	0.88		0.07	0.06	0.07	0.07	0.08
4. Exploitation innovation strategy	6.58	1.63	0.43	0.44	0.43		0.08	0.08	0.08	0.08
5. Exploration innovation strategy	5.09	2.62	0.31	0.39	0.48	0.07		0.07	0.07	0.07
6. Open system performance	6.98	1.45	0.43	0.40	0.45	0.40	0.51			0.06
7. Rational goals performance	6.14	2.00	0.07	0.21	0.20	-0.09	0.37	0.56		

<sup>a</sup> Correlations between any two constructs (phi) are presented below the diagonal. Standard errors of phi estimates between any two constructs are presented above the diagonal.



**Table 3**  
Results of structural model.

Linkages in the model		Standardised parameter estimates		
		Parameter	Estimate	t-value
<b>H1.</b> Learning to collaborate	→ Knowledge acquisition	$\beta_{12}$	0.44	3.18***
<b>H2.</b> Knowledge about managing distributors	→ <b>a.</b> Knowledge acquisition	$\gamma_{11}$	0.39	2.80***
	→ <b>b.</b> Learning to collaborate	$\gamma_{21}$	0.88	13.79***
<b>H3.</b> <b>a.</b> Knowledge acquisition → <b>b.</b> Learning to collaborate →	Exploitation-based innovations	$\beta_{31}$	0.22	1.69*
		$\beta_{32}$	0.28	2.16**
<b>H4.</b> <b>a.</b> Knowledge acquisition → <b>b.</b> Learning to collaborate →	Exploration-based innovations	$\beta_{41}$	0.01	0.09
		$\beta_{42}$	0.40	3.15***
<b>H6.</b> Exploitation-based innovations	→ <b>a.</b> Open system performance	$\beta_{53}$	0.38	4.53***
	→ <b>b.</b> Rational goals performance	$\beta_{63}$	-0.09	-1.19
<b>H7.</b> Exploration-based innovations	→ <b>a.</b> Open system performance	$\beta_{54}$	0.51	5.88***
	→ <b>b.</b> Rational goals performance	$\beta_{64}$	0.40	5.33***

Fit statistics:  $\chi^2_{(287)}=643.89$ ; GFI=0.80; RMSEA=0.079; SRMR=0.08; CFI=0.96; TLI (NNFI)=0.96.

\*  $p < 0.1$ .

\*\*  $p < 0.05$ .

\*\*\*  $p < 0.01$ .

The size of the effects on performance is generally higher for exploration-based innovations than for exploitation-based innovations, in line with the reasoning provided by  $H_8$ . To check whether the effects are significantly different, we performed two successive structural models, setting equal  $\beta_{53}$  (exploitation-based innovation → open system performance) and  $\beta_{54}$  (exploration-based innovation → open system performance) for open system performance ( $H_{8a}$ ) and  $\beta_{63}$  (exploitation-based innovation → rational goals performance) and  $\beta_{64}$  (exploration-based innovation → rational goals performance) for rational goals performance ( $H_{8b}$ ). A chi-squared comparison (Anderson and Gerbing, 1988) of each of these models with the structural model, whose results are presented in Table 3, yields a non-significant result in the case of the open system performance ( $\chi^2_{dif(1)}=0.21$ ,  $p=n.s.$ ). Therefore,  $H_{8a}$  is not confirmed. A different result is obtained in the case of rational goals performance, confirming  $H_{8b}$  regarding the higher impact of exploration-based innovation strategy compared to exploitation-based innovations on rational goals performance ( $\chi^2_{dif(1)}=13.13$ ,  $p < 0.001$ ).

