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REVIEW PAPER

Coopetition as the new trend in inter-firm alliances: literature review and research patterns

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Abstract Since the end of the 1990s, the number of articles on coopetition—a relationship built on simultaneous competition and cooperation—has steadily increased in response to the growing prevalence of relationships of coopetition in many industries. The tension inherent in a relationship of coopetition with a direct competitor presents both a challenge for managers and, at the same time, an exciting and complex research area. Different researchers of coopetition have addressed the topic from vastly different perspectives, basing their research on different theoretical frameworks, types of analysis, methods, and aims. By classifying articles on coopetition published in the last 20 years, this paper presents an application of cluster analysis to examine trends and tendencies in coopetition research. The paper also assesses whether this research field has followed a coherent progression during this period. The research reveals two independent research trends within the coopetition literature. The first research trend consists of studies that have mathematically modeled and simulated coopetition scenarios using game theory, whereas the second research stream consists of theoretical research describing the dynamics and tensions of coopetition based on evidence from case studies. Based on the cluster analysis, inter-firm alliances and their governance mechanisms emerge as the

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most promising theoretical and practical approach to improve cooperation between competitors.

Keywords Coopetition · Literature review · Inter-firm alliances · State-of-the-art · Cluster analysis · Research patterns

Mathematics Subject Classification 62H30

1 Introduction

The complex phenomenon of coopetition is a widespread reality in today's business world. The increasingly turbulent, competitive, complex, and uncertain business environment makes collaboration with competitors an attractive strategy for many firms (Bouncken et al. 2015a), especially small firms that lack the resources to cope with entrepreneurial challenges and seize market opportunities (Bengtsson and Johansson 2014; Bouncken and Fredrich 2015; Bouncken et al. 2016a).

Shorter product life cycles, spiraling R&D costs, risk sharing (Gnyawali and Park 2009), and greater competitiveness are some of the challenges forcing firms to improve their resources and competencies (Alves et al. 2016). Cooperation between firms is an answer to these challenges. Through cooperation, firms can access technology, improve distribution channels, or simply obtain synergies. The inexorable spread of globalization means that markets no longer wait for firms to grow internally. Information technologies (ITs) have also been crucial in the qualitative shift from internal business growth rationale to the dynamics of business networking (Soriano et al. 2014).

The growing importance of cooperation in today's complex business environment has highlighted the paradox of coopetition, namely that the cooperating firm is also a competitor. In this context, this paper explores the directions and trends in coopetition research and establishes whether this body of research has a coherent structure.

In the information age, firms in the knowledge-based economy—characterized by global competition and the means to produce products and services efficiently—assimilates knowledge in the form of innovations much faster than in the past. This business context is demanding for big companies, yet it presents an even bigger challenge to small and medium-sized enterprises (SMEs) (Aragon-Sanchez and Sanchez-Marin 2005), which, albeit competitive in certain business areas, are inherently weak in terms of size.

Cooperation lets SMEs group together to form large enough alliances to overcome their disadvantages with respect to larger competitors, while maintaining their advantages in terms of specialization, cost reduction, and flexibility (Pil and Holweg 2003). Cooperation with potential competitors is an attractive coping strategy for SMEs in fast-paced industries. Due to SMEs' lack of resources and their insufficient size to develop and introduce radical innovations, cooperation with

other SMEs and larger companies, especially in knowledge-intensive industries, is a basic strategy for developing capabilities in alliance portfolio management (Bengtsson and Johansson 2014). At the same time, coopetitive relationships allow firms to stay agile and flexible and to benefit from opportunities for SMEs. Scholars such as Bouncken et al. (2013) and Park et al. (2014a, b) have shown that coopetition improves innovation performance in knowledge-intensive SMEs, especially those that operate in clusters. Hence, coopetition can offer a good strategy for SMEs to cope with technological uncertainty and compensate for the fact they lack the resources necessary to develop the competencies to thrive in a complex, fast-paced environment. Nevertheless, coopetition relationships are far from simple and conflict free.

In addition to research showing the importance of coopetition for SMEs (Kraus et al. 2012) and family firms (Harms et al. 2010; Kraus et al. 2016), coopetition case studies have shown the importance of alliances among large companies. Case studies of global companies such as Sony, Samsung, Amazon (Ritala and Hurmelinna-Laukkanen 2009; Ritala et al. 2014) and Air France (Chiambaretto and Fernandez 2016) have raised the profile of coopetition as a business strategy and have garnered the attention of scholars and the public alike. The number of published articles on coopetition is increasing rapidly, with a point of inflection around the year 2000. Despite this growth, however, the coopetition literature remains relatively scarce. As documented by Liu et al. (2014), coopetition theory has been applied to study different business and organizational phenomena such as business networks (Chien 2005; Gnyawali and Madhavan 2001; Ritala and Hurmelinna-Laukkanen 2009), strategic alliances (Afuah 2000; Khanna et al. 1998), multifaceted supply chain management relationships (Wilhelm 2011), conflicting relationships between subsidiaries of multinational corporations (Luo 2005), and district formation (Soubeyran and Weber 2002).

