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Knowledge transfer in interorganizational partnerships: what do we know?

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Abstract

Purpose – The purpose of this paper is to review the literature on knowledge transfer in interorganizational partnerships. The aim is to assess the advances in this field by addressing the questions: What factors impact knowledge transfer in interorganizational partnerships? How do these factors interact with each other?

Design/methodology/approach – The study reports results of a literature review conducted in ten top journals between 2000 and 2017 in the fields of strategy and innovation studies.

Findings – The review identifies three overarching themes, which were organized according to 14 research questions. The first theme discusses knowledge in itself and elaborates on aspects of its attributes. The second theme presents the factors that influence interorganizational knowledge transfer at the macroeconomic, interorganizational, organizational and individual levels. The third theme focuses on the consequences, namely, effectiveness and organizational performance.

Practical implications – Partnership managers may improve and adjust contracts, structures, processes and routines, as well as build support mechanisms and incentives to guarantee effectiveness in knowledge transfer in partnerships.

Originality/value – The study proposes a novel theoretical framework that links antecedents, process and outcomes of knowledge transfer in interorganizational partnerships, while also identifying aspects that are either less well researched or contested and thereby suggesting directions for future research.

Keyword Interorganizational Partnerships, Alliances, Network, Collaboration, Knowledge transfer

Paper type Literature review

1. Introduction

Knowledge transfer across organizations is central to the development of sustainable competitive advantages, as firms rarely innovate in isolation and depend to a large extent on external partners (Coombs and Metcalfe, 1998; Powell *et al.*, 1996; Ring *et al.*, 2005). Defined as a process through which an organization purposefully learns from another, interorganizational knowledge transfer is an important sub-field of research in partnerships, which has undergone noteworthy progress in recent decades (Easterby-Smith *et al.*, 2008; Battistella *et al.*, 2016).

Despite the proliferation of valuable contributions in this tradition, knowledge transfer tops the list of the most complex challenges managers face in interorganizational arrangements (Mazloomi Khamseh and Jolly, 2008). Even if considered a promising strategy, a large number of alliances yield disappointing results (Inkpen, 2008). Of particular interest is the way partners deal collectively with knowledge management and the learning process (Easterby-Smith *et al.*, 2008; Larsson *et al.*, 1998). Knowledge transfer is an intricate process that encompasses a myriad of sub-processes, including search (i.e. the identification of useful knowledge), access (i.e. the acquisition of externally generated knowledge), assimilation (i.e. the processing, understanding and absorption of outside knowledge) and integration (i.e. the combination of new external knowledge with existing internal one) (Filieri and Alguezaui, 2014).

Partnerships demand significant time and effort to find the right partners and to develop routines that support interaction, particularly in contexts where the tension between



competitive and cooperative forces is in play (Fang *et al.*, 2013). They also include a number of operational challenges, such as the commitment of the involved parties and the mechanisms for the congregation, harmonization and integration of the individual contributions (Inkpen and Tsang, 2007). A recurrent conundrum in managing multi-party settings is to ensure fit between knowledge, communication channels and partner characteristics (Hutzschenreuter and Horstkotte, 2010). The inherent characteristics of knowledge, such as context dependency, ambiguity and tacitness, make it sticky, that is, difficult to transfer, once such characteristics require corresponding governance mechanisms (Fang *et al.*, 2013). Another issue refers to the multiplicity of learning processes that occur simultaneously (i.e. learning about the partner, with the partner, from the partner and about alliance management). These imply high complexity due to the differences among partnering organizations in terms of, for instance, technological capabilities, physical distance, culture (Battistella *et al.*, 2016), absorptive capacity [1] (Mazloomi Khamseh and Jolly, 2008) and social capital (Filieri and Alguezaui, 2014). Besides, partnerships encompass a number of risks that range from the leakage of critical knowledge (Khanna *et al.*, 1998) to the conflicts over the division of unexpected returns. Conflicts may arise when new knowledge is generated, as returns may not be clear at the onset of an alliance (Lee *et al.*, 2010). The relationship between the actors is indeed of critical nature for the effectiveness of knowledge transfer, which presupposes trust, intensity of connections, a degree of familiarity and reciprocity (Battistella *et al.*, 2016).

The contrast between the promise partnerships represents as vehicles for knowledge transfer (Faulkner and De Rond, 2000) and the challenges they pose for strategy scholars and managers alike motivates our research:

RQ1. What factors impact knowledge transfer in interorganizational partnerships?

RQ2. How do these factors interact with each other?

We address these questions by carrying out a systematic literature review. Research in this field draws on various traditions that encompass evolutionary theory, transaction cost theory, theories of the firm, learning, motivation and dynamic capabilities. It is based on multiple methodological approaches, including secondary data, questionnaires, interviews, observations and interventions. Given the conceptual and methodological diversity, as well as the relative fragmentation, a holistic view is needed.

Understanding knowledge transfer in interorganizational contexts is relevant because it has been a widely applied strategy (Mazloomi Khamseh and Jolly, 2008; Lee *et al.*, 2010). Empirical studies point to a significant surge in several countries and sectors, particularly since the 1990s (Hagedoorn, 2002; Schilling, 2015). The phenomenon is interpreted as a response to the growing uncertainty in the economic environment, the intensification of the globalization process, the increase in R&D complexity and costs, the reduction in product life cycles and the technological shocks (Powell *et al.*, 1996; Child *et al.*, 2005; Schilling, 2015). Partnerships help organizations minimize risks, uncertainties and costs, allocate resources more efficiently, access partners' resources and markets and increase the portfolio of products and services (Schilling, 2015). They are seen as an effective way of transferring, accessing, generating and absorbing knowledge (Inkpen and Dinur, 1998; Lorenzoni and Lipparini, 1999; Inkpen, 2000; Simonin, 2004). Learning is hence an important driver of interorganizational cooperation (Inkpen, 2008; Dyer and Nobeoka, 2000; Kogut, 1988).

We carry out a synthesis of the literature through a systematic review of the top ten journals in the fields of strategy and innovation studies during the 2000–2017 timeframe. Our review is presented in three overarching themes—knowledge in itself, its impacting factors and consequences—which were organized according to 14 research questions. We propose a novel theoretical framework that integrates the three themes at multiple levels: macroeconomic, interorganizational, organizational and individual. Our framework

highlights the importance of the attributes of the knowledge at stake; the organizational context from where knowledge is sent and received; the motivation and the governance of the alliance; the individual behavior and ability in receiving and transferring knowledge; the complexities of the transfer process. Of particular interest is the need to advance our understanding of the relations between the different levels and their outcomes, especially those relative to the dynamic mechanisms that arise with time.

Our contribution thus lies in a novel theoretical framework that identifies and links the antecedents, process and outcomes of interorganizational knowledge transfer. It provides a consolidation and a critical evaluation of the findings of this research field, together with an overview of the limitations and less contested issues. Another contribution of our study is to suggest directions for future research, methodological improvements and guidance for practice.

2. Methodology

We carried out a systematic literature review following Massaro *et al.* (2016), Petticrew and Roberts (2008) and Tranfield *et al.* (2003). A systematic literature review is a scientific method of making sense of a large body of information that explicitly aims to limit the bias of traditional reviews (e.g. preferences of the author for pet theories), mainly by attempting to detect, appraise and synthesize all relevant studies that address a particular set of questions (Petticrew and Roberts, 2008). As to ensure rigor, objectivity and relevance to our methodology, we first developed a literature review protocol that laid out the course of the study, which we detail below. This structured process guided the identification, selection and assessment of the relevant literature and it is efficient and effective (Watson, 2015). In addition to a description of our research topic, our protocol stated the questions we wanted to explore: How is research on knowledge transfer in interorganizational contexts (i.e. partnerships, alliances, networks, joint ventures, etc.) evolving? What do we know about it (the focus) and what do we need to explore (the critique)? What recommendations can we offer to practitioners who face the task of developing a favorable learning environment for alliance partners?

The protocol also included our search strategy, which was designed to be transparent, replicable and focused (Massaro *et al.*, 2016). We aimed at achieving this by screening the most relevant outlets in the highly accredited EBSCO database (hosted by Business Source Premier) and by employing an exhaustive list of keywords and search terms (Tranfield *et al.*, 2003). Once we wanted to prioritize the inclusion of highly impactful research, we selected ten top journals in the fields of strategy and innovation studies according to the impact factor calculated by Journal of Citation Reports 2013/2014. After selecting the relevant journals (see Table I), we searched for papers in the title or in the abstract using a number of keywords that expressed our research field in a far-reaching and comprehensive fashion[2]. Even if semantically distinct, knowledge and technology are often used interchangeably in scholarly work. Hence, we added both “knowledge transfer” and “technology transfer” as our search terms. Besides, since the phenomenon of interorganizational collaboration is referred to in the literature by a number of related concepts and labels (i.e. partnership, alliance, network, joint venture, consortia, among others), we used a series of keywords that the research team had identified as relevant synonyms[3]. We considered the period 2000–2017, once we wanted to capture recent contributions. This search retrieved a total of 5,685 papers.

After excluding papers that were either duplicated or constituted non-novel contributions (such as book reviews and editorial pieces), we independently examined the remaining abstracts and filtered them according to fit. Two authors carried out this classification process simultaneously to establish clarity about the selection criteria and to reassure reliability and rigor (Petticrew and Roberts, 2008). Our review protocol included a number of inclusion/exclusion criteria regarding the topics of interest, since all study designs were welcome. As we were particularly concerned with research addressing

Journal	Author	Analytical level	Type
<i>Strategic Management Journal</i>	Inkpen (2000)	Interorganizational	Conceptual
	Dussage <i>et al.</i> (2000)	Interorganizational	Quantitative
	Lane <i>et al.</i> (2001)	Interorganizational/ organizational	Quantitative
	Tsang (2002)	Organizational	Quantitative
	Kotabe <i>et al.</i> (2003)	Interorganizational/ organizational	Quantitative
	Oxley and Sampson (2004)	Interorganizational	Quantitative
	Dyer and Hatch (2006)	Organizational	Quantitative/ Qualitative
	Williams (2007)	Organizational	Quantitative
	Mesquita <i>et al.</i> (2008)	Organizational	Quantitative
	Inkpen (2008)	Interorganizational	Conceptual
	Zhao and Anand (2009)	Organizational/ Individual	Quantitative
	Cheung <i>et al.</i> (2011)	Interorganizational/ organizational	Quantitative
	Schildt <i>et al.</i> (2012)	Interorganizational/ organizational	Quantitative
	Love <i>et al.</i> (2014)	Organizational	Quantitative
<i>Research Policy</i>	Howard <i>et al.</i> (2016)	Interorganizational	Quantitative
	Bozeman (2000)	Macro/Organizational	Literature review
	Amesse and Cohendet (2001)	Organizational	Qualitative
	Segrestin (2005)	Interorganizational	Quantitative
	Zhang <i>et al.</i> (2007)	Organizational	Quantitative
	Janowicz-Panjaitan and Noorderhaven (2008)	Individual	Quantitative
	Jiang and Li (2009)	Interorganizational	Quantitative
	Frenz and Ietto-Gillies (2009)	Organizational	Quantitative
	Lee <i>et al.</i> (2010)	Interorganizational	Quantitative
	Guennif and Ramani (2012)	Macro	Comparative historical analysis
	Tzabbar <i>et al.</i> (2013)	Organizational	Quantitative
	Bozeman <i>et al.</i> (2014)	Macro/Organizational	Literature review
	Frankort (2016)	Interorganizational	Quantitative
	Kavusan <i>et al.</i> (2016)	Interorganizational	Quantitative
García-Canal <i>et al.</i> (2008)	Interorganizational	Quantitative	
Wu (2012)	Interorganizational/ organizational	Quantitative	
<i>Journal of Management</i>	Grimpe and Sofka (2016)	Organizational	Quantitative
	Tsai (2009)	Organizational	Quantitative
	Herstad <i>et al.</i> (2014)	Macro	Quantitative
<i>Industrial and Corporate Change</i>	Ireland <i>et al.</i> (2002)	Organizational	Conceptual
	Schilke and Goerzen (2010)	Organizational	Quantitative
<i>Academy of Management Review</i>	Lazaric and Marengo (2000)	Interorganizational	Qualitative
	Hagedoorn <i>et al.</i> (2009)	Interorganizational	Quantitative
	Frankort <i>et al.</i> (2011)	Organizational	Quantitative
	Berchicci <i>et al.</i> (2016)	Interorganizational	Quantitative
<i>Management Review</i>	Bhagat <i>et al.</i> (2002)	Organizational/ Individual	Conceptual
	Inkpen and Tsang (2005)	Interorganizational	Conceptual
	Jarvenpaa and Majchrzak (2016)	Interorganizational/ individual	Conceptual