Finally, to test  $H_9$ , which posits that knowledge in inter-organisational relationships with distributors only affects performance through their application to exploitation- and exploration-based innovations, we follow Baron and Kenny's (1986) test of mediation. The interrelationships between the different dimensions of knowledge make it very difficult to apply this test with a structural modelling methodology. Therefore, we built a second-order construct of knowledge related to distributors (KNOWDIST) composed of three dimensions: knowledge acquisition, learning to collaborate, and knowledge about managing distributors. A confirmatory factor analysis of this second-order configuration showed an acceptable fit ( $\chi^2_{(51)}=168.53$ ; GFI=0.87; SRMR=0.048; CFI=0.98; TLI (NNFI)=0.97) and high standardised loadings between knowledge acquisition (0.84;  $t=11.15$ ), learning to collaborate (0.94;  $t=14.97$ ), and knowledge about managing distributors (0.93;  $t=11.37$ ). We estimated a theoretical model ( $M_T$ ) linking KNOWDIST with exploitation- and exploration-based innovations and of these two innovation strategies with open system and rational goals performance (no direct link between KNOWDIST and performance was established). The results of  $M_T$  show that variations in KNOWDIST account for variations in the presumed mediator, that is, the firm's exploitation- ( $\gamma_{41}=0.48$ ;  $p < 0.01$ ) and exploration-based innovations ( $\gamma_{42}=0.45$ ;  $p < 0.01$ ). In the same model, we also observe that the effects of the mediator on performance are mostly significant

( $\beta_{\text{exploitation-based innovation} \rightarrow \text{open system performance}}=0.37$ ,  $p < 0.01$ ;  $\beta_{\text{exploitation-based innovation} \rightarrow \text{rational goals}}=-0.09$ ,  $p=n.s.$ ;  $\beta_{\text{exploration-based innovation} \rightarrow \text{open system}}=0.51$ ,  $p < 0.01$ ;  $\beta_{\text{exploration-based innovation} \rightarrow \text{rational goals}}=0.40$ ,  $p < 0.01$ ). Lastly, Baron and Kenny (1986) state that when the independent variable → mediator and the mediator → dependent variable paths are controlled, a previously significant relationship between the independent and dependent variables is no longer significant. To test for this condition, estimation of a model where only KNOWDIST appears as an antecedent of performance yields a significant effect in the KNOWDIST → performance relationships ( $\gamma_{\text{KNOWDIST} \rightarrow \text{open system performance}}=0.48$ ,  $t=5.36$ ,  $p < 0.001$ ;  $\gamma_{\text{KNOWDIST} \rightarrow \text{rational goals performance}}=0.19$ ,  $t=2.53$ ,  $p < 0.01$ ). We later observed that in an alternative model ( $M_{ALT}$ ), where the paths between KNOWDIST and the two dimensions of performance are added to  $M_T$ , these direct effects becomes non-significant ( $\gamma_{\text{KNOWDIST} \rightarrow \text{open system performance}}=0.12$ ,  $p=n.s.$ ;  $\gamma_{\text{KNOWDIST} \rightarrow \text{rational goals performance}}=0.13$ ,  $p=n.s.$ ). Furthermore, a chi-squared difference test to compare  $M_T$  with  $M_{ALT}$  confirms the complete mediatory role of the firm's innovation strategy in our model ( $\chi^2_{dif(2)}=2.92$ ,  $p > 0.20$ ). These results corroborate  $H_9$ .

We assess nomological validity of the set of relationships established in this study with the use of two control variables that we believe might influence the dependent variables of the model that is, the exploitation- and exploration-based innovations and the two dimensions of performance. They are the number of employees (one proxy of the size) and the age of the firm (one proxy of accumulated knowledge and expertise). Regarding the former, it only has a significant and positive influence on the performance measure of rational goals ( $\gamma_{6,2}=0.13$ ,  $p < 0.10$ ), whereas the latter is positively related to exploration-based innovation ( $\gamma_{4,3}=0.20$ ,  $p < 0.01$ ) and open system performance ( $\gamma_{5,3}=0.13$ ,  $p < 0.10$ ). However, the value and significance of the structural parameters of the model presented in Table 3 do not change with the addition of the control variables. This confirms that the set of relationships tested in this research maintains its explanatory power even in presence of the control variables.

#### 4. Conclusions and discussion

This study extends our understanding of the role of external knowledge on innovation decisions, providing empirical proofs of

the links in the sequence external knowledge-innovation-performance (Ellonen et al., 2009). In particular, we develop and test a comprehensive model of the influence of knowledge in relationships with distributors on the manufacturers' exploitation- and exploration-based innovations. Previous studies have recognised the role of customers and competitors in guiding the adoption of exploitation and exploration competences for product innovation (e.g., Atuahene-Gima, 2005). This research focuses on distributors as a powerful group that influences manufacturers' innovation decisions, a supply chain vertical relationship that, in spite of its importance for manufacturers' success, has been scarcely studied in the innovation literature (one exception is Song and Zhao, 2004). Moreover, the fact that we perform this research in the food and beverages industrial setting contributes to compensating for other important bias, that is, the neglect of so-called low-tech and mature industries in innovation studies (Hauknes, 2001).