Coopetition has been studied for an ample range of phenomena and sectors (Bouncken et al. 2015a), including the biotechnology sector (Lai et al. 2007), the engineering sector (Shih et al. 2006), the IT sector (Gueguen 2009), and service industries such as tourism (Wang and Krakover 2008), health care (Peng and Bourne 2009), insurance (e.g. Okura 2007), and transportation (Shao 2012). Each sector has its own idiosyncrasies and challenges, so the objectives and aims of coopetition differ (Le Roy and Czakon 2016). Some studies have focused on how coopetition affects innovation performance (Quintana-García and Benavides-Velasco 2004; Bouncken et al. 2013, 2016b, 2017; Bouncken and Fredrich 2016; Ricciardi et al. 2016). Other studies have examined how cooperation between competitors affects economic, financial, or market performance (Oum et al. 2004; Ritala et al. 2008; Ritala 2012). A range of approaches have been applied in these studies, which have yielded contradictory results regarding the effectiveness of coopetition—in some cases positive (e.g. Gnyawali et al. 2008) and in others negative (e.g. Bengtsson et al. 2010).

Research on coopetition may therefore appear unsystematic, disperse, and patchy, which has led some scholars to call for a reevaluation of how coopetition is conceptualized as well as analysis of the research tendencies and opportunities so that the planning of the research agenda may be improved. Given the vast array of

approaches, issues, and objectives covered by research on coopetition, the studies by Bengtsson and Kock (2014), Bouncken et al. (2015a) and Peng et al. (2012) represent a milestone in the coopetition literature. These papers analyze and classify coopetition studies by theory, methods, and objectives.

This paper develops and complements the three literature reviews by Peng et al. (2012), Bengtsson and Kock (2014), Bouncken et al. (2015a) and Bengtsson and Raza-Ullah (2016) in an attempt to classify coopetition studies. The paper also evaluates whether the coopetition literature has developed in a coherent manner according to the classification proposed by Bengtsson and Kock (2014) and Bouncken et al. (2015a) and whether the trend in published articles has been positive. Cluster analysis of published papers on coopetition provides a better understanding of the strength of the research streams within the coopetition literature, the trends and theoretical frameworks that support each of these streams, and the direction of research in the field.

This paper has the following structure. Section 2 presents a literature review, building on previous research by Peng et al. (2012), Bengtsson and Kock (2014), Bouncken et al. (2015a) and Gast et al. (2015). Section 2 also assesses the basic traits and dimensions that characterize different types of coopetition studies. Section 3 presents a cluster analysis of the coopetition literature based on the dimensions described in Sect. 2. Section 4 summarizes the results, discusses research patterns, and describes the clusters of coopetition studies. Section 5 presents the conclusions of the study.

2 A review of research on coopetition

2.1 Defining coopetition

Far from being unusual or novel, cooperation among competitors is actually common and has a long history in business. According to Harbison et al. (1998), as early as the 1990s, most cooperative agreements between businesses were between competitors. The first authors to formalize the term coopetition were Brandenburger and Nalebuff (1996). They analyzed coopetition using game theory, conceiving coopetition as a plus-sum game, rather than a zero-sum game, in which players (competitors) can win even when rivals do not lose. This is a prisoner's dilemma variant of game theory (Lado et al. 1997).

Like any theoretical concept designed to capture a complex reality in the social sciences, coopetition has been interpreted in numerous ways within different theoretical frameworks, albeit always under the same premise that coopetition refers to cooperation with competitors (Bengtsson and Kock 2000). Coopetition is inherently contradictory (competition vs. cooperation), so it creates tensions that, if handled improperly, can easily erode and destroy the coopetition relationship (Wilhelm 2011). In fact, according to Bengtsson and Kock (2014), the defining feature of coopetition is its paradoxical nature. Coopetition cannot exist without an interaction between the conflicting logics of cooperation and competition (Bengtsson et al. 2010; Smith and Lewis 2011). The definition of coopetition

implies using the relationship of coopetition to address problems where the two opposing logics—competition and cooperation—are interrelated (Chen 2008). From this perspective, coopetition is a challenging strategy that is hard to understand if considered outside a highly competitive environment where adverse circumstances force two competitors to work together. Unsurprisingly, therefore, the word "force" appears explicitly in many definitions of coopetition (Wiener and Saunders 2014).

To make sense of the volatile, unstable relationships that characterize coopetition, some authors have extended the definition of coopetition by delineating the scope of relationships of cooperation and competition separately. For instance, Peng et al. (2012) define coopetition as cooperation with competitors in non-market areas where direct competition takes place. Bengtsson and Kock (2000) offer a similar definition, describing conventional coopetition as a situation whereby two organizations cooperate in activities such as R&D or procurement while competing in activities such as sales (Dahl 2014). Under these definitions, firms cooperate in areas that do not directly involve the customer while competing in customer-related areas (Bouncken et al. 2015a). In such cases, the dynamics of cooperation and competition are organizationally and even physically separate (Brandenburger and Nalebuff 1996).