Table I.
Papers included in
the literature review

(continued)

Journal	Author	Analytical level	Type
<i>Academy of Management Journal</i>	Luo (2005)	Interorganizational	Quantitative
	Yang <i>et al.</i> (2015)	Organizational	Quantitative
	Zhao <i>et al.</i> (2004)	Organizational	Qualitative
<i>Strategic Organization</i>	Hagedoorn <i>et al.</i> (2011)	Organizational	Conceptual
	Draulans <i>et al.</i> (2003)	Organizational	Quantitative
	Beamish and Berdrow (2003)	Interorganizational	Quantitative
<i>Long Range Planning</i>	Osterloh and Frey (2000)	Individual	Conceptual
	Zollo <i>et al.</i> (2002)	Interorganizational/ organizational	Quantitative
	Inkpen and Currall (2004)	Interorganizational	Conceptual
<i>Organization Science</i>	Vandaie and Zaheer (2015)	Organizational	Quantitative
	Liu and Ravichandran (2015)	Organizational	Quantitative

Source: Authors' elaboration

Table I.

knowledge transfer and/or integration between organizations, we eliminated papers that investigated other aspects of partnership management or that did not relate to phenomena at the interorganizational level[4]. Specifically, we removed papers dealing with personnel mobility, mergers and acquisitions and cross-business unit (intra-organizational) interactions. Besides, given our focus on managerial issues, we discarded papers at the aggregate level emphasizing a regional development perspective, such as cluster policy, agglomerations and industrial districts. Studies on the university–industry linkages, the outcomes of scientific production or the commercial engagement of academics were covered by only two articles, as we did not intend to evaluate universities as specific players. In a similar vein, international knowledge transfer in the context of multinational corporations or foreign direct investment was disregarded. Besides, papers related to the structural or morphological aspects of social networks (i.e. nature of ties and configuration), as well as to supply chain integration were considered off-topic. Using the above-mentioned criteria for relevance, we eliminated 5,458 articles. Both authors separately inspected the full text of the remaining 227 articles and then jointly examined the decision to include or exclude each one until agreement was reached. At this stage, we also excluded studies that did not address knowledge exchange in collaborative multi-party settings. As a result, we classified 174 papers inappropriate.

We subsequently read the 53 papers that met all inclusion criteria and discussed them in a detailed fashion during evaluation meetings, where the whole research team was present. We coded the papers and synthesized them in data-extraction forms that encompassed general information (author and publication details), key topic, study features (analytical level, empirical context, method, partnership form and data) and main results (Tranfield *et al.*, 2003). During this phase, we also used a number of preliminary tables, schemes and reports to facilitate our joint interpretation. Table I provides an overview of the papers selected, alongside their corresponding analytical level and type of methodology[5]. More detailed information can be found in Table AI.

The majority of articles (62 percent) were published in two journals, namely, *Strategic Management Journal* and *Research Policy*. Regarding the yearly distribution of articles presented in Figure 1, we did not recognize any pattern; it seems that the topic maintained the same rate of interest during these 17 years.

The literature can be further broken down into different levels of analysis, namely, macroeconomic, interorganizational, organizational and individual. As Figure 2 portrays, the interorganizational and organizational are the most central levels, which amount to 85 percent of the investigated papers, taking into account that some papers addressed

Figure 1. Number of reviewed articles on knowledge transfer in interorganizational partnerships per year (2000–2016)

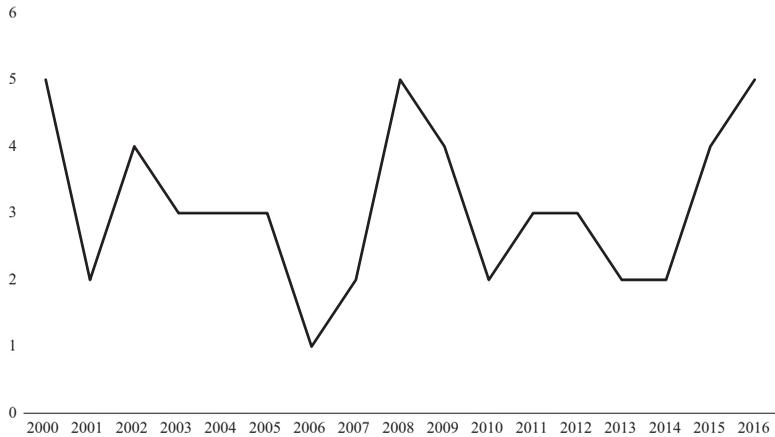
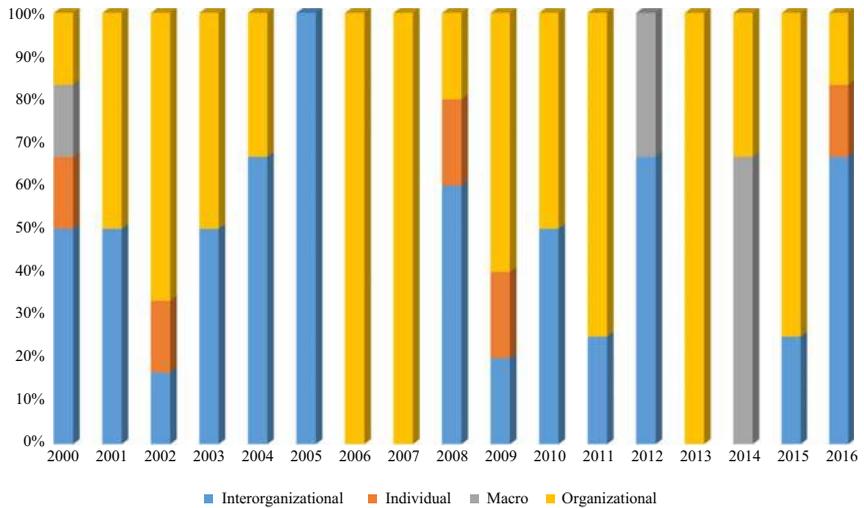


Figure 2. The percentage of the reviewed articles per level of analysis and year (2000–2016)



multiple levels of analysis. It means that scholars are particularly concerned with factors such as structure of the partnership, motivation, alliance capability, absorptive capacity and trust. Surprisingly, the other levels of analysis, i.e. macro context and individual, received scant attention in the field. Regarding the methodological choice, quantitative methods are clearly favored over qualitative, conceptual and other study designs, once 64 percent of the papers applied a quantitative approach (see Figure 3).

As a final step of our analysis, we applied two techniques to support our research synthesis. As recommended by Petticrew and Roberts (2008), we first organized the description of the studies into logical categories. For this purpose, we identified common research questions throughout the articles and grouped them accordingly, with the view of summarizing the essence of this literature. The second stage was to analyze the findings within each category of research question and produce tables that succinctly systematized them. In the third phase, we strived to synthesize and integrate the findings across the different studies. Specifically, we codified the findings into three different dimensions – antecedents, process and outcomes – with

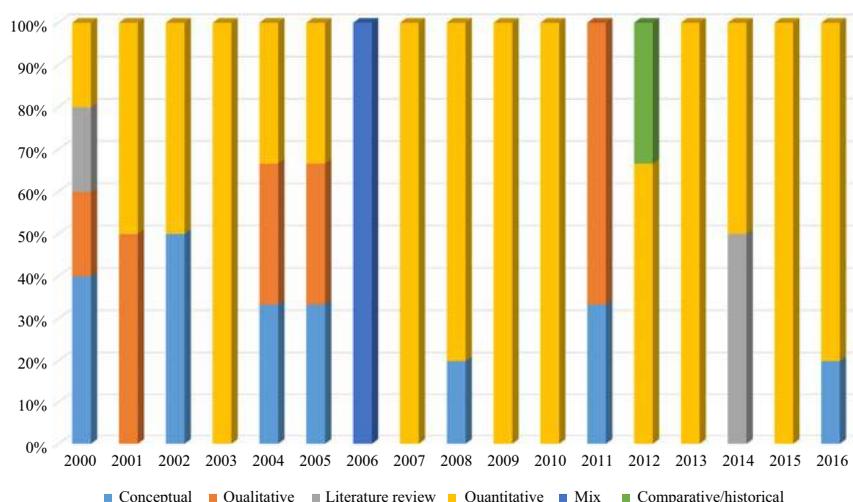


Figure 3. The percentage of the reviewed articles per research method and year (2000–2016)

a number of sub-codings for each dimension. In line with Tranfield *et al.* (2003), we supplemented this structured and deductive protocol-based process with an inductive approach for the resulting interpretation of findings.

3. Literature review

Our review shows that the literature covers three overarching themes. The first theme discusses knowledge in itself and elaborates on the types and characteristics. The second theme presents the factors that impact knowledge transfer, either in the decision to form a partnership or during its operation. The third theme encompasses aspects related to the consequences of interorganizational knowledge transfer, i.e. effectiveness and organizational performance. We formulated 14 research questions that reflect these overarching themes, as described in Table III[6]. Next, we discuss the research questions in detail.

3.1 Theme 1: knowledge

Interorganizational transfer is the migration of knowledge between partnering firms (Beamish and Berdrow, 2003). Yet, it is not a uniform process that may be classified according to diverse approaches. Williams (2007) differentiated two mechanisms related to knowledge transfer, which may be utilized simultaneously: replication and adaptation. While replication is the attempt to recreate identical activities in two localities, adaptation is the attempt to modify or combine practices of the source organization. Zhao *et al.* (2004) and Zhao and Anand (2009) proposed a further differentiation between collective and individual transfer. They distinguished learning at the individual level from the group (organization) level as regards their nature, strategic importance and level of difficulty. The transfer of collective knowledge is the most valuable, difficult and prone to error, since it is restricted to tacit knowledge shared among employees, which often occurs in a veiled and unconscious way.

3.1.1 Knowledge attributes. The characteristics and types of knowledge, as well as how and why they influence the transfer process are among the most debated topics in the literature. Nearly one-third of reviewed papers (32 percent) deal with this issue in one way or the other. Tables III and IV organize our main findings in relation to these aspects – What type of knowledge is being transferred? What are the characteristics of the knowledge being transferred?

Theme 1: knowledge	Theme 2: impacting factors			Theme 3: consequences	
	Macro context	Interorganizational	Organizational		Individual
What type of knowledge is being transferred?	What factors of the macro environment affect the motivation to form partnerships for knowledge transfer?	How do the drivers of partnership formation affect knowledge transfer?	How do organizational characteristics affect knowledge transfer?	What leads individuals to transfer knowledge?	How to evaluate knowledge transfer?
What are the characteristics of the knowledge being transferred?		How do partnership structures influence knowledge transfer?	What is necessary for an organization to receive external knowledge?	How do individuals learn?	How does knowledge transfer affect organizational performance?
		How do routines affect knowledge transfer?			
		How do relations in a partnership affect knowledge transfer?			
		How does knowledge absorption occur in a partnership?			

Table II.
Research questions
per theme

Source: Authors' elaboration

The characteristics and types of knowledge are thus highly relevant. The more tacit (Bhagat *et al.*, 2002; Osterloh and Frey, 2000), complex (Bhagat *et al.*, 2002), technological (Kotabe *et al.*, 2003; Hagedoorn *et al.*, 2009), collective (Zhao *et al.*, 2004) and systemic (Bhagat *et al.*, 2002) knowledge is, the more difficult is its transfer. Also relational knowledge, which is developed within the boundaries of the dyad, sets up transfer barriers (Mesquita *et al.*, 2008). Regarding characteristics of knowledge, the degree of similarity (Inkpen, 2000), cumulativeness and appropriability (Herstad *et al.*, 2014) facilitates use and assimilation, whereas causal ambiguity (Dyer and Hatch, 2006; Williams, 2007; Inkpen, 2008), context dependency (Bhagat *et al.*, 2002; Williams, 2007), viscosity (Inkpen, 2008), stickiness (Bhagat *et al.*, 2002) and sensitivity (Jarvenpaa and Majchrzak, 2016) interfere negatively, in the sense of making knowledge transfer more challenging.

3.2 Theme 2: factors impacting knowledge transfer

The second theme related to factors impacting knowledge transfer gathers the most discussed topics in the literature, particularly those at the interorganizational and organizational (divided into the source and the recipient firm) levels of analysis. Besides, we grouped factors pertaining to the macroeconomic and individual levels too. Table V lays out our classification and key underlying variables.

3.2.1 Macro-environmental factors. Among the reviewed papers, few deal with the macro context in which partnerships are situated. This should nevertheless be considered with caution given our choice of journals, the majority of which are focused on business and management.