As a matter of fact, the issue of alliance formation for innovation purposes (i.e., new product development) is well documented in the literature (e.g., Rothaermel and Deeds, 2004). Nevertheless, as the success of innovations depends also on how they are marketed, the value of this research lies in the fact that it constitutes a seminal approach to figuring out how knowledge in inter-firm relationships and innovation strategy are related in the commercialisation phase of the value chain. In this value-chain relationship, the use of knowledge from distributors provides a way to link and leverage the voice of the consumer to the manufacturers' innovation activities. As Danskin et al. (2005) affirm, "while anecdotal evidence suggests that some firms are building knowledge management systems that include both proactive and passive systems to provide feedback loops throughout the value chain, there is no empirical research relating these developments to strategy, value chain position, and firm performance" (p. 96). This study is a first attempt to relate knowledge obtained in supply chains to innovation and performance, and the results allow us to recommend the implementation of inter-firm knowledge management systems to sustain innovations.

From a theoretical point of view, our model and results confirm the postulate of the knowledge-based view of the firm concerning competitiveness as the result of the firm's ability to generate, acquire, and integrate both internal and external sources of knowledge (Rosenkopf and Nerkar, 2001). Specifically, we observe the issue of how knowledge in inter-firm relationships with distributors is incorporated into the dynamics of innovation. From a managerial point of view, our results confirm that the external knowledge coming from vertical relationships is relevant for management, as advocated by Grant and Baden-Fuller (2004). Because it is a challenge for managers to turn knowledge into internal competencies for innovation (Kogut and Zander, 1992), by focusing on the link between learning from distributors and innovation, this study meets this challenge and presents a new perspective on the role of learning capabilities in vertical relationships with distributors. To ensure the effective development of innovations, managers should work to improve their firm's internal capacity to absorb external knowledge (Xia and Roper, 2008). Our results confirm that the firm's absorptive capacity depends on individuals who stand at the crossroad of the firm and the external environment (Spithoven et al., 2010), with the manufacturers' departments and personnel in contact with distributors (e.g. trade marketing and key accounts managers) playing a very important role. In line with this, firstly, managers are advised to take care that these personnel and organisational functions contribute by developing the cultural values, and the learning structures and processes considered in our three-dimensional construct of knowledge in inter-firm relationships with distributors (knowledge acquisition, learning to collaborate, and knowledge about managing distributors) as an

effective mechanism of leveraging market-oriented innovations (Kok and Biemans, 2009). Secondly, manufacturers should implement mechanisms to interlace these personnel and departments in contact with distributors with the R&D function to mutually interchange knowledge and to collaborate for the initiation and success of innovations (Spithoven et al., 2010). Moreover, the finding of a significant mediating role of exploitation- and exploration-based innovation strategies in the relationship between knowledge related to distributors and performance suggests that only those firms that develop their capacity to learn from distributors to leverage innovation may benefit from learning with distributors. These innovation strategies enable manufacturers to reap the benefits of learning with distributors, a relevant result for managers, who should design their structures and processes of interaction with distributors with the innovation strategy in mind (and vice versa).