2.2 Levels of coopetition analysis

Perhaps the most relevant factor leading to the divergence of coopetition research, besides its ambiguous definition (Bengtsson and Kock 2014), is the variety of levels of analysis applied by scholars. For Raza-Ullah et al. (2014), simultaneous cooperation and competition between firms creates tensions, which emerge at the individual, organizational, and inter-organizational levels.

The main stream of coopetition research focuses on the inter-organizational level, analyzing coopetition between competing firms (Bouncken et al. 2015a). Nevertheless, studies on coopetition have also examined the individual level (coopetition between people working in the same company) and inter-network level (coopetition between two firm networks or two groups of associated firms).

The first obvious division of coopetition is inter-organizational versus intra-organizational coopetition. Inter-organizational coopetition involves a strategic decision that affects the organization and maintains the independence of the coopeting entities. Intra-organizational coopetition, in contrast, can be sub-divided into coopetition between individuals, teams (Baruch and Lin 2012), functional units, or business units within the same organization. At the intra-organizational level, actors must follow their organization's instructions, and the goals defined by the organization are common. At the individual level, the organizational culture, motivation, and rules for interaction play fundamental roles in the dynamics of coopetition (Poulsen 2001; Allal-Chérif and Bidan 2017). In the relationship between business units, the social network perspective of organizational coordination regarding formal hierarchical structure and coordination mechanisms is paramount (Tsai 2002).

In their literature review, Bouncken et al. (2015a) identify four coopetition dynamics depending on the level of analysis: the individual level between people, the intra-organizational level between business units, the inter-organizational level, and the network level. Similarly, Bengtsson and Kock (2014) establish four types of

coopetition analysis depending on the level of the coopetition: individual level, organizational level, inter-organizational level, and inter-network level. Bengtsson and Kock (2014) also emphasize the importance of not restricting coopetition to an exclusive relationship between two firms because several firms can be involved simultaneously in various relationships of coopetition.

2.3 Objectives of coopetition

The reasons for an organization to collaborate with its competitors vary, but they must be compelling enough to force the organization to take the controversial step of entering into a relationship of coopetition. The most common reasons for entering into a relationship of coopetition are to gain access to essential resources and knowledge (Bengtsson and Kock 2000), share resources and knowledge to improve efficiency, develop technical innovations by collaborating in R&D (Bengtsson and Kock 2014; Walley 2007; Bouncken et al. 2013, 2016b), reduce risks, share costs (Bouncken et al. 2015a), achieve economies of scale by combining similar activities (Gnyawali and Park 2011), enter new markets (Gnyawali and Park 2009), and achieve economies of scope by combining complementary activities (Luo 2005). Some of these aims are complementary. Bouncken et al. (2015a) classified the objectives of coopetition into five groups: efficiency, market power, market exploration and development, innovation, and internationalization.

Notable research devoted to studying the creation of new markets or the improvement of the firm's position in existing markets includes the studies by Ritala and Hurmelinna-Laukkanen (2009) and Zeng and Chen (2003). A special case of the creation of new markets is internationalization or, to borrow Bengtsson and Kock's (2014) term, international expansion (Luo and Rui 2009). Notable research on coopetition as a strategy to improve innovation includes studies by Bonel and Rocco (2007), Huang and Yu (2011), Quintana-García and Benavides-Velasco (2004), Ritala (2012), Ritala and Sainio (2014) and Ritala and Tidström (2014). Another group of innovation-related studies consists of those that have examined the creation and acquisition of knowledge. Notable research includes studies by Li et al. (2011) and Zhang et al. (2010). Studies on networks as a means of learning (Powell et al. 1996) also fall into this group. In the literature related to efficiency and cost saving, notable studies include those by Chin et al. (2008), Gnyawali and Park (2009, 2011), Luo (2007) and M'Chirgui (2005).

The aforementioned objectives of coopetition are covered by studies on inter-organizational coopetition. In the case of intra-organizational coopetition, the dominant individual- and organizational-level objectives are sharing knowledge and exploiting economies of scope (Bengtsson and Kock 2014). At the organizational level, studies have also assessed team or group performance (Baruch and Lin 2012; Enberg 2012).

2.4 Theoretical frameworks for coopetition

Difficulties caused by the lack of consensus regarding the definition of coopetition (Bengtsson and Kock 2014) are exacerbated by the myriad of theoretical approaches

to the problem, which are determined by the level of analysis and the objectives of the coopetition addressed in the study. For instance, knowledge-sharing coopetition requires a different theoretical framework at the individual level (Hutter et al. 2011) than at the inter-organizational level (Li et al. 2011). Dividing different theoretical frameworks can prove difficult because different research streams may overlap and draw on premises from different schools of thought. Numerous theoretical frameworks have been applied in research on coopetition.