Type	What it is, why and how it affects the transfer process	Source
Technical transfer vs technological transfer	Technical transfer is relatively simple and includes know-how to solve a specific operational problem. Technological transfer involves a wide range of activities, requiring dedicated coordination and interaction between groups for long time periods. It demands a more sophisticated collaboration process involving communication and codification abilities. The greater the project scope and the more complex the knowledge, the greater will be the costs and difficulties for transfer. This is because technological knowledge tends to be tacit and embedded in a specific context	Kotabe <i>et al.</i> (2003)
Relational vs redeployable	Redeployable knowledge may be reproduced by partners, so that competitive gains may be appropriated in other relations. Relational knowledge may not be applied outside the alliance context, since it is based on informal agreements and codes of conduct. The routines, capabilities and specific resources of the relationship act as barriers to the transfer and reduce the risk of copying. Consequently, firms can create sustainable competitive advantages through their networks of relationships	Mesquita <i>et al.</i> (2008), Dyer and Hatch (2006)
About vs from the partner	Knowledge about the partner is related to understanding its organizational characteristics – culture, values, strategic objectives, history, structure, leadership, etc. As it is accumulated, it facilitates cooperative relations and knowledge transfer. Knowledge from the partner is related to the technical know-how and technologies that may be appropriated by the recipient organization	Zollo <i>et al.</i> (2002), Inkpen and Currall (2004)
Human vs social vs structured	Human knowledge describes what the individual knows and is generally both tacit and explicit. Social knowledge is embedded in the relationships between individuals and groups and can be largely described as tacit. It is informed by cultural norms and depends on a joint effort. Structured knowledge refers to organizational processes, rules, routines and systems	Bhagat <i>et al.</i> (2002)
Individual vs collective	There are skills that are individual and belong to them. Skills, when aggregated, become something greater than the sum of their parts, i.e. collective knowledge. This is embedded in the norms and routines shared by all organization members. Its nature is eminently tacit and, therefore, more difficult to transfer	Zhao <i>et al.</i> (2004)
Tacit vs explicit	Explicit knowledge may be expressed by written language and symbols. Tacit knowledge is acquired and accumulated by the individual, it is embedded in an organization's culture, values and routines	Osterloh and Frey (2000), Bhagat <i>et al.</i> (2002)
Simple vs complex	Complex knowledge encompasses a wide variety of interrelated parts, which cannot be easily ungrouped. It involves greater causal ambiguity and requires greater volume of information and skills to be transferred. Simple knowledge requires a low volume of information and is easier to be transferred	Bhagat <i>et al.</i> (2002), Dyer and Hatch (2006)
Independent vs systemic	Independent knowledge can be described by itself, whereas systemic knowledge must be described in relation to the overall knowledge base of the source organization	Bhagat <i>et al.</i> (2002)

Source: Authors' elaboration

Table III.
Knowledge types

Characteristic	What it is, why and how it affects the transfer process	Source
Similarity	It refers to the degree of overlap between partners' knowledge bases. Moderate-to-high degree of similarity facilitates knowledge use and assimilation as it draws on a comparable set of individual skills and increase the motivation of interacting individuals. However, this occurs only in the initial stages of a partnership	Inkpen (2000), Schildt <i>et al.</i> (2012), Tzabbar <i>et al.</i> (2013), Frankort (2016), Kavusan <i>et al.</i> (2016)
Causal ambiguity	Causal ambiguity arises from a complex process of production, in which firms do not understand the underlying causes of their performance. As knowledge is incorporated in routines that are intertwined in long chains involving multiple individuals, it may not be totally understood	Dyer and Hatch (2006), Williams (2007), Inkpen (2008)
Context dependency	When knowledge depends on a specific social environment, its transfer is more difficult, since environmental conditions are not perfectly replicable. The greater the differences between cultures, the harder it is to transfer context-dependent knowledge	Williams (2007), Bhagat <i>et al.</i> (2002), Inkpen (2008)
Stickiness	Sticky knowledge is not only complex, but also tacit and systemic. Combinations of human, social and structured knowledge may assume this characteristic	Bhagat <i>et al.</i> (2002)
Viscosity	The degree of viscosity is determined by the number of embedded cognitive and organizational aspects. Knowledge transfer requires a long process of learning and mentoring, as to support the exchange of a large amount of tacit knowledge	Inkpen (2008)
Sensitivity	It refers to knowledge possessed by one organization that another organization can act on in ways that cause harm to the releasing organization – an assessment that is situational, temporal, context-dependent and ambiguous. Sensitivity creates tension between knowledge sharing-protecting that is emotionally intense	Jarvenpaa and Majchrzak (2016)
Analytical	Knowledge that is universal and theoretical. It refers to economic activities where knowledge development is based on systematic R&D and formal models	Herstad <i>et al.</i> (2014)
Technè	Knowledge that is instrumental, context specific and practice related	Herstad <i>et al.</i> (2014)
Cumulativeness	The extent to which current development relies on knowledge, technology and routines already accumulated and controlled by the firm	Herstad <i>et al.</i> (2014)
Appropriability	The capacity of an organization to get ownership of the developed knowledge	Herstad <i>et al.</i> (2014)

Table IV.
Knowledge characteristics

Source: Authors' elaboration

What factors of the macro environment affect the motivation to form partnerships for knowledge transfer? According to Guennif and Ramani (2012), the factors to be considered are industrial policy, competition policies, macroeconomic policies, intellectual property regime and price regulation. They stressed the role of the State as a generator of “windows of opportunity” and of positive externalities similar to the radical technological changes that lead to the formation of partnerships. The outcome of public policies depends on the perception of stakeholders. The expectations of the companies define if the window of opportunity will be sensed and exploited, initiating the formation of partnerships. In evaluating catching up processes, Guennif and Ramani (2012) concluded that it is determined by the interaction between organizations, institutions and policies in the National Innovation System: State, public laboratories, universities, companies, financial organizations, consumers and civil society groups. Following the same line of reasoning, Bozeman *et al.* (2014) stressed the role of the State as an inducer of demand for a specific type of knowledge.

In turn, Hagedoorn *et al.* (2009), together with Grimpe and Sofka (2016), highlighted industry characteristics, specifically appropriability regime and the level of technological sophistication, which they considered to affect firm preferences for the type of partnership contract. The more

Macro context	Interorganizational	Recipient organization	Organizational	Individual
Public policies (Guennif and Ramani, 2012)	Motivation (Lee <i>et al.</i> , 2010; Beamish and Berdrow, 2003)	Motivation (Dyer and Hatch, 2006)	Motivation (Dyer and Hatch, 2006)	Motivation (Osterloh and Frey, 2000; Zhao and Anand, 2009)
Demand (Bozeman <i>et al.</i> , 2014)	Structural governance (Jiang and Li, 2009; Oxley and Sampson, 2004; Dussage <i>et al.</i> , 2000; Garcia-Canal <i>et al.</i> , 2008)	Absorptive capacity (Dyer and Hatch, 2006; Schildt <i>et al.</i> , 2012)	Credibility (Dyer and Hatch, 2006; Kotabe <i>et al.</i> , 2003)	Cognitive styles (Bhagat <i>et al.</i> , 2002)
Technological regimes, technological sophistication and technology and market opportunities (Hagedoorn <i>et al.</i> , 2009; Herstad <i>et al.</i> , 2014)	Procedural governance (Zollo <i>et al.</i> , 2002; Dyer and Hatch, 2006; Inkpen, 2008; Ireland <i>et al.</i> , 2002; Kotabe <i>et al.</i> , 2003; Howard <i>et al.</i> , 2016; Cheung <i>et al.</i> , 2011; Lazaric and Marengo, 2000)	Alliance management capability (Draulans <i>et al.</i> , 2003; Schilke and Goerzen, 2010; Frankort <i>et al.</i> , 2011)	Alliance management capability (Draulans <i>et al.</i> , 2003; Schilke and Goerzen, 2010)	Learning behavior (Janowicz-Panjanitan and Noorderhaven, 2008)
	Relative absorptive capacity (Schildt <i>et al.</i> , 2012)	Partner-specific learning capability (Yang <i>et al.</i> , 2015)	Partner-specific learning capability (Yang <i>et al.</i> , 2015)	Emotions (Jarvenpaa and Majchrzak, 2016)
	Relational and cognitive governance (Luo, 2005; Inkpen and Curral, 2004; Amesse and Cohendet, 2001; Segrestin, 2005; Cheung <i>et al.</i> , 2011; Lane <i>et al.</i> , 2001; Mesquita <i>et al.</i> , 2008; Cheung <i>et al.</i> , 2011; Inkpen and Tsang, 2005)	Prior alliance experience (Tzabbar <i>et al.</i> , 2013; Draulans <i>et al.</i> , 2003; Hagedoorn <i>et al.</i> , 2011; Inkpen and Tsang, 2005; Vandate and Zaheer, 2015; Kavusan <i>et al.</i> , 2016) and prior openness (Love <i>et al.</i> , 2014)	Prior alliance experience (Tzabbar <i>et al.</i> , 2013; Draulans <i>et al.</i> , 2003; Inkpen and Tsang, 2005; Vandate and Zaheer, 2015; Kavusan <i>et al.</i> , 2016)	Individual absorptive capacity (Zhao and Anand, 2009)
		Prior partner experience (Zollo <i>et al.</i> , 2002)	Prior partner experience (Zollo <i>et al.</i> , 2002)	Resistance (Zhao and Anand, 2009)
		R&D centralization and breadth of knowledge base (Zhang <i>et al.</i> , 2007)	Training (Lane <i>et al.</i> , 2001)	
		Network constraints and internal processes (Dyer and Hatch, 2006)	Culture (Kotabe <i>et al.</i> , 2003; Bhagat <i>et al.</i> , 2002; Ireland <i>et al.</i> , 2002; Inkpen and Tsang, 2005; Cheung <i>et al.</i> , 2011)	
		Trust (Lane <i>et al.</i> , 2001)		
		Culture (Kotabe <i>et al.</i> , 2003; Bhagat <i>et al.</i> , 2002; Ireland <i>et al.</i> , 2002; Inkpen and Tsang, 2005; Cheung <i>et al.</i> , 2011)		
		Managerial involvement and strategic relevance (Tsang, 2002)		

Source: Authors' elaboration

Table V.
Factors impacting
knowledge transfer
per analytical level

sophisticated and R&D intensive the industry is, and the greater the efficacy of appropriability secrets, the greater will be the propensity of companies to choose technology transfers through partnerships. This is because partnerships allow for high degree of involvement between partners, as well as monitoring and controlling technology transfer (Hagedoorn *et al.*, 2009). Equally, the more shallow the markets for technology in an industry are, the more likely firms will be to opt for relational collaboration in the form of alliances (Grimpe and Sofka, 2016).

Knowledge characteristics may also impact the choice of firms to establish collaboration agreements. In contexts where knowledge is analytical, presents high appropriability and low cumulateness, as well as opens new market and technological opportunities, it increases preferences for partnerships[7]. As this kind of knowledge presupposes formal and systematic R&D processes, it may be supported by reports, electronic files and patent descriptions. This set of tools tends to be less sensitive to distance effects, once they build on common language and criteria. Consequently, global innovation partnerships are positively associated with the availability and the use of IPR protection measures in a given industry (Herstad *et al.*, 2014).

The macro-environmental factors therefore impact knowledge transfer indirectly by influencing the motivation of organizations to form partnerships with this purpose.

3.2.2 Interorganizational factors. Part of the literature is dedicated to investigating how motivation and governance affect knowledge transfer.

How do the drivers of partnership formation affect knowledge transfer? Two kinds of drivers for entry into partnerships are identified: cost-sharing and synergy-seeking motives (Lee *et al.*, 2010). Unexpectedly, accessing knowledge and new skills (i.e. synergy) turn out to be secondary motives to market positioning against competitors and sharing risks (i.e. cost sharing) (Beamish and Berdrow, 2003). In alliances where partners are in a position of substitution and not of complementarity, the costs arising from conflicts are greater and partners have higher incentives to appropriate benefits in an exclusive fashion. As a consequence, they do not invest in the development of mutual trust. The result may be the unforeseen end of the partnership or ineffective results – understood here as not achieving synergies and complementarities. In other words, partners do not succeed in accessing each other's complementary assets and capabilities. Partnerships are hence not very attractive for knowledge transfer when partners have cost sharing as key motivation (Lee *et al.*, 2010).

How do partnership structures affect knowledge transfer? The characteristics that determine the design of partnerships (structural governance), such as their contractual form and scope, are understood as fundamental for knowledge transfer.