To the best of our knowledge, this is the first empirical endeavour that simultaneously deals with the three types of knowledge-related issues in inter-firm relationships (i.e., knowledge acquisition, learning to collaborate, and knowledge about managing distributors). The study of the relationships among these three dimensions allows us to observe that the stock of knowledge accumulated by manufacturers about how to manage distributors is of the utmost importance to improve collaboration and to internalise knowledge from distributors. This confirms the important role played by the knowledge about managing distributors as an essential precondition to learning, innovation and performance. Regarding this, literature on alliances has exhibited some evidence of the effect of the accumulated firm's stock of knowledge about managing alliances on the firm's stock market (Kale et al., 2002), on a general subjective evaluation of performance of one specific alliance (Kale and Singh, 2007), and on the performance of all the firm's alliances (Draulans et al., 2003). Zollo et al. (2002) consider the effect of alliance capability on subsequent knowledge acquisition from the alliance. They use the firm's satisfaction with the knowledge accumulated from participating in the collaborative agreement, as "alliance research identifies knowledge accumulation as a key organisational outcome of inter-firm collaborations" (p. 706). However, it is just one of the three items used to build a summed scale of performance (the others are "the extent to which the alliance created new opportunities for the firm" and "the degree to which the alliance satisfied the partnering firm's initial objectives"). Compared to that article, we present an original contribution by empirically delving into the *black box* of the effect on a firm's performance of the firm's stock of knowledge about managing relationships. We theoretically justify and empirically confirm that knowledge about managing distributors positively influences the acquisition of substantial knowledge from distributors and the collaboration with them, as learning to collaborate is enhanced. From a managerial point of view, this result suggests that manufacturers' investments in developing this capability pay off in terms of its ability to continue learning from distributors.

In general, we observe that learning in relationships with distributors is more influential on exploitation-based innovations than on exploration-based innovations. Koza and Lewin (1998) defend the idea that, because of returns associated with exploitation are more visible, proximal in time, and certain, the application of inter-organisational learning to exploitation strategies is favoured against exploration. In any case, both learning to collaborate and acquiring knowledge from distributors are variables that influence manufacturers' innovations. However, learning to collaborate with distributors is confirmed as a more decisive variable in our model. It not only contributes to the firms' acquisition of distributors' knowledge but also contributes directly to both exploitation- and exploration-based innovations.

Therefore, the logical relationship between resources, innovation and performance is supported and better understood by explaining how firms prioritise their resources to exploitation vs. exploration depending on their knowledge in inter-firm relationships with distributors.

This study offers new empirical evidence to the literature dealing with the exploitation–exploration dichotomy of innovation strategies. Empirical confirmation of hypotheses H<sub>3</sub> and H<sub>4</sub> indicates that learning from distributors is one issue that simultaneously favours exploitation and exploration, thus contributing to weakening the dynamics of concentration in one at the other's expense. Holmqvist (2009) describes learning from inter-firm relationships as a relatively complicated affair that generates slowness in learning from experience, complicating learning and impeding the prominence of any strategy over the other, as no clear-cut relationship between experience and success can be easily established. Moreover, learning from distributors consists of learning from a portfolio of other firms that are heterogeneous about their own state in the exploitation vs. exploration dichotomy in one specific moment and with variations of their particular states in different moments (Koza and Lewin, 1998). Knowledge acquired from this diverse portfolio of distributors and the adaptation to their demands will favour the simultaneous adoption of exploitation- and exploration-based innovations as a result of the incorporation of learning from distributors into the firm (Im and Rai, 2008). Therefore, managers must pay attention to maintaining and nurturing a portfolio of relationships with distributors that maximises the number of strategic opportunities for innovation and also that minimises the potential for negative biases on the choices and restrictions of the actions through agreements and operational standards of behaviours (Gobbo and Olsson, 2010).

Additionally, our empirical evidence shows a relative imbalance between the effects of each type of innovation on performance, as exploitation is only positively related to open-system performance, while exploration is positively related to both types of performance. This is explained by the fact that the scale used to measure open system performance accounts for innovation's intermediate results, which are independent of the firm's competitive environment (e.g., product quality or adaptation to the market demands). These results can be achieved with incremental innovations that characterise an exploitation-based innovative strategy. However, final results in the market like those considered in the scale of rational goals (e.g., market share, sales or profitability) are very dependent on the firm's competitive environment so that, to achieve these goals, according to our results, only an exploitation strategy will not be enough. In fact, we found that the effects of exploration-based innovations on a firm's rational goals are higher than those obtained with exploitation-based innovations. As exploration-based innovation strategy involves an accumulation of resources and capabilities (Danneels, 2002), it seems more adequate to achieve those goals that are more dependent on the competitive environment.