As previously mentioned, the first theoretical framework employed to study coopetition was game theory (Brandenburger and Nalebuff 1996). Despite its early importance in coopetition research, however, game theory has not remained the dominant logic, although it has been heavily used both on its own (Okura 2007; Rodrigues et al. 2009) and in conjunction with other theories (Gnyawali and Park 2009; Ritala and Hurmelinna-Laukkanen 2009).

In terms of strategic management, several theoretical perspectives have influenced research on coopetition. Research on strategic alliances has addressed coopetition in alliances, albeit as a peripheral or conflictive element in relationships of cooperation. The analysis of strategic alliances has centered on six major bodies of theory: transaction cost economics, resource dependence, strategic choice, stakeholder theory, organizational learning (Bouncken et al. 2014), and institutional theory (Lowensberg 2010). These theories can be found in the literature on coopetition. For instance, Peng et al. (2012) draw a distinction between the following theoretical frameworks used to analyze coopetition: transaction cost theory, resource dependency, and organizational learning perspectives. Peng et al. (2012) also highlight the use of alliance learning dynamics (Khanna et al. 1998; Bouncken et al. 2015b). Interestingly, like in strategic alliances, these perspectives can be used to study not only the formation of alliances, but also their lifecycle and dynamics (Lowensberg 2010).

Another key framework within coopetition research is the resource-based view (RBV). Given that firms can attain a better competitive position by improving their capabilities and exploiting unique, inimitable, non-transferable resources (Grant 1991; Peteraf 1993), groups of competing firms with complementary resources can join forces to combine their resources (Quintana-García and Benavides-Velasco 2004). Under the RBV, collaborating with other firms offers a flexible mechanism to access strategic resources to compete in competitive, dynamic environments (Wong et al. 2007). The objective of exploring learning and knowledge sharing can also be analyzed using the network perspective (Powell et al. 1996). Several authors have used this approach to study the dynamics of coopetition (Bengtsson and Kock 2000; Chetty and Wilson 2003; Madhaven et al. 2004; Song and Lee 2012). Together with the main theories used in research on inter-organizational coopetition, other approaches have been used to study intra-organizational coopetition. Such approaches include social embeddedness (Luo et al. 2006).

The vast range of approaches in coopetition research makes it difficult to propose a common classification. Some authors have therefore opted to group theories into broader categories to make them easier to handle. For example, Bouncken et al. (2015a) considered the following five theoretical perspectives used in coopetition research: dynamics and game theory, resource-based view and dynamic capabilities,

power (resource dependency and control theory), negotiation (contract building, contract learning, and different relational capital), and governance logic. Other authors, however, have preferred to keep approaches separate, even when studies use multiple approaches (Peng et al. 2012).

The first stage of analysis in this study was to quantitatively examine the classification proposed by Bouncken et al. (2015a) and Bengtsson and Kock (2014). The second stage of analysis was designed to identify possible masked trends in theoretical frameworks, objectives of coopetition, and analysis levels.

3 Methods

The literature review presented in this study consisted of analyzing articles listed in the *Web of Science* (formerly *Web of Knowledge*), the world's premier research platform. Echoing the approach adopted by Bouncken et al. (2015a), the review was performed for articles published in peer-reviewed business and management journals, including "operations research and management science" journals. This latter journal category was included because several studies using game theory fell into this category, and its exclusion would have biased the sample. Other journal categories contained few coopetition studies, and the articles were heavily sector focused (e.g. health, tourism, and metallurgy). Books and conference proceedings were omitted. Articles that contained the words "coopet*" or "co-opet*" (Bouncken et al. 2015a) in the title were selected. Discarding reviews, articles not written in English, and a few unavailable articles yielded a final sample of 75 articles published between 1996 and 2015 (20 years).

All articles were classified according to the three main dimensions previously discussed (analysis level, coopetition objectives, and theoretical framework) and two more dimensions (size of the firm and method). To avoid differences in the criteria used to assess the papers, the three authors of the current paper ensured they reached an agreement on all decisions regarding classification. As far as possible, this study used classifications proposed in previous reviews of the coopetition literature. For instance, for the level of analysis, a modified version of the classification proposed by Bengtsson and Kock (2014) was used (see Table 1). For the classification of coopetition objectives and the theoretical framework, however, several proposals were merged to create a new classification. Cooperation objectives were classified according to a modified version of the classification by Bengtsson and Kock (2014), with elements taken from Bouncken et al. (2015a) (see Table 1). In addition, a fifth objective type (i.e. combination of objectives) was added for studies that brought together disparate objectives such as knowledge sharing and innovation or efficiency and economies of scope or that took a broad view of the potential advantages of coopetition. For the theoretical framework, bringing together a small number of approaches proved more difficult, so it was crucial to find a suitable trade-off between having a small number of groups in the classification and ensuring that all the theories within a given group were coherent. Hence, instead of using a "theoretical framework" dimension (Peng et al. 2012), this dimension was instead named "theoretical focus" (see Table 1), and a new