A key finding is that knowledge is transferred and shared more effectively in equity-based partnerships (i.e. joint ventures), if compared to non-equity-based ones. As equity-based partnerships promote direct and frequent interaction, they produce better mutual understanding and favor the adoption of transfer practices at lower cost. Furthermore, their hierarchical structures guarantee *de facto* incorporation of partners' knowledge and stimulate mutual trust (Jiang and Li, 2009), thereby constraining opportunism and unintended knowledge leakage (Yang *et al.*, 2015). This is especially true for situations where technology flows turn the monitoring of partnership activities and the distribution of cooperation rents hard to control, such as the case of combination of already existing technologies (Garcia-Canal *et al.*, 2008).

Remarkably, formal contracts facilitate knowledge transfer between partners that collaborate remotely and are geographically distant. Such governance mechanisms counterbalance the absence of other interaction forms, such as personnel mobility, socialization, face-to-face exchanges and informal ties (Berchicci *et al.*, 2016).

Defined as the extent to which partners combine multiple and sequential functions or value chain activities such as R&D, production or marketing, scope shows a positive

relationship with knowledge transfer. The greater the scope, the greater will be the opportunities for interaction, the sharing of ideas and the development of mutual trust (Jiang and Li, 2009). In investigating the option of partners to reduce the scope of international alliances in face of the risk of technological leakage, Oxley and Sampson (2004) corroborated the relevance of scope for the effectiveness of knowledge transfer. What is more, partnerships in which actors contribute asymmetrically to knowledge tend to favor skill transfers (Dussage *et al.*, 2000).

How do routines affect knowledge transfer? The structural elements are complemented with a perspective that emphasizes the coordination mechanisms through which interactions between partners occur, i.e. processes and routines. Such coordination mechanisms are part of the so-called procedural governance – instruments that regulate the day-to-day aspects of interactions.

Zollo *et al.* (2002) introduced the concept of interorganizational routines, defined as stable patterns of structural governance interactions developed between partners over repeated collaboration agreements. Prior experience with specific partners favors the formation of such routines. As they facilitate information sharing, communication, decision making and conflict resolution, they contribute to the achievement of expected results. This aspect applies particularly to non-equity-based alliances. Companies that have a background of partnerships with specific allies have less need of formal structures to align incentives and monitor activities. In this way, interorganizational routines can be seen as substitutes of the more formal mechanisms of coordination, which are generally found in equity-based partnerships. Social interactions between partners play an important role in this regard, particularly when a partnership involves a more experienced firm in alliance management. More intensive and frequent interactions provide room for the development of mutual trust and enhance tacit information exchange, thereby contributing to the exposition of the routines of the more experienced partner, including those related to external collaboration (Howard *et al.*, 2016).

Alliance management routines perform a coordination function (Ireland *et al.*, 2002; Kotabe *et al.*, 2003), whose primordial role is to support the flow of information between partners, facilitate learning and, at the same time, protect strategic knowledge. Managers need to understand the partner's objectives relative to learning and to establish appropriate monitoring mechanisms as to achieve alignment at the strategic, relational and operational levels. The coordination activities involve observing whether the partnership meets particular objectives; whether there is balance in the degree of importance given by the partners; whether the partnership will deliver the expected value; what will be the response of the stakeholders; and whether there are differences between the organizational structures and how possible conflicts will be managed (Ireland *et al.*, 2002).

An example of the importance of alliance management routines is presented in Inkpen's (2008) study of the joint venture formed between GM and Toyota, NUMMI. The case details the creation of the mechanisms supporting each partner's learning process, which proved to be fundamental for the exploitation of the opportunities of knowledge application and for the breakdown of transfer barriers related to causal ambiguity. Examples include training, visits, documentation and consulting services. It was the establishment of these specific mechanisms and the involvement of a large number of staff that guaranteed systematic and continuous knowledge transfer.

However, interorganizational routines may also act as barriers. According to Dyer and Hatch (2006), knowledge embedded in routines can only be transferred if a new set of routines is implemented by the recipient organization, what makes the process considerably more difficult.

Beyond routines, other coordinating tools include the integration of systems and databases and market knowledge related to customers (Cheung *et al.*, 2011).

How do relations in a partnership affect knowledge transfer? In addition to structures and processes, there are important relational and cognitive factors that affect knowledge transfer. Among the relational governance factors, the literature emphasizes the role of trust, control and the perception of justice. Among the cognitive factors, it highlights cultural differences, collective identity and the formation of interorganizational teams.

Trust and control influence not only the definition of objectives, such as knowledge transfer, but also the choice of the type of contract and the establishment of rules (Ireland *et al.*, 2002). Amesse and Cohendet (2001) argued that the functioning of partnerships depends to a large extent on mutual trust, as it reduces the risk of super specialization and facilitates cooperation. In general, empirical studies point to a positive relationship between trust and partnership performance (Ireland *et al.*, 2002; Lane *et al.*, 2001). Trust determines the effort spent in collaboration, the commitment and the disposition to take risks, thereby reducing transaction costs (Inkpen and Tsang, 2005). Defined as the conviction and belief in another party in a risk situation in which the possibility of opportunistic behavior exists, trust is an outcome of the relationship between actors and the institutional context. Control relates to the process utilized by a player to influence others to behave in a determined manner, using power, authority, bureaucracy or peer pressure (Inkpen and Currall, 2004). In partnerships, controls may be formal – judicial actions, directives and periodical meetings – or informal – values, unwritten codes of conduct, norms and culture. The latter is known as relational governance (Mesquita *et al.*, 2008). Inkpen and Currall (2004) proposed a dynamic relation of substitution between trust and control. The presence of trust minimizes the need for control and vice versa. As time goes by, partners learn about each other and partnerships become operational entities, changing the level of trust. The authors portrayed trust as a non-static and evolutionary element, which is by-product of the interactions between the parties involved.

The common sense of justice is another outcome of the relationship between partners that produces effects akin to trust. It improves efficiency, increases engagement and reduces operational and administrative costs. Conceptualized as “procedural justice” (Luo, 2005), it concerns the criteria adopted in decision-making and execution processes such as impartiality, representativeness, transparency and ethics. By diminishing the need for control and conferring stability to the relationship, procedural justice affects positively knowledge exchange. Luo (2005) found that profitability is greater when there is a common understanding of procedural justice. His empirical evidence reveals that the shared sense of justice becomes more important for partnerships portraying a high degree of uncertainty and internationalization, that is, when the cultural distance between partners is large.

Research further highlights the importance of building a collective identity – the development of a common objective, as well as of joint rules and regulations. The case of the joint venture formed between Renault and Nissan, which started from an unstable relationship with dubious potential for synergy, reveals the role of managerial support for the consolidation of a collective identity as a means of conferring legitimacy to the collaboration (Segrestin, 2005). A key driver in the process of building a collective identity is interorganizational teams, to the extent that they promote the formation of shared meanings about the partnership’s strategy and objectives. In this regard, Mesquita *et al.* (2008) and Cheung *et al.* (2011) emphasized the investment in relation-specific assets as mechanisms of knowledge integration, information exchange and joint problem solving. Such investment supports the development of a shared memory where values and beliefs are stored and later incorporated into routines and other formal and informal processes.

How does knowledge absorption occur in a partnership? The literature identifies the abilities of partners to learn from each other, conceptualizing it as “relative absorptive capacity” (Schildt *et al.*, 2012). The capability of an organization to assimilate and

utilize outside knowledge is neither absolute nor stable, but depends on the knowledge source, once it is specific to each relationship. Relative absorptive capacity is determined by the degree of similarity between partners from a technological (i.e. knowledge base), a cultural – i.e. formalization, centralization and compensation practices (Ireland *et al.*, 2002) and an institutional standpoint – compatible norms and values and similar operational priorities or dominant logics (Lane *et al.*, 2001). By the same token, knowledge exchanges between partners may be asymmetrical. Yang *et al.* (2015) introduced the concept of “partner-specific learning capability” as to highlight the competitive dimensions of learning in a multi-party setting. One firm may out-learn a partner by developing processes and routines that enable the acquisition of partner’s know-how quicker than the partner, while simultaneously using safeguards against unintended transfer of information.

Recent studies show that the evolution of relative absorptive capacity is rather intricate. Schildt *et al.* (2012) found that it takes the format of an inverted U-shaped curve, thereby introducing dynamics into the construct. While there is a lot of knowledge exchange in the initial period of a partnership, when relative absorptive capacity is under development, it decreases with time, as the partner’s knowledge loses relevance. Interorganizational relationships thus evolve with time: as collaboration matures, ties and routines for knowledge transfer are developed together with partner-specific knowledge, which, in turn, transform the initial relative absorptive capacity.

Another mechanism used for knowledge absorption is managerial involvement via supervision and daily operation; the latter being most effective. This holds true especially in young joint ventures, where exchange flows and information-processing channels are not yet development, turning knowledge acquisition via direct channels difficult. The more strategic a joint venture is, the higher the investment of managers’ time and, consequently, the higher the learning (Tsang, 2002).

3.2.3 Organizational factors. A significant part of this research body is dedicated to investigating how firm-level characteristics – of the source and the recipient organizations – affect knowledge transfer. It discusses capabilities (e.g. alliance management[8] and alliance learning capability), intangible resources (e.g. credibility, previous experience), behavioral aspects (e.g. motivation, credibility and trust) and internal processes.

Which organizational characteristics affect knowledge transfer? A fundamental characteristic examined in various studies refers to the experience of the company in forming partnerships, which determines its ability to recognize, assimilate and apply external knowledge (Draulans *et al.*, 2003). Previous alliance experience also contributes to the speed of knowledge integration on the part of the recipient organization, in particular when sourced knowledge is distant from the company’s knowledge base or when partners are unknown to each other (Tzabbar *et al.*, 2013). Openness to external knowledge partners is an outcome of the evolution of past experiences, in the sense that it encompasses an interactive process of information processing for the selection of adequate partners and for the development of management systems designed to handle relationships (Love *et al.*, 2014). In addition to general experience, experience with a specific partner is also relevant (Hagedoorn *et al.*, 2011; Inkpen and Tsang, 2005), to the extent that it facilitates the development of interorganizational routines and diminishes the probability of opportunistic behavior (Zollo *et al.*, 2002). According to Liu and Ravichandran (2015), information technologies (ITs) enhance learning from past experiences, once they both support knowledge spillovers and mitigate the barriers in such spillovers. IT supports knowledge sharing and distribution and thereby contributes to overcome the challenges of handling tacit knowledge. On the one hand, learning from past experiences demands des-contextualization and the ability to generalize from acquired knowledge. On the other hand, knowledge reutilization requires the search and the selection of appropriate routines for the new context. Once managers are subject to cognitive limitations, IT contributes to diminish potential biases.

Numerous studies emphasize the importance of accumulating experience with a broad range of partners for firms to develop an alliance management capability (Kavusan *et al.*, 2016), defined as the mechanisms and routines utilized to accumulate, stock, integrate and disclose relevant organizational knowledge on alliance administration (Draulans *et al.*, 2003). An organization's success increases as it enters more partnerships, however, at a decreasing rate, suggesting the existence of an optimum portfolio size (Frankort *et al.*, 2011; Vandaie and Zaheer, 2015). This evidences the existence of an alliance management capability, but at the same time points to its limit, which is around six alliances. In line with Draulans *et al.* (2003), Schilke and Goerzen (2010) and Ireland *et al.* (2002) also discussed the concept of alliance management capability and found similar empirical results.

For Frankort *et al.* (2011), a firm reaches the greatest knowledge inflows with a portfolio of intermediate size and with a balanced mix of novel and repeated partners. Vandaie and Zaheer (2015) also noted the negative consequences of a broad portfolio of partnerships with respect to knowledge absorption stemming from partnerships with resource-rich and resource-poor partners. This is attributed to the frustration of the expectations of the resource-rich firm in relation to the facilitating role a resource-poor partner is able to play in the collaboration. Since the resource-poor partner has a broad portfolio of partnerships, the resource-rich firm realizes that its investment capacity in the partnership will be divided between diverse partners.

Experience thus seems to promote interest alignment and facilitate the exploitation of complementarities. In this regard, partner repetition allows the firm to benefit from established routines supporting knowledge exchange. Yet, new partners bring in novel inputs that expand the partnership's learning potential. In face of technological uncertainty, firms profit mostly from leveraging established routines, since they limit eventual problems related to the understanding, identification and recognition of new knowledge. For this reason, a firm tends to form partnerships with repeated partners or with partners of its partners in contexts of high uncertainty, as long as there is still knowledge to be explored (Hagedoorn *et al.*, 2011).