#### 4.1. Limitations and further research

As with any other study, the current one has limitations that may open new avenues for research. First, it is limited to one specific type of relationship in the food and beverages sector: the manufacturer's relationship with its distributors. Although the importance of the sector and of the role played by distributors is widely recognised, other types of relationships can also influence and interact in different ways in the firm's innovation strategies (Tödtling et al., 2009). Future research could help to explore these interactions from a network-based perspective instead of a dyadic

perspective. Moreover, we have used a wide description of the manufacturers' relationships with distributors. In this sense, we have not included a description of the particular governance mechanisms used in the relationship, even though governance has been found as a significant influence on learning in inter-firm relationships (Hernandez-Espallardo et al., 2010). Second, although the results are valid from a channel of distribution perspective, a consideration of the implications of the type of distributor involved, for instance a wholesaler or a retailer could have interest from a managerial point of view.

Future research could also be more exhaustive about the process of knowledge transfer and its effects on innovation in inter-firm relationships; for instance, are the roles played by explicit and tacit knowledge different (Dawson, 2000)? Another question concerns the specific type of knowledge already possessed by each firm and its redundancy considering manufacturer-related factors, customer-related factors, and interface-related factors (Sivakumar and Roy, 2004). In particular, learning to collaborate might be more critical for acquiring tacit knowledge (Wagner, 2003), and the levels of knowledge redundancy between the manufacturer and the distributor might determine whether knowledge is transferred from the distributor and/or created in the collaborative relationship (Sivakumar and Roy, 2004). The latter might be a function of the stage of the relationship (Dwyer et al., 1987). As a result, a positive relationship between learning to collaborate and knowledge acquisition might actually be moderated by these issues, and further research could explore them.

We measured innovation strategy and performance across four years to avoid the adverse effects of circumstantial eventualities in any of these variables (Atuahene-Gima, 2005). However we did not do the same with the scales that measure the manufacturers' knowledge in relationships with distributors (i.e. knowledge acquisition from distributors, learning to collaborate with distributors, and knowledge about managing distributors). We followed a general procedure in the literature that does not impose an explicit period of time to questions about the cultural orientation of the firm (e.g., Atuahene-Gima, 2005) such as knowledge-related issues (e.g., Weerawardena et al., 2006). Conversely, by doing so we could expose the research to causality problems if the respondent had answered the questions thinking about the most recent activities and if these were very different from the activities performed in the past. Nevertheless, a general consensus does exist in the literature about the success of organisational learning's depending on the firm's absorptive capacity, which is determined by the firm's prior related knowledge (Zahra and George, 2002), and therefore built over time by the accumulation of a relevant base of knowledge (Cohen and Levinthal, 1990). Therefore, it is conceivable to believe that answers to knowledge in inter-firm relationships include the history of knowledge-related issues of the manufacturer in its relationships with the distributors. In any case, questions about causality can arise, and it is clear that further research might adopt a longitudinal design to tease out these linkages more clearly (Atuahene-Gima, 2005).

A similar concern about causality may be present in the relationship between knowledge about managing distributors as an antecedent of knowledge acquisition and learning to collaborate. We used cross-section data; therefore, we cannot observe the dynamics that might lead from learning to collaborate to knowledge about managing distributors. According to Kale and Singh (2007) a process of articulation, codification, sharing and internalisation of the know-how acquired during the collaboration process might serve to improve manufacturers' knowledge about managing relationships with distributors, which, in a further step, would help to improve learning to collaborate in a

continuous process. As we have already said by citing Anand and Khanna (2000), “the ability to learn from a particular alliance is likely to be enhanced by the trials and tribulations of past learning experiences” (p. 298), but path dependence is an issue in learning to learn (Cohen and Levinthal, 1990), so that “firms that have learnt to learn will continue to do so at an increasing rate, while those that have never invested in learning from different experiences will not find optimal to do so” (Anand and Khanna, 2000; p. 298).

Finally, data were collected from a single source, which can present a certain bias (Kumar et al., 1993). The goal of interviewing a wide sample of manufacturers made the triangulation of data from other sources for each of the interviewed firms prohibitively expensive. To reduce this risk, we were very thorough about the interviewee selection, searching for the person in each firm with the most knowledge of the topics included in the questionnaire (see Section 3). However, some bias may be present, and future research with different sources of data could contribute to validating the results obtained in this study.

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