Table 1 Criteria used to classify the coopetition literature (frequency in parentheses)

Analysis level[a]	Coopetition objectives	Theoretical focus	Size of firm	Method[b]
Individual and team (6)	Market exploration and development (13)	Dynamics and game theory (10)	SMEs (42)	Conceptual models (10)
Organizational (5)	Gaining new knowledge and exploiting economies of scope (16)	RBV, dynamic capabilities, and knowledge management (12)	Large companies (10)	Qualitative methods (30)
Inter-organizational (52)	Efficiency and economies of scale (20)	Network perspective (7)	Multinationals (12)	Quantitative methods (22)
Network and cluster (12)	Technology development and innovation (14)	Alliance dynamics (11)		Mathematical and simulation models (13)
	Combination of objectives (10)	Social perspective (8)		
		Coopetition (19)		
		Others (8)		

[a] Adapted from Bengtsson and Kock (2014)

[b] Adapted from Bouncken et al. (2015a)

classification was created to combine the proposals by Bouncken et al. (2015a) and Peng et al. (2012). In some empirical studies, the authors developed their theoretical focus by drawing upon the coopetition literature itself. Accordingly, the theoretical focus classification made it possible to classify articles whose literature review was based on the coopetition research and theoretical frameworks specific to coopetition.

In addition to these dimensions, other types of variables were used to classify the research on coopetition. Whereas the case study method is used for exploratory research, statistical analysis of empirical data (i.e. quantitative analysis) is used for confirmatory research. In coopetition research, the use of mathematical models is also prevalent. Bouncken et al. (2015a) proposed a classification of articles by research method (see Table 1). For each of the five dimensions considered in this study (analysis level, coopetition objectives, theoretical focus, size of firm, and method), Table 1 shows the categories within the classification. The number of articles in each classification appears in parentheses. For instance, of the 75 articles in the sample, 6 articles were placed in the "individual and team" of the analysis level dimension, 5 were placed in "organization," 52 were placed in "inter-organizational," and 12 were placed in "network and cluster." When an article could not be clearly classified in a specific dimension, the classification was left blank. For instance, for the "size of firm" dimension, 11 articles were not classified into any category (Table 1).

The articles were classified depending on whether the research focused on SMEs or multinationals (Bengtsson and Kock 2014). An intermediate classification (large companies) was added for firms that were neither SMEs nor multinationals, as was the case with ports (Shao 2012). Data on the full classification criteria and the

number of articles in each category appear in Table 1. Some classifications were ambiguous. For example, many articles had a theoretical focus that combined several approaches. In such cases, the dominant method was used to classify articles in terms of their theoretical focus. Hence, although Peng et al. (2012) classified their own article (Peng and Bourne 2009) as having an RBV and network structure focus, in the present study, this article was placed in the network perspective category because it was considered the article's most dominant and relevant focus.

Several articles using mathematical models were not classified in the "size of firm" dimension because they did not fit any of the categories within this dimension. Moreover, conceptual papers that contained no reference to size were not assigned to any category in the "size of firm" dimension. Nevertheless, some articles using mathematical models were considered valid for SMEs when the number of participants in the model is large. In other cases, when the size of the firms studied using mathematical models was explicitly large, the paper was classified in the large companies or multinationals categories (e.g. Kwok and Lee 2015).

4 Results

To analyze patterns emerging from the classification of the literature described in Table 1, a two-step cluster analysis was performed using SPSS. Two-step cluster analysis is an exploratory technique that reveals non-obvious groups of cases. The technique works with both continuous and categorical variables. The number of clusters was determined automatically using the Akaike information criterion.

Cluster 1 consists of articles focusing on the team and organization levels (4 articles and 2 articles, respectively). The objectives of this form of coopetition are to allow firms to gain new knowledge (7 articles) and improve performance (3 articles classified in the efficiency category). The articles use a range of theories but generally adopt a social perspective (8 articles). The methods used in this cluster are both qualitative (6 articles) and quantitative (5 articles). Articles in this cluster have a clear tendency for intra-organizational analysis, fundamentally based on team dynamics. There is a special focus on knowledge sharing and the outcomes of multifunctional projects. The size of the firms is irrelevant in this cluster. This cluster was named "coopetition in intra-organizational project teams."

Cluster 2 is dominated by inter-organizational analysis (11 articles). The fundamental objectives are to gain new knowledge and exploit economies of scope (3 articles) and to develop technology and innovate (9 articles). The theory is varied, but in this cluster, the RBV and dynamic capabilities are the dominant logics, especially in terms of knowledge management (7 articles). The predominant method is quantitative (11 articles). Most articles focus on SMEs, linked to the quantitative method. This cluster was named "innovation and economies of scope."