In the view of Schilke and Goerzen (2010), alliance management capability is a second-order construct, formed by a set of routines connected to interorganizational coordination, alliance portfolio coordination, interorganizational learning and market proactivity (i.e. the capacity to understand the environment and identify new market opportunities). These authors found that a dedicated function to alliance management has a positive effect on final performance. For Ireland *et al.* (2002), alliance management capability is equally qualified as fundamental to gaining competitive advantage and creating value with collaborative arrangements. Effective alliance management includes a thorough consideration of the benefits an alliance aims to obtain and a careful selection of appropriate partners.

In addition to management systems, there are behavioral factors to be considered, such as motivation and credibility. The lack of motivation, either from the source or the recipient organization, sets up barriers that make the learning process challenging. This can be ascertained through the time spent in the knowledge transfer process. In the case of Toyota, for instance, the longer the company exchanged knowledge in its supplier's factory, the quicker it improved performance. The lack of credibility refers to the source organization and arises out of a subjective evaluation made by the partner and is connected to the trust established between them (Dyer and Hatch, 2006).

Several authors have dealt with cultural differences. Bhagat *et al.* (2002) studied the influence of culture on knowledge transfer, particularly when partnering organizations come from different countries. They proposed a theoretical model based on the premise that each society transfers and absorbs knowledge in a distinctive manner, depending on the standards of cultural action that characterize it: individualism–collectivism and verticality–horizontality.

Such standards determine the forms and preferences for the various types of knowledge (explicit vs tacit, human vs social vs structured). Their key argument is that interorganizational knowledge transfer is most efficient when partners are located in contexts with identical cultural standards. Also for Ireland *et al.* (2002) and Inkpen and Tsang (2005), the less the cultural distance between the partners, the easier it is the exchange of any type of knowledge.

Kotabe *et al.* (2003) corroborated this argument by showing that the effort of transferring knowledge from one country to another is difficult and potentially unfruitful. In an investigation of American and Japanese suppliers of the automobile industry, they found that the specificities of each country must be observed. In Japan, companies are more reluctant to exchange partners and encounter difficulty in benefiting from short-term relationships for the exchange of technical knowledge. In the USA, companies take longer to reap the benefits of technological transfer as compared to Japan, but achieve short-term gains in the exchange of technical knowledge. The time duration of the relationship is an important mediator between knowledge transfer and the performance of the recipient organization.

Conversely, the findings of Cheung *et al.* (2011) point to a decrease of relevance of cultural differences. The reason is attributed to one of the most important outcomes of globalization, namely, the cross-pollination beyond national borders, which has fostered a cohort of multicultural managers.

What is necessary for an organization to receive external knowledge? An organization needs absorptive capacity, autonomy (to circumvent network restrictions), flexibility (from the point of view of production), internal processes of knowledge dissemination and training.

Possibly one of the most studied constructs in this literature absorptive capacity refers to the capability of the recipient firm to recognize, transform and assimilate external knowledge. One first important differentiation is between individual and collective absorptive capacity. Collective absorptive capacity is the sum of individuals' absorptive capacities and of organizational characteristics such as coordination and motivation. In order to absorb new external knowledge, individuals need to change the way they think, act and conduct their activities, as well as how they communicate with colleagues. A second characteristic is the resistance of individuals to new knowledge, which brings uncertainty and the possibility of the loss of privileges. Consequently, motivation must be present. A high degree of collective absorptive capacity helps overcome the challenges connected to coordination and motivation (Zhao and Anand, 2009).

Zhang *et al.* (2007) examined how resources and structures affect knowledge transfer. They argued that absorptive capacity is not determined exclusively by R&D expenditure, but also by management. The breadth of the knowledge base and the centrality of the R&D department influence positively a firm's absorptive capacity and, consequently, its propensity to form partnerships. Defined as the number of knowledge fields covered, the breadth of the knowledge base confers greater ability to recognize and assimilate the development of potentially new technologies. Likewise, when R&D is centralized (concentrated in few business units), central planning and control take place at the corporate level. This results in faster decision-making processes, greater capacity to renew knowledge, as well as economies of scale and scope that are beneficial to alliances. In a similar vein, Lane *et al.* (2001) noted that new knowledge acquired from a partner in a joint venture only impacts learning if combined with high levels of training provided by the source organization. Through training the source organization helps the partner to understand the applicability and meaning of this knowledge, thereby minimizing ambiguity and tacitness.

Likewise, the management of the recipient organization plays a role in the internal process of knowledge dissemination (Inkpen, 2008). In the case of NUMMI, GM learned how

to capture and share internally the knowledge obtained through the joint venture. It established a well-informed process that included, among other mechanisms, the choice of appropriate personnel and specific training. It is not enough to expose individuals to new knowledge; the creation of internal mechanisms of knowledge dissemination is necessary too. Experimentation by the recipient organization is similarly crucial. As learning processes are marked by trial and error, it is only through the course of collaboration that the opportunities for knowledge exploitation become clear (Inkpen, 2008).

The lack of adaptability in organizations is considered a barrier to knowledge transfer. For Dyer and Hatch (2006), barriers exist even when partners are motivated and the recipient organization shows high levels of absorptive capacity. Knowledge transfer may become difficult and costly in the presence of network restrictions and of rigidity in the internal processes. Network restrictions are the policies or specific demands of each partner that determine the production process. In the case of the automobile industry, suppliers are subject to marked differences in the specifications of each client. These restrictions limit the adoption of best practices for all the buyers. In an analogous fashion, the rigidity of internal processes refers to the lack of flexibility of the recipient organization in changing its production line. For example, in highly automated factories, suppliers do not always manage to adapt their productive process due to the pre-established layout (Dyer and Hatch, 2006).

3.2.4 Individual factors. There is relatively limited research about the behavior of people involved in partnerships. The majority of papers deal with interorganizational knowledge transfer from a collective and non-personalized perspective. The few studies that work at this level of analysis identified the following variables as relevant: motivation, cognitive styles, emotions, learning behavior, individual absorptive capacity and resistance.

What leads individuals to transfer knowledge? Individual motivation, be it intrinsic or extrinsic, is related to distinct forms of knowledge transfer. Since the transfer of tacit knowledge can neither be observed directly nor attributed to one person, it cannot be rewarded. It depends, therefore, on the intrinsic motivation of individuals. The challenge resides in the fact that companies have little control over this aspect. Contrariwise, the transfer of explicit knowledge is visible and may be rewarded and encouraged. It is therefore better leveraged by extrinsic motivation. However, both incentive mechanisms cannot coexist due to the prevalence of a crowding-out effect. An individual intrinsically motivated to perform a determined task may lose such motivation if he or she receives a financial reward, leading him or her to depend on extrinsic mechanisms in the future. This makes the management of motivation a complex issue and, at the same time, a fundamental one (Osterloh and Frey, 2000).

Emotions are another variable that impact how individuals behave in interorganizational settings, as to cope with the uncertainties related to partners' behavior. In a context in which some knowledge needs to be shared and some knowledge needs to be protected, emotions provide the cues to individuals to interpret events and to decide whether or not to "segment" knowledge of sensitive nature, that is, to switch from not sharing knowledge to sharing gradually knowledge bites in a self-regulated dynamics (Jarvenpaa and Majchrzak, 2016).

How do individuals learn? Knowledge transfer across organizations necessarily encompasses the process through which individuals assimilate knowledge. Bhagat *et al.* (2002) elaborated on this issue by drawing on the concept of cognitive styles. They identified three distinct individual styles: tolerance for ambiguity, signature skills and mode of thinking. In their view, each cultural context favors certain cognitive styles to the detriment of others. Individuals with a high tolerance of ambiguity deal better with tacit, complex and systemic knowledge. Signature skills refer to favorite problem solving and information-seeking styles developed by each person, including his or her cognitive approach (the way of structuring a question) and preference for certain tasks, tools and methodologies. Individuals with very

distinct signature skills will experience greater difficulty in exchanging knowledge. Mode of thinking refers to how an individual analyzes information. Those taking a holistic perspective analyze the whole spectrum of available information in an associative manner before using it, while those taking the analytical perspective scrutinize each portion of information separately. Bhagat *et al.* (2002) contended that individuals with different modes of thinking will encounter greater challenges in learning from each other.

In addition to the diversity of styles, individual learning behavior can be formal (via planned events) or informal (via spontaneous interactions). Both formal and informal learning behaviors have positive effects on learning that are complementary. Formal behavior through projects and visits encourages informal behavior, that is, socialization beyond organizational boundaries. The latter, in turn, facilitates the overall exchange of tacit knowledge. There is nevertheless a limit to this relation, once a high degree of formalization restricts learning to the extent that it stifles informality (Janowicz-Panjaitan and Noorderhaven, 2008).

Also Zhao and Anand (2009) identified the importance of individual absorptive capacity and the necessity of individuals to change their mindset, the way of acting and conducting their daily activities, as well their communication style. They further pinpointed the resistance of individuals to new knowledge, which brings uncertainty and the possibility of loss of privileges.

3.3 *Theme 3: consequences of interorganizational knowledge transfer*

In addition to the results obtained by the partnership as a whole, there is a vivid discussion about how to measure learning outputs and their effects on individual organizations.

How to evaluate knowledge transfer? A fundamental issue from the perspective of partners is the evaluation of the effectiveness of knowledge transfer. Nevertheless, most scholars do not explicitly refer to this aspect and seem to infer a dichotomous judgment, based on whether or not knowledge transfer took place. The works of Bozeman (2000) and Bozeman *et al.* (2014) expand this evaluation in proposing seven parameters and indicators.

The first criterion – “out of the door” – evaluates whether the organization received (or not) knowledge from the partner, without considering its impact. Because of its practicality and ease of measurement, it is the most used criterion. Bozeman (2000) called attention to its limitations, because the recipient organization may or may not have implemented external knowledge *de facto*. The second criterion refers to the market impact in terms of commercial outputs such as profitability and market share. The third one is economic development and contemplates similar effects to the previous criterion, but from a collective perspective that goes beyond the gains achieved by an organization individually. It considers, for example, the financial impact of knowledge transfer on the economy of a region. The political criterion is the fourth one and is based on the expectation of non-financial rewards. It may translate into support for a social group, the legitimization of a policy or for the expansion of political influence. The opportunity cost criterion examines the choices for the utilization of resources employed and their possible impact on other knowledge transfer tasks. The criterion of human, technological and scientific capital takes into account the gains accrued in the development of the people implicated in the process, that is, if there has been technically relevant learning for a determined work group. Finally, the criterion of public value analyzes more wide-ranging objectives of public interest connected to societal grand challenges, e.g. sustainability of the planet (Bozeman *et al.*, 2014).

How does knowledge transfer affect organizational performance? The types of performance improvements organizations achieve through partnerships are subject to extensive debate and a myriad of empirical exercises. Mesquita *et al.* (2008) proposed an interesting distinction between redeployable and relational performance. They called

“redeployable performance” the gains that improve general firm performance as to refer to the learning that is not adapted to the needs of a specific partner and that can be used in other contexts. Contrariwise, they referred to “relational performance” as the specific gains of the intimate and symbiotic interaction brought about by the dyad. Relational performance may not be appropriated by organizations outside the partnership, as it arises from dyad-specific investments in assets and capabilities and from the acquisition of know-how within and the dyad. The study of Cheung *et al.* (2011) corroborates the relationship effects for performance too, while emphasizing that outcomes differ for each party in buyer–supplier agreements. Yet, evidence is not entirely positive. Beamish and Berdrow (2003) suggested that there is no direct relationship between learning and joint venture performance in terms of operational and financial gains.

Regarding the consequences of partnerships for organizational performance relative to innovation output, the work of Frenz and Letto-Gillies (2009) noted that the acquisition of knowledge through alliances is less efficient than the acquisition of knowledge through own investments, R&D purchase and intra-firm transfer. For international collaboration, the effects are positive for internal networks; while very small for external networks. That is, collaboration between units produces more benefits relative to innovation. One possible explanation is the sharing of organizational culture, which may facilitate the exchange of knowledge within the same company (e.g. expatriate programs guarantee face-to-face interaction). In contrast, Herstad *et al.* (2014) found that global innovation linkages are positively associated with technology and markets opportunities, since they generate more sales from innovation. Grimpe and Sofka (2016) detected complementary effects between relational collaboration that involves partner-specific investments and transactional collaboration occurring via external R&D contracts and in-licenses in markets for technology. Only the joint adoption of both collaboration strategies enhances innovation performance, as they allow firms to simultaneously overcome the disadvantages of each approach and to leverage scarce absorptive capacities most efficiently. The complementarity effect is stronger in industries with less developed markets for technology.

Following a similar reasoning, other contributions discovered a more nuanced relationship between technological collaboration and product innovation, where the effect is contingent on market competition, sectoral characteristics (Wu, 2012), absorptive capacity (Tsai, 2009) and technological or market relatedness (Frankort, 2016). Intense market competition diminishes the positive outcomes of interorganizational collaboration, as short-termism and opportunism prevail (Wu, 2012), whereas absorptive capacity enhances effective learning between collaborating firms resulting in new product development outcomes (Tsai, 2009), especially when partners are active in similar technological domains but operate in distinct product markets (Frankort, 2016).

4. Analysis

With the view of coherently integrating our findings, we adopt an antecedents-process-outcomes framework, in line with Bengtsson and Raza-Ullah (2016) and Oliver and Ebers (1998). We therefore organize our analysis in three blocks: factors that antecede knowledge transfer, the process of transference itself and the outcomes. We classified the antecedents as factors that precede knowledge transfer, either driving the formation of the partnership or throughout it. These are variables that influence an organization’s decision to establish a partnership, like appropriability regimes, technology sophistication (macro context) and the existing internal processes of the recipient firm. In turn, process variables are those directly connected to the operational dimensions of knowledge transfer, such as routines, managerial supervision and social relations. Outcomes refer to the results (gains and losses) obtained through the partnership.

Our interpretation of the systematic literature review indicates that there are six dimensions antecedent to knowledge transfer processes in partnerships, namely, knowledge attributes, the macro context, interorganizational factors, the source organization, the recipient organization and individual factors. With respect to the knowledge transfer process, it is determined by procedural governance, relational and cognitive governance and dynamics, which are the learning effects over time. We further observe that the literature includes two dimensions connected to outcomes: effectiveness and organizational performance. All these dimensions are linked in a novel theoretical framework, depicted in Figure 4. The framework offers an overarching explanation of knowledge transfer in interorganizational contexts, permeated by a myriad of cause-and-effect relationships among multilevel factors.

The links between the antecedents and the process suggest that the same set of antecedents can stimulate knowledge transfer in distinctive ways. For instance, formal contracts (structural governance) may or may not support the development of knowledge sharing routines (procedural governance) (Inkpen, 2008), depending on the level of initial trust among partners, the cultural context they are embedded in (Kotabe *et al.*, 2003), their alliance management capabilities (Draulans *et al.*, 2003; Tzabbar *et al.*, 2013; Zollo *et al.*, 2002), as well as the preference of interacting individuals for formal or informal exchanges (Janowicz-Panjaitan and Noorderhaven, 2008). In a similar rationale, the lack of credibility of the source organization (Dyer and Hatch, 2006) in the partner-specific competence to deliver what was agreed upon influences the investments and effort dispensed by the source firm in the transfer process.

As knowledge attributes and the macro context are independent (not impacted by other variables) and affect other antecedents (as well as each other), they are represented in the

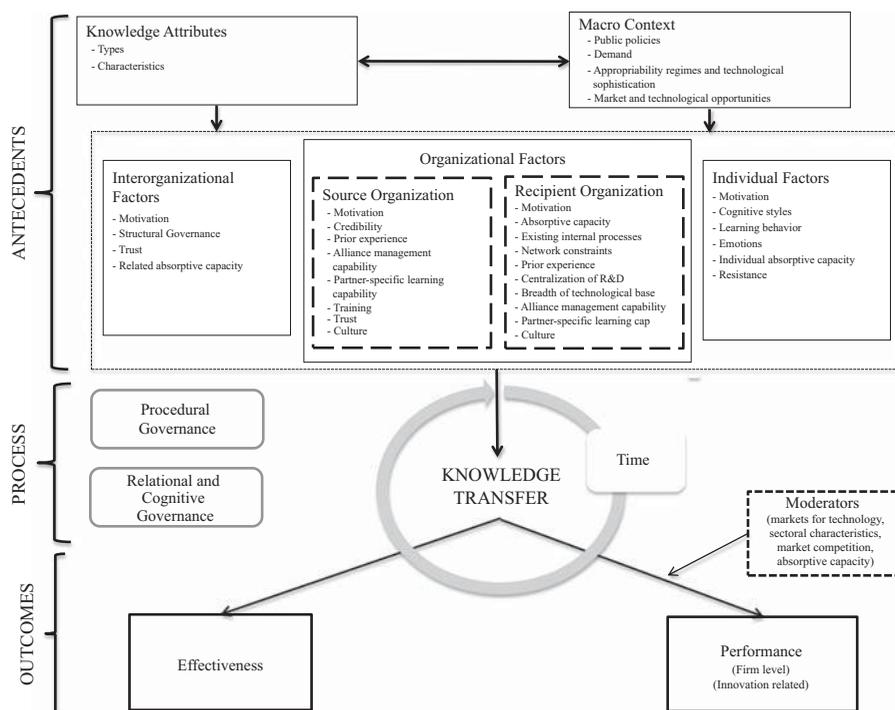


Figure 4. A systemic and dynamic model of knowledge transfer in interorganizational partnerships

outer part of our theoretical framework. Knowledge attributes determine appropriability regimes and technological sophistication of the industry (Hagedoorn *et al.*, 2009), as well as the intellectual property regime (Guennif and Ramani, 2012) and the demand of the State (Bozeman *et al.*, 2014), which, in turn, influence companies' decisions to form partnerships driven by synergy-seeking motives (Lee *et al.*, 2010). Knowledge attributes similarly influence interorganizational variables such as governance. Jiang and Li (2009), for example, argued that tacitness favors joint ventures. At the individual level, tacit knowledge influences the intrinsic motivation to handle external sources (Osterloh and Frey, 2000). Besides, complex and systemic knowledge are privileged in the cognitive styles with greater tolerance of ambiguity (Bhagat *et al.*, 2002).

The knowledge transfer process lies at the center of the framework as to suggest that it is necessary to understand it as a multilevel phenomenon. Characteristics such as causal ambiguity and context dependency determine to a large extent the transfer mechanisms employed. Inkpen (2008) advocated that, as context-dependent and collective knowledge is embedded in routines, it can only be transferred when a new set of routines is implemented. It is during the partners' interaction via mechanisms of knowledge replication and adaptation (Williams, 2007), routines (Inkpen, 2008), training (Lane *et al.*, 2001) and managerial involvement (Tsang, 2002) that partner-specific knowledge advances, and consequently transforms the initial relative absorptive capacity (Schildt *et al.*, 2012). This further indicates that, despite the initial conditions given by the antecedents, the quality of the transfer process determines the outcomes. The efforts and investments made by the source and recipient organizations in adjusting the process in accordance with knowledge attributes (Hagedoorn *et al.*, 2009; Bhagat *et al.*, 2002; Osterloh and Frey, 2000; Schildt *et al.*, 2012); in accommodating different types of governance (Jiang and Li, 2009; Garcia-Canal *et al.*, 2008; Berschicci *et al.*, 2015); in modifying internal structures (Dyer and Hatch, 2006; Tsang, 2002); and in developing and adapting routines (Zollo *et al.*, 2002) facilitate or hinder the achievement of the expected outcomes. Individual learning behaviors are relevant to the form in which the knowledge should be transferred too. For instance, certain knowledge attributes such as tacitness call for more social interactions and mentoring.

When comparing the different facets, it seems noteworthy that antecedent variables assume more central focus within the field than outcomes. The effectiveness of knowledge transfer remains a marginal concern, since most studies (with the exceptions of Bozeman, 2000; Bozeman *et al.*, 2014) assume an implicit dichotomous evaluation of whether or not knowledge was moved, irrespective of its applicability and other intangible by-products, such as the advancement of human capital. Still there seems to be an increasing focus on the performance outcomes, particularly with respect to innovation in more recent years. Existing evidence on performance outcomes of partnerships is overall mixed (Frenz and Letto-Gillies, 2009; Grimpe and Sofka, 2016; Herstad *et al.*, 2014), suggesting great heterogeneity in the extent to which firms are able to capture value from interorganizational knowledge transfer. Several empirical contributions demonstrate that these seemingly contradictory findings stem from a complex and nuanced causal relationship, moderated by a number of contextual variables: markets for technology, sectoral characteristics, market competition and absorptive capacity (Grimpe and Sofka, 2016; Frankort, 2016; Tsai, 2009; Wu, 2012).

As our framework demonstrates, absorptive capacity is a highly relevant concept treated not only as an antecedent (at the interorganizational, organizational and individual levels), but also as part of the knowledge transfer process itself and as a moderator of the relationship between collaboration and innovation outcomes. The literature is, however, not conclusive with respect to the dominating influence of this variable or to which extent the various effects overlap with each other. These are issues that clearly deserve more careful consideration in future studies.

In addition to these cause-and-effect relations, it is worth mentioning that we found relevant time effects, which bring dynamics to the analysis and which we illustrate by the gray circular arrow. Dynamics represent the changing effects of learning upon variables as time goes by. Several authors pinpoint the role of time. Kotabe *et al.* (2003) discussed the importance of the duration of the alliance, which, depending on the culture, may impact knowledge transfer in a positive or negative fashion. Dyer and Hatch (2006) pointed out the need to invest time in the knowledge transfer process, as integration demands commitment (Tzabbar *et al.*, 2013). Segrestin (2005) and Mesquita *et al.* (2008) highlighted the importance of building a collective identity, while Inkpen and Currall (2004) contended that partners learn about each other and change the level of trust as collaboration matures. Likewise, time changes the macro context, and the combination of both can modify the motivation to join partnerships at different levels – interorganizational, organizational and individual. Individual factors, such as resistance, emotions and individual absorptive capacity, also evolve with time. For instance, if uncertainties related to partner's behavior are mitigated, knowledge sharing may be improved (Jarvenpaa and Majchrzak, 2016).

By elucidating the cause-and-effect relationships and the interactive character driven by time, our framework thus not only illuminates the encompassing picture of knowledge transfer, but also enlightens the role of learning and provides an evolutionary perspective of the process.

5. Opportunities for future research

Our literature review and framework reveal that the study of knowledge transfer requires distinct analytical and methodological approaches. Since interorganizational partnerships are arrangements characterized by different forms of governance and involve at least two organizations, which, in turn, are composed by innumerable individuals, the understanding of knowledge transfer process claims a multilevel analysis. Aspects such as the motivation of individuals and organizations to engage in collaboration along with formal and informal governance instruments require different conceptual backgrounds. As our framework was organized around antecedents, process and outcome factors, it elucidated that the understanding of relationship between levels and variables is a vital issue. Moreover, since our framework unravels the dynamic character of collaboration, it calls for longitudinal studies in addition of quantitative cross-sectional methods that prevail in this research stream.

Our literature review discloses that most part of the articles is concentrated in one level of analysis and used quantitative methods. In fact, this concentration poses limitations in terms of inferring causal relationships between variables situated at different levels and hinders the comprehension of their evolution. The papers that discuss dynamics do so in a conceptual manner (with few exceptions such as Schildt *et al.*, 2012; Tzabbar *et al.*, 2013); the empirical evidence being scanty. Even if this is a challenging task due to the inherent efforts in data collection, it is crucial for the future development of research in this field. There is room for multiple approaches that draw on qualitative data more intensely. Case studies may expand our understanding of contextual aspects and uncover less contested issues such as structural governance. Regarding the relationship among different levels, we propose some questions for future investigations. For instance, how does alliance governance – structural, procedural, relational and cognitive—shape individual learning? Does the formation of a collective identity increase or diminish the predisposition of agents to collaborate and share knowledge?

Likewise, our study uncovers that scant attention is devoted to the individuals involved in the knowledge transfer process. Although this may be a reflection of our choice of journals (which have a limited tradition of studies at this level of analysis) and of the dominating concern on the collective level that has traditionally pervaded the strategy and

innovation research fields, the role of individuals is naturally a key point. As a matter of fact, until the novel contribution of Felin and Foss (2005) calling for contributions on the micro-foundations of aggregate concepts, the role of individuals has been largely disregarded. In a recent review on the topic of interorganizational R&D, Smith (2012) also discovered a predominant tendency of researchers to focus on the management and firm level of analysis with few pioneering studies investigating the phenomenon at the micro-level, i.e. the level where knowledge creation and innovation take place. For a special issue on behavioral foundations, Powell *et al.* (2011) similarly contended that the strategy field lacks adequate psychological grounding. Since the field's central concern has been to explain firm heterogeneity, there is a restricted number of studies dealing with individuals and related behavioral aspects.