Cluster 3 is split between inter-organizational studies (8 articles) and studies on networks and clusters (5 articles). The dominant theories are network theory and alliance dynamics. The methodology is dominated by qualitative methods—mostly case studies (10 articles)—that overwhelmingly focus on large companies and multinationals. This is a complex group of studies, but the fundamental link between

Table 2 Characteristics of the clusters and examples of articles in each cluster

Cluster	Characteristics	Outstanding articles in the cluster
1. Coopetition in project teams	Team and organization levels Objective: to gain new knowledge and improve performance Theoretical framework: team dynamics and knowledge management	Ho and Ganesan (2013), Ghobadi and D'Ambra (2012), Baruch and Lin (2012) and Lin et al. (2010)
2. Innovation and economies of scope	Inter-organizational analysis Objective: to gain new knowledge and exploit economies of scope Theoretical framework: mostly based on knowledge management and RBV	Hong and Snell (2015), Song and Lee (2012), Wilhelm and Kohlbacher (2011) and Enberg (2012)
3. Alliance dynamics	Objective: broad range (from innovation to market sharing) Theoretical framework: network theory and alliance dynamics Qualitative methods	Hung and Chang (2012), Park et al. (2014b) Afuah (2004) and Gnyawali and Park (2011)
4. Mathematical and simulation models	Theoretical framework: game theory mathematical and simulation models Objective: market position and firm performance	Kwok and Lee (2015), Niu et al. (2015), Gurnani et al. (2007) and Pun (2013)
5. Broad approach to coopetition	Theoretical framework: coopetition dynamics and management Objective: from innovation to market share Mostly using qualitative methods	Park et al. (2014a), Ritala and Tidström (2014), Fernandez et al. (2014) and Bengtsson and Johansson (2014)

them is coopetition in alliances (7 articles), although in several articles the alliance is with several suppliers that form a network (6 articles), requiring a special approach. This cluster was named "alliance dynamics."

Cluster 4 comprises studies based on game theory (8 articles) and studies using mathematical and simulation models (10 articles). The analysis level is inter-organizational, and the objectives are mostly linked to market position and firm performance (9 articles related to both objectives). This cluster was named "mathematical and simulation models."

Finally, Cluster 5 comprises inter-organizational studies with a broad approach but with a theory specifically built on previous coopetition studies (17 articles). Cluster 5 covers a wide range of objectives, and some articles address a complex combination of objectives (5 articles). The size of the firms in the empirical studies is mixed, although, interestingly, the dominant method is qualitative. This cluster was named "broad approach to coopetition." Table 2 shows a summary of the five clusters and some relevant articles in each cluster.

To determine whether these clusters changed over time, a second cluster analysis was performed, adding the article's year of publication (Table 3). Doing so made it

Table 3 Cluster distribution of the classified articles

Cluster	Articles in the cluster	% of clustered articles (%)	% of all articles (%)
1 (coopetition in project teams)	11	17.2	14.7
2 (innovation and economies of scope)	12	18.8	16.0
3 (alliance dynamics)	13	20.3	17.3
4 (mathematical and simulation models)	10	15.6	13.3
5 (broad approach to coopetition)	18	28.1	24.0
Combined	64	100.0	85.3
Articles excluded	11		14.7
Total	75		100.0

possible to observe whether the cluster patterns changed over time. To maintain the number of clusters in the first analysis, the second cluster analysis was forced to yield five clusters. The results in terms of the number of articles in each cluster remained practically the same over time. The results regarding the change in the clusters over time appear in Fig. 1.

As Fig. 1 shows, the term "coopetition" has generally been used to refer to inter-organizational coopetition, with Cluster 1 ("coopetition in intra-organizational project teams") having a strong presence during the 2000s. Interestingly, the presence of articles in Cluster 4 ("mathematical and simulation models") remained consistently present over time. In the remaining clusters (2, 3, and 5), which contain the majority of the articles on coopetition (43 of the 64 articles placed into clusters), the tendency seems to be toward a broader view of coopetition that addresses a wide range of objectives or indeed a combination of objectives in the same study (Cluster 5). The most recent studies (Clusters 3 and 5) are dominated by qualitative methods.

This result is interesting for several reasons. First, alliance dynamics (i.e. Cluster 3) stands out as one of the most prevalent theories in coopetition research. This finding implies that researchers act pragmatically by first trying to understand the dynamics and then the mechanisms that successfully govern coopetition (Bouncken et al. 2016b). These mechanisms can be divided in two main groups: *transactional governance*, which deals with laws and economic incentive systems to govern interparty exchanges, and *relational governance*, embedded in social relationships based on trust, commitment, norms, and mutual understanding.