We also see individual-level investigations as a fruitful and much needed avenue for further research in the area of interorganizational knowledge transfer. We welcome studies focused on individuals to complement and extend the learning mechanisms identified at aggregate levels. A promising question is, for instance: what leads a person to collaborate *de facto* in an interorganizational alliance? In particular, the not-invented-here syndrome (Katz and Allen, 1982) – the negative attitude to knowledge sourcing defined at the individual and the team levels – which may potentially affect interorganizational knowledge transfer, did not appear in the studies investigated in our review.

From an empirical standpoint, as demonstrated in Table AI, the literature prioritizes the context of industry (especially the automobile, pharmaceuticals, IT and telecommunications industries), while the service sector is examined to a limited extent. Whereas many studies focus on the relations between buyers and suppliers, few look into partnerships between competitors. Besides, the majority favors joint ventures and R&D agreements, with limited attention to other forms of collaboration. In the current political agenda where public-private partnerships are highly valuable as objects of public policy in many countries, this would be a subject of great practical interest. The bulk of the literature investigated in this review focuses on private companies, without questioning the legitimacy of the results for partnerships involving public organizations. We therefore encourage the development of studies in this empirical context too.

6. Conclusions

Knowledge transfer is central to the development of competitive advantages, as organizations increasingly depend on partnerships with external partners. However, this is far from a trivial task, especially when it takes place in interorganizational arrangements. Our systematic literature review aims at uncovering the state-of-the-art on this topic by addressing the following questions: What factors impact knowledge transfer in interorganizational alliances? How do these factors interact with each other? Our study extends existing literature in three ways. First, we offer a synthesis of the variables, how and why they influence knowledge transfer in partnerships. Given the complexity and heterogeneity of the field, we point out the position of individual variables and their segmentation, emphasizing areas of divergence and convergence that had not been self-evident in the literature. We also identify themes that are less well investigated and contested, indicate methodological deficiencies and other weaknesses. We particularly pinpointed the need for multilevel inquiries since, in our view, important interactions have so far not received the attention they deserve. In this way, we have suggested an agenda for future research.

Second, we bring together our main findings in a novel theoretical framework that integrates antecedents, process and outcomes. In the framework we elucidate the cause-and-effect relationships among factors and their interactive and dynamic character. Therefore, our model not only illuminates the systemic picture of the knowledge transfer process, but

also enlightens the role of learning and provides an evolutionary perspective of the process. In this way, we hope to facilitate the dialogue between otherwise unconnected approaches.

Third, we offer recommendations for practitioners who face the challenge of developing a suitable environment for learning in an interorganizational partnership. A possible reason for the high failure rate of partnerships may be the lack of a holistic picture of knowledge transfer. Positive outcomes hinge on the ability of managers of the partnering firms to see how multiple levels affect one another throughout the collaboration process. Alliance managers may make use of our study to improve and adjust contracts, structures, processes and routines, as well as to build the support mechanisms that guarantee effectiveness in knowledge transfer.

Although there exists limited understanding about the practical implications, since research results offer a restricted set of insights on the “how-to-do,” some takeaways are worth mentioning. As a starting point, partnership managers should try to characterize and understand in depth the attributes of the knowledge at stake. This initial characterization may help him or her to dimension the challenge in question and find adequate transfer mechanisms. In striving to achieve fit between knowledge, partner characteristics and appropriate governance, managers should think hard which transfer processes to implement, including routines, training, visits and informal social interactions. As regards the partner, managers ought to observe his motivations and previous experiences that indicate his capability to manage alliances, thereby favoring partners with whom they enjoy prior experience and a trustworthy relationship. Partners of partners may also be considered, particularly in cases where novel inputs are needed and there exists limited technological uncertainty. Yet, expanding too far the number of collaborations in play at a given point of time is a risky endeavor. A very extensive portfolio of partnerships likely diminishes a firm’s ability to capture value from interorganizational knowledge transfer. The organizational structure with respect to the position of the partner’s R&D department may be a valuable indication (and a fairly easily one to assess) of proficiency in using external knowledge, alongside the breadth of the knowledge base. Regarding his or her own organization, managers should evaluate motivation, absorptive capacity and flexibility of existing structures. An honest and careful appraisal of his/her capability to manage partnerships is recommended too. Another aspect to consider is time. The duration of the agreement, the time dedicated to knowledge transfer, the evolution of absorptive capacity and trust, and the time needed for knowledge integration are some crucial issues. Finally, the individual motivations, as well as their cognitive styles and learning behaviors should be assessed.

Our results are relevant for policy makers too; in special those formulating policies in countries that have opted for partnerships as a way of promoting technological catch-up in selected sectors. For policy makers, it is crucial to disentangle the drivers of the learning process, as to be able to design more effective mechanisms and incentives for a stimulating environment where the choice to form partnerships for knowledge transfer is made.

Having said this, we are aware that our study could have been improved in various ways. The papers from the ten journals we examined certainly do not exhaust the population of papers on interorganizational knowledge transfer. As we covered the leading journals in the fields of strategy and innovation studies, we are nevertheless confident that we covered a representative sample of the most influential research; albeit not fully comprehensive. Our choice of journals also limits our capacity to make proposals for public policy, as there are few studies dedicated to this issue. The selection of keywords represents another limitation worth mentioning. Even if we included a broad range of search terms encompassing relevant synonyms of “knowledge transfer” and “partnership,” some have been left out. The keyword cluster, for instance, was not added; even though it might represent an important phenomenon connecting the interorganizational and macro levels. Finally, our triangulation strategy was limited to coder triangulation, as both authors carried out an independent classification of papers. Yet, it did not include other reliability measures such as a citation analysis.

Notes

1. For a detailed review of the literature on absorptive capacity, see Lane *et al.* (2006) and Volberda *et al.* (2010).
2. Search term used in the EBSCOhost Search Screen – Advanced Search Database – Business Source Premier: JN “*journal name*” AND (AB *keyword1* OR TI *keyword1*). Date from 2000 to 2017.
3. Keywords used in the literature search: knowledge transfer, technology transfer, alliance, network, consort*, collaborat*, co-opet*, coopet*, interorgani*, inter-organi*, interfirm, inter-firm, joint venture and partnership.
4. Our paper quite solely focuses on “knowledge transfer,” which includes the search, acquisition, assimilation and integration of knowledge (Fileri and Alguezaui, 2014). Other perspectives emphasize that knowledge is not only transferred, but also co-created in interorganizational contexts.
5. We included in our search the journal *Administrative Science Quarterly* too; yet none of the retrieved paper was selected.
6. Variables relative to time are treated across themes.
7. Cumulativeness is associated with complexity and system embeddedness, which implies the necessity of more communication and opens the possibility of lock-ins to collaboration partners. Regarding appropriability, engaging in collaborative knowledge development entails exposure of proprietary knowledge and opens space for uncertainty concerning the control of jointly developed knowledge assets.
8. For more details, see Wang Y. and Rajagopalan N. (2015) and Andrevski *et al.* (2016).

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Further reading

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Appendix

Article	Key issue	Empirical context	Partnership form	Data	Main results
1 Williams (2007)	The various mechanisms of knowledge transfer	Telecommunication services in various countries	Technology licensing agreements	Survey	Adaptation and replication are distinct mechanisms used simultaneously during the knowledge transfer process. The more causal ambiguity, the more replication. The more context dependency, the more adaptation
2 Inkpen (2008)	Transfer of knowledge from the perspective of organizational processes	Automobile industry in the USA and Argentina	Joint ventures	Interviews	Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors
3 Dyer and Hatch (2006)	The role of network resources in influencing firm performance	Automobile industry in the USA	Vertical between suppliers	Survey/ Interviews	Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific
4 Mesquita <i>et al.</i> (2008)	The types of competitive advantage brought by vertical alliances	Equipment industry in the USA	Vertical between suppliers	Survey	Conciliation of the two theories (resource-based view and relational view) regarding competitive advantages derived from networks (redeployable and relational performance), which complement each other
5 Kotabe <i>et al.</i> (2003)	The sources of operational performance improvement in supplier partnerships	Automobile industry in Japan and USA	Vertical between suppliers	Survey	The role of relational assets and the importance of the distinction between simple techniques and higher-level technological capabilities in the study of inter-firm relationships
6 Inkpen (2000)	Firms' learning behavior in alliance through processes, teams, management	—	—	—	Learning is often an important motive but will generally not be the primary one. More typical are partnerships where

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Table AI.
Articles included in the review by key issue, empirical context, partnership form, data and main results

Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
7 Schildt <i>et al.</i> (2012)	Absorptive capacity and its influence in learning of alliances	ICT industry in the USA	Joint ventures	Survey	<p>partners openly recognize the asymmetrical objectives and an expectation of learning via private benefits</p> <p>Knowledge is transferred through long-term routines. Due to the difficulties in sharing learning, the analysis is restricted to the industrial environment, which demands complex knowledge. The partnerships formed seek new opportunities in the acquisition of learning, however, they do not differentiate between the process of alliance formation and the intentions in the acquisition of a new knowledge</p> <p>There are important distinctions between the transfer of individual and collective knowledge. The authors uncovered mechanisms that can be compared between different levels, such as collective learning and individual knowledge</p> <p>Intrinsic motivation plays a key role for the firms because it is strongly related to the need to generate and transfer tacit knowledge</p> <p>The experience with a specific partnership has a positive impact on the performance of the alliance. This effect is stronger in non-equity-based governance. A specific partner or technology influences the results of the alliance in terms creating opportunities and</p>
8 Zhao and Anand (2009)	Collective and individual knowledge transfer, absorptive capacity	Automobile industry in China	Joint ventures and R&D collaboration agreements	Survey	
9 Osterloh and Frey (2000)	Intrinsic and extrinsic motivation for tacit and explicit knowledge transfer	–	–	–	
10 Zollo <i>et al.</i> (2002)	“Routinization” between the partners and its influence in cooperative agreements.	Biotechnology and pharmaceutical industry	Collaborative agreement for manufacturing/R&D	Survey	

(continued)

Article	Key issue	Empirical context	Partnership form	Data	Main results
11 Inkpen and Currall (2004)	Evolution of trust, control and learning in partnerships	–	–	–	supporting partners to reach strategic objectives Trust and control evolve over time. In collaborative processes, trust creates initially a climate in the partnership that helps to define the interactions between the partners affecting over time the objectives defined <i>a priori</i> It identifies four standards of cultural actions, dealing with their potential to moderate the effectiveness of the knowledge transfer beyond organizational boundaries. Culture is defined in terms of individualism–collectivism and verticality–horizontality The shared sense of justice becomes increasingly important for the gains with the alliance when the latter presents a structure of high uncertainty (characteristic of emerging markets) or when the cultural distance between the partners in the firms is high (characteristic of international cooperative alliances)
12 Bhagat <i>et al.</i> (2002)	Effectiveness of knowledge transfer of the firm in different cultural contexts	–	–	–	Collaboration strategies for knowledge transfer are advantageous in the long term when the partners share synergy-seeking motives in accessing complementarities among themselves. The same does hold true when the motive for forming the partnership is cost sharing
13 Luo (2005)	Perception of justice (procedural justice) between international cooperative alliances	Industrial sector (manufacturing) in China	Technical/Productive cooperation agreements	Survey/Secondary data	
14 Lee <i>et al.</i> (2010)	Trade-off between cost-sharing and synergy-seeking drivers for the long-term knowledge transfer	High technology industry (IT, biotechnology, semiconductors) in the USA	R&D collaboration agreements	Secondary data	

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
15 Jiang and Li (2009)	The scope and governance of alliances and their implications for the creation, sharing and innovation of the firm	Joint ventures in Germany	Joint ventures	Survey/ Secondary data	Joint ventures are more effective and influential in facilitating the creation and sharing of knowledge. This scope of the alliance does not possess a direct relation with the creation of knowledge. Knowledge sharing, its creation and interaction contribute significantly to innovative performance of the partnering firms
16 Janowicz-Panjaitan and Noordervan (2008)	Formal and informal learning behavior of individuals	Joint ventures in Poland	Joint venture between international competitors	Survey	Informal learning behavior has a positive effect on knowledge generation and on the formal behavior of learning. A lot of formality in the generation of organizational knowledge obstructs learning. Formal behavior encourages informal learning in creating a barrier beyond the boundaries of the firm. An excess of formality protects knowledge
17 Bozeman (2000)	Synthesis and critique of multidisciplinary literature on technology transfer between university and industry	–	R&D collaboration agreements	–	Development of the contingent effectiveness model for technology transfer. Augments the criteria utilized to measure technology transfer in university-company partnerships
18 Bozeman <i>et al.</i> (2014)	Re-reading of the work of Bozeman (2000) aggregating new tendencies in technology transfer	–	R&D collaboration agreements	–	Re-reading of the work of Bozeman (2000) including the contingent effectiveness model for technology transfer, the interest in the public and social value that orientates technology transfer
19 Amesse and Cohendet (2001)	Technology transfer from the perspective of the knowledge-based economy (KBE) theory	Nortel Network (ICT industry in the USA)	Joint production agreement	–	The process of knowledge transfer depends on how firms and other institutions manage knowledge, in particular the co-evolution of their

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Article	Key issue	Empirical context	Partnership form	Data	Main results
20 Frenz and Ietto-Gillies (2009)	The impact of knowledge transfer in alliances on organizational performance	All manufacturing sectors in the UK	R&D collaboration agreements	Survey	absorptive capabilities and their knowledge-transmission strategies The acquisition of knowledge through alliances is less efficient than the acquisition of knowledge through own investments, purchase of R&D and intra-firm transfer. In relation to the international collaboration, the effects are positive for internal networks; in other words, collaboration between units brings more benefits relative to innovation
21 Tzabbar <i>et al.</i> (2013)	A contingency theory to explain the integration of external knowledge	The biotechnology industry in the USA	R&D collaboration agreements	Secondary data	The rate of knowledge integration depends on the type of knowledge source and the degree of familiarity with the acquired knowledge. Prior experience in the formation of alliances in R&D and in the recruiting of scientists from other firms reduces significantly the time that the firm needs to integrate knowledge that is located elsewhere
22 Zhang <i>et al.</i> (2007)	The role of management in fostering absorptive capacity and consequently the formation of alliances	Biotechnology industry in USA and Europe	Strategic alliances	Secondary data	There is a strong substitution effect between the breadth of the knowledge base of the firm and organizational structure. The greater the extent of the knowledge base of the firm and the more centralized R&D structure is, the greater will be the chances of the firm to form strategic alliances
23 Segrestin (2005)	Cooperative alliance formed between Renault and Nissan	Automobile industry	Cooperative agreement of technical/	Interviews and secondary data	The relationships, even collaborative, can be very precarious and experimental. A new collective identity requires a specific management model to developed

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
24 Guennif and Ramani (2012)	Catching up of the pharmaceutical industries in Brazil and India	Pharmaceutical industry in Brazil and India	production assimilation –	Secondary data	common purposes, where new types of contract may arise Indian firms produce more generic products on the basis of the corresponding API – active pharmaceutical ingredient. Brazilian firms have to import API to formulate the medications, paying double the price for having lost the technological catching up and ignoring their internal market The success of alliances in the organization grows in direct proportion to the number of alliances that the organization concludes. Experience with one type of alliance improves the firm's performance
25 Draulans <i>et al.</i> (2003)	The role of prior experience for alliance performance	Large companies in Holland	Strategic alliances	Survey	Four teaching–learning configurations, the group that teaches learns more effectively in a strategic transfer when they transfer knowledge collectively. The sequence of individual learning is less costly than group education, but it delays more and is less effective for transferring collective technological knowledge
26 Zhao <i>et al.</i> (2004)	Learning strategies for collective knowledge transfer	Chinese and USA firms	Joint ventures and R&D agreements	Interviews	The higher the level of technological sophistication of the industries, the higher is the probability that the firm will prefer a fixed licensing agreement with a partner rather than a licensing contract. The stronger the appropriation regime of the industry, the higher is the probability that the firm will prefer a fixed licensing
27 Hagedoorn <i>et al.</i> (2009)	Selection of partners for the technology transfer process	Technology transfer between firms measured by licensing conditions	Technology licensing agreements	Secondary data	that the firm will prefer a fixed licensing

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Article	Key issue	Empirical context	Partnership form	Data	Main results
28 Schilke and Goerzen (2010)	The conceptualization and operationalization of alliance management capability	Machinery, chemical and vehicles industries in Germany	R&D collaborative agreements	Survey	agreement with a partner rather than a standard licensing contract Alliance management capability is reflected in five types of routines: interorganizational coordination, portfolio coordination, interorganizational learning, alliance proactiveness and alliance transformation. Alliance management capability has positive effects on performance The management of alliances is crucial for firms to reach competitive advantage. Effective alliance management begins with selecting the right partner, building social capital and trust-based relationships
29 Ireland <i>et al.</i> (2002)	The management of strategic alliances using as theoretical lenses transaction cost, social network and resource-based view	–	Strategic alliances	–	A firm with a higher specific learning capability relative to its partner's is rewarded with superior stock performance. Equity alliance governance suppresses competitive learning, while market similarity between partners aggravates the learning race Production-based joint ventures are not typically motivated by learning outcomes, and there is no direct relationship between learning and performance Interacting individuals use emotional cues to dynamically adjust their sharing and protecting behavior according to the complexity of sensitive knowledge in
30 Yang <i>et al.</i> (2015)	The performance outcomes of learning race between partners	Computing and biotechnology industry in the USA	R&D collaboration agreements	Secondary data	
31 Beamish and Berdrow (2003)	The learning intent, learning process and performance outcomes	Canadian and US firms engaged in production-based joint ventures	International joint ventures	Survey	
32 Jarvenpaa and Majchrzak (2016)	The role emotions and cognition play in self-regulatory processes for the knowledge sharing-protection tension	–	–	–	

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
33 Frankort (2016)	The performance consequences of alliances from the perspective of both knowledge acquisition and new product development outcomes	IT industry in the US	R&D collaboration agreements	Secondary data	interorganizational collaboration, as well as how such adjustments can be guided by home organization management Firms acquiring more technological knowledge from their R&D alliance partners are on average more productive in new product development, particularly when the technological knowledge base of alliance partners are more closely related and when they operate in different product markets
34 Kavusan <i>et al.</i> (2016)	The impact of technological overlap and alliance experience on both knowledge acquisition and complementarity specialization	IT industry in the USA	Strategic alliances	Secondary data	Alliances between firms sharing moderate-to-high degrees of technological overlap show high levels of knowledge acquisition, whereas alliances between firms sharing either low or high levels of technological overlap display high levels of complementarity specialization. Prior alliance experience positively moderates these relationships There is greater propensity to create joint ventures in alliances in which it is more difficult for the partners involved to control the activities of the alliance and/or where there are more difficulties in distributing cooperation rents according to contributions made individually The positive effect of technological collaboration on product innovation is weaker at higher levels of market competition, yet this relation is positively moderated by high-tech sectors
35 García-Canal <i>et al.</i> (2008)	The influence of technological flows in the choice of governance forms of technology alliances	Multi-industry setting in European Union countries	Strategic alliances and joint ventures	Secondary data	
36 Wu (2012)	The consequences of strategic alliances for product innovation	Multi-industry setting in China	Technological collaboration agreements	Survey data	

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
37 Grimpe and Sofka (2016)	The complementarity between relational and transactional search strategies	Multi-industry setting in Germany	R&D collaboration agreements, external R&D contracting or in-licensing	Survey/ Secondary data	There are positive complementary effects between relational and transactional knowledge search, which is particularly stronger in industries with shallow markets for technology
38 Tsai (2009)	The effects of different types of partners and the moderating role of absorptive capacity on innovation performance	Multi-manufacturing industry in Taiwan		Survey data	Absorptive capacity positively moderates the impact of vertical collaboration (with suppliers and customers), as well as with horizontal collaboration and with universities on product innovation performance
39 Lane <i>et al.</i> (2001)	The relations between learning and performance by segmenting absorptive capacity into three components: trust, relative absorptive capacity and learning structures and processes	Multi-industry and service setting in Hungary	International joint ventures	Survey data	Trust between joint venture's parents is associated with performance of the partnership and not with learning. Prior knowledge acquired from the foreign partner influences learning only if it is combined with high levels of training offered by the parent. There needs to be a high degree of similarity between established problems and priorities, so that new knowledge is recognized
40 Tsang E. (2002)	How firms learn from their collaborative experience and the amount of knowledge acquired by them	Multi-industry setting in Singapore and Hong Kong	International joint ventures	Survey data	Managerial involvement in JVs by the source organization is an important driver for knowledge transfer. This involvement may be through supervision performed by the parent managers or through daily operation; the latter being more important when the JV is new. The greater the strategic importance of a JV, the greater the resources allocated and the greater the learning

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
41 Cheung <i>et al.</i> (2011)	The influence of relational learning on the relationship performance of both the buyer and the supplier	5 Manufacturing companies in various countries (126 cross-border dyads)	Vertical between suppliers	Telephone interview	Three specific types of relational learning – information sharing, joint sense making and knowledge integration – influence relationship performance
42 Oxley and Sampson (2004)	When partner firms are direct competitors even “protective” governance structures may provide insufficient protection to induce extensive knowledge sharing among alliance participants	Electronics, telecommunications and equipment industries	Horizontal between competitors	Secondary data	Decisions to restrict alliance scope are made, at least in part, as a response to the elevated leakage concerns associated with knowledge sharing in particular competitive contexts
43 Dussage <i>et al.</i> (2000)	The outcomes and durations of strategic alliances as indicators of learning by partner firm	Multi-industry manufacturing setting in Europe, North America and Asia	Horizontal between competitors	Secondary data	Inter-firm learning and skill transfers appear to occur more often in alliances in which partners contribute asymmetrically to knowledge transfer
44 Love <i>et al.</i> (2014)	The role of openness in terms of external linkages for the generation of learning effects	Manufacturing plants in Ireland and Northern Ireland	–	Survey data	Partners with substantial experience of external collaborations in previous periods derive more innovation output from openness in the current period
45 Howard <i>et al.</i> (2016)	How relatively novice technology firms can learn intraorganizational collaborative routines from more experienced alliance partner and then deploy them independently for their own innovative pursuits	Eli Lilly and Company and 55 small biotech partner firms	R&D alliance	Survey/ Secondary data	The authors found that greater social interaction between partner firm and organization source increases internal collaboration among partner firm's inventors
46 Berchicci <i>et al.</i> (2016)	The relationship between physical distance between partners and a firm' innovative performance	High-tech small firms	R&D alliances	Survey data	Remote collaboration is positively related with innovation performance, but at low R&D intensity, this relationship vanishes. In practice, however, this may be complicated as personal contacts are more limited so that effective search and

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Article	Key issue	Empirical context	Partnership form	Data	Main results
47 Lazarc and Marengo (2000)	The role nature and characteristics of knowledge for technological transfer	8 case studies	Alliances	Qualitative data	transfer of remote partners' tacit knowledge is hampered The nature and characteristics of knowledge have a central role in defining the direction and learning in collaborative agreements
48 Frankfort <i>et al.</i> (2011)	The effects of R&D partnership portfolio on the inflow of technological knowledge from a firm's partners	ICT industry	R&D partnerships	Secondary data	The size of a firm's R&D partnership portfolio and its share of novel partners both have an inverted U-shaped effect on the inflow of technological knowledge for the firm's R&D partners
49 Hagedoorn <i>et al.</i> (2011)	The role of technological uncertainty, redundancy and information heterogeneity for the formation of alliances	–	R&D alliances	–	Cooperation agreements with close partners – coming from the same group of partners or partners of their partners – lead to the convergence of the technological profile, reducing learning possibilities. New partners open up better opportunities to reduce technological uncertainty, but the value obtained must be greater than the cost of finding a new partner
50 Inkpen and Tsang (2005)	How knowledge moves within networks and how social capital affects the knowledge movement	–	Strategic alliance	–	The findings emphasize the importance of trust, culture, prior experience and the establishment of clear objectives for knowledge transfer
51 Vandaie and Zaheer (2015)	The influence of resource-rich alliance partners on a resource-poor firm's capability, particularly given the focal firm's alliance experience, partner turnover, and level of specialization	Independent motion picture production studios in the USA	Alliances	Secondary data	The results show that the number of major partners exhibits and inverted U-shaped effect on an independent studio's capability. The authors also found that both an independent studio's alliance experience with major partners and its level of specialization intensify (positively moderate) this relationship

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Table AI.

Article	Key issue	Empirical context	Partnership form	Data	Main results
52 Liu and Ravichandran (2015)	The role of IT for knowledge integration	Multi-industry setting	Alliances	Secondary data	The authors found that firm's IT enables knowledge integration. Although knowledge gained through prior experience is important, complementary capabilities that enable firms to leverage and utilize such knowledge are also necessary for <i>ex ante</i> value creation in alliances
53 Herstad <i>et al.</i> (2014)	How sources of behavioral differentiation derived from the literature on industrial knowledge bases and technological regimes condition the degree of involvement in international innovation collaboration	Multi-industry setting in Norway	Global networks	Secondary data	The study concludes that knowledge characteristics (cumulativeness and appropriability), knowledge type (analytical), as well as market and technological opportunities determine the return rate of partnerships. They also influence decision making in relation to the formation of global networks for innovation

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