Interestingly, adding the time variable to the other classification variables but allowing the algorithm to determine the number of clusters yielded four clusters (data not shown). Clusters 1 and 4 were identical to those previously described, but Cluster 3 ("alliance dynamics") disappeared. Most articles appeared in Cluster 4 ("broad approach to coopetition"), while a few were allocated to Cluster 2 ("innovation and economies of scope"). This regrouping created a concentration of network articles in Cluster 4.

Finally, to complete the analysis, Table 4 shows the top 20 most cited authors in the emergent coopetition literature. This list was created based on the number of

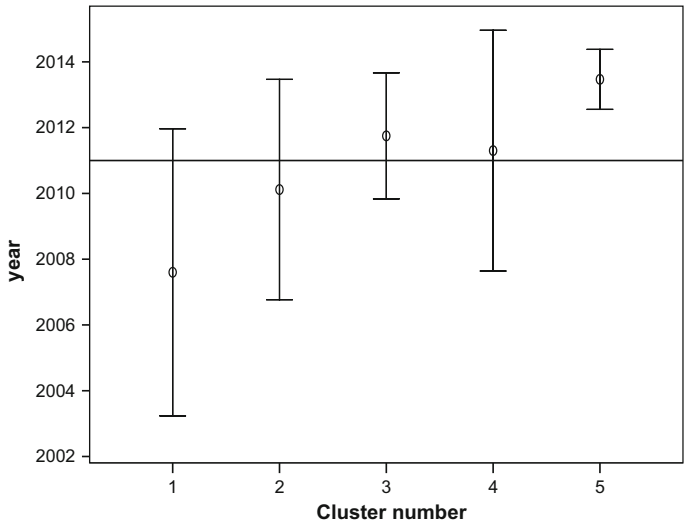

Fig. 1 Change in clusters over time

citations received by each author for articles published between 2012 and 2016 with the word "coopet*" or "co-opet*" in the title in the *Web of Science* database.

5 Conclusions

Coopetition has become a key area within management research. The number of articles with coopetition in their title has been growing steadily in recent years (20 articles in 2014 vs. 11 in 2011). This rise in the number of coopetition articles has also led to a shift in research focus and approaches in the study of coopetition. Most notably, coopetition has already been studied within the field of strategic alliances, which no longer represents a new problem. The objectives in an alliance may be as varied and complex as they are in a coopetition relationship. These objectives include improving production capacity, reducing risk and uncertainty, improving operational flexibility, fulfilling market potential (Todeva and Knoke 2005), combining resources, and cutting costs. Likewise, strategic alliances can be studied from a host of other theoretical perspectives (Lowensberg 2010). Cooperating with companies in the same market, product line, or value-chain phase means collaborating with competitors. Strategic alliance researchers have consistently viewed competition between partners as the normal state of affairs (Oum et al. 2004). In fact, competition in an alliance is considered a negative factor that can jeopardize collaborations. From the strategic alliance point of view, however, the potential for partner opportunism adds to the element of risk in alliances and must be avoided (Das 2004). Nevertheless, the difficulties in competitive alliances and the risk of opportunistic behavior by partners mean that such alliances have their own idiosyncrasies. These additional difficulties of cooperation relationships with competitors are even greater in horizontal alliances, posing greater management

Table 4 Top 20 most cited authors in the emergent coopetition literature

Author	Affiliation	Number of citations	Cited papers	Cluster
Ritala, Paavo	Lappeenranta Univ. Technol, Finland	156	5	2, 5
Bengtsson, Maria	Umea Univ., Sweden	106	6	5
Kock, Soren	Hanken Sch Econ, Finland	90	4	5
Gnyawali, Devi R.	Virginia Polytech Inst and State Univ, VA USA	76	4	2, 3, 5
Le Roy, Frederic	Univ Montpellier I, France	66	6	1, 3, 5
Bouncken, Ricarda B	Univ Bayreuth, Germany	65	4	2, 5
Kraus, Sascha	Univ Liechtenstein, Liechtenstein	57	2	2, 5
Hurmelinna-Laukkanen, Pia	Lappeenranta Univ Technol, Finland	54	1	2
Fernandez, Anne-Sophie	Univ Montpellier I, France	44	3	1, 3, 5
Raza-Ullah, Tatbeeq;	Umea Univ, Sweden	43	3	5
Park, Byung-Jin (Robert)	Hanyang Univ, South Korea	42	2	2, 3, 5
Srivastava, Manish K.	Michigan Technol Univ, MI USA	42	2	2, 3, 5
Tidstrom, Annika	Univ Vaasa, Finland	42	2	2, 5
Hu, Jiangping	Univ Elect Sci and Technol China, Peoples R China	41	4	3
Chen, Jen-Ming	Natl Cent Univ, Taiwan	35	1	4
Chang, Chia-I	Natl Cent Univ, Taiwan	35	1	4
Zheng, Wei Xing	Univ Western Sydney, Australia	32	1	3
Ghobadi, Shahla	Univ New S Wales, Australia	29	2	1
D'Ambra, John	Univ New S Wales,, Australia	29	2	1
Gurau, Calin	GSCM Montpellier Business Sch, France	25	3	1, 3

Data extracted the 21st of May 2017

challenges for partners (Perry et al. 2004). In some cases, like when suppliers form collaborative networks with main clients, coopetition is "forced." This idiosyncrasy of coopetition, coupled with the powerful simulation tool provided by game theory, has led to the development of a specific area of research on coopetition.

Coopetition researchers seem to have developed a theoretical approach based on two main pillars. The first pillar is specific and deals with analyzing and describing the dynamics of coopetition. The second pillar is normative and has strong connections with research on strategic alliances. As reported by Bouncken and Fredrich (2015), to achieve returns, firms must ensure a high alliance orientation in their coopetition relationships. Coopetitors need a minimum level of alliance orientation. Accordingly, in addition to employing a descriptive approach, researchers have adopted a pragmatic view, shifting their focus toward asking how and to what extent firms can benefit from coopetition (Park et al. 2014a, b) and how to manage the coopetition paradox (Gnyawali et al. 2016). Nevertheless, case

studies continue to be an important source of insight into coopetition dynamics, focusing on understanding and managing tensions arising during coopetition. Despite this clear trend in the coopetition literature, scholars continue to perform important studies at the intra-organizational level, and even at the individual level.

After 15 years of studies focusing on coopetition, the topic requires a review and redefinition of the challenges facing researchers. This paper discusses the development, trends, and future of coopetition research as well as the challenges that studies on coopetition seek to overcome. The results show a tendency toward coopetition theory based on what Bengtsson and Kock (2014) define as the dynamics of coopetition. This trend, together with the multiple aims of coopetition—technical innovation, economies of scope, economies of scale, and internationalization—addressed by studies, means that coopetition scholars have tended to perform qualitative research (case studies), which allows them to thoroughly explore the dynamics of complex coopetition relationships (e.g. Kraus et al. 2017). Interestingly, this tendency covers both horizontal coopetition and vertical coopetition through supply networks. Although research is often framed within established theoretical frameworks such as the RBV, knowledge management, and the network perspective, these frameworks must be adapted to the conditions and tensions that characterize coopetition. It is important to understand how relationships of coopetition form, how the dynamics between partners work, and which factors must be managed to yield advantages that outweigh the risks and tensions created by coopetition. Besides exploratory research, management journals have begun to publish coopetition studies that use mathematical models and simulations based on game theory. These studies complement the development of a theory that permits the dynamic analysis of coopetition.

An important finding resulting from the cluster analysis is the key role of networks in coopetition, especially among SMEs. The explanation for this finding is that networks have a strong presence in all clusters except Cluster 1 (“coopetition in intra-organizational project teams”). The same is true for SMEs. Coopetition, especially in networks of firms with similar bargaining power, can help SMEs overcome difficulties due to size and take advantage of new opportunities. Difficulties due to size relate not only to resources, but also to the capabilities and knowledge that are essential in innovation.

5.1 Limitations of the study and future research

Despite this study’s objective nature, the method used was somewhat subjective. The choice of classification variables and the choice of groups for each variable meant that the method was somewhat biased. This subjectivity was mitigated using variables cited in three prominent coopetition literature reviews (Bengtsson and Kock 2014; Bouncken et al. 2015a; Peng et al. 2012), which made it possible to combine the perspectives of these three studies and use common elements as much as possible. Nevertheless, the method remains subjective. In addition to this initial subjectivity, the decision to place each study into a certain group, especially for the categories “objectives” and “theoretical focus,” was at times ambiguous and

challenging. Hence, the findings of this study should not be interpreted as conclusive, but rather as an indication of the trends in coopetition research.

Regarding future research, an important gap in the coopetition literature relates to the lack of studies dealing with startups. Coopetition can be a successful strategy for startups due to their characteristics and needs. Startups usually have extremely limited resources and capabilities, and they require high levels of innovation and fast growth. To perform all the activities necessary to enter a market, startups need to rely on external collaboration. Just as there is a lack of research on startups, very few studies have examined small family firms. Because family firms are characterized by commitment, flexibility, and a long-term outlook, they offer a unique context to study coopetitive relationships. Other areas of interest for further study include the relationship between the different coopetition levels: individual, company, and network (Tidström and Rajala 2016).

In addition to addressing the aforementioned questions, future research requires a broader scope in terms of methods. As is customary in the social sciences, the methods used in coopetition research should combine qualitative and quantitative techniques to provide insight into coopetition dynamics and test the validity of any assertions made. Case studies play an important role in gaining a deep understanding of the forces and factors interacting in coopetitive relationships. Qualitative comparative analysis (QCA) could be especially valuable for exploring complex causality and asymmetric relationships in coopetition. QCA allows researchers to perform systematic cross-case comparisons and embraces within-case complexity (Woodside 2013) because set-theoretic connections are asymmetric rather than symmetric (Kraus et al. 2016).

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