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Learning from experience? Technological investments and the impact of coopetition experience on firm profitability

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ABSTRACT

A firm may learn how to manage coopetition as it becomes more experienced. Conversely, because of the complexity of coopetition, a firm may fail to make sense of its experiences in working with coopetitors and may thus fail to learn from these experiences effectively. Building on this premise, we develop a contingency view regarding the relationship between coopetition experience and firm profitability — as coopetition experience can enhance or hurt firm profitability and the internal abilities of firms to capitalize on experience are heterogeneous. Analyzing a panel data set from 911 Spanish manufacturing firms between 2007 and 2014, we provide empirical evidence on the often overlooked but critical detrimental effects of coopetition experience on firm profitability and reveal the asymmetric moderating role of a firm's technological investments in information technology (IT) and R&D. Specifically, we find that the impact of coopetition experience on firm profitability is negative and becomes more negative as R&D investment increases, which suggests that R&D investment may aggravate the detrimental effects of coopetition experience. However, as IT investment increases, the effect of coopetition experience on firm profitability shifts from negative to positive, indicating that firms can counteract the “dark side” of coopetition experience through substantial IT investment.

Introduction

Coopetition — “simultaneous competition and cooperation among firms with value creation intent” (Gnyawali and Ryan Charleton, 2018: 2512) — has become central to firm strategy, especially in the technological domain (e.g., Brandenburger and Nalebuff, 1996; Dong et al., 2017; Gnyawali and Park, 2011; Gnyawali et al., 2006). While establishing coopetition relationships, such as technological alliances with competitors, leads to valuable innovation opportunities (e.g., Estrada et al., 2016), managing such relationships is very challenging, as coopetition involves a simultaneity of opposing logics (Gnyawali and Ryan Charleton, 2018), leading to a paradox and tensions (e.g., Raza-Ullah et al., 2014). Gnyawali and Ryan Charleton (2018), for example, stress that a key challenge in coopetition is to navigate the interplay between the particular facets of cooperation and competition (e.g., mutuality vs. rivalrous spirit). Because not all firms are equally able to deal with these challenges, firms profit from coopetition to varying degrees (e.g., Bengtsson et al., 2016; Gnyawali and Park, 2011).

Coopetition scholars have suggested that coopetition experience (that is, a firm's accumulated experience in coopetition relationships) is key to explaining such firm heterogeneity, as it is central to a firm's coopetition capability — “ability to sense, seize, and adapt to the dualities of simultaneous cooperating and competing” (Park et al., 2014: 896). However, research on coopetition experience is still in its infancy and a systematic examination of its role and implications has yet to be developed. Therefore, this study aims to enrich our understanding of the role of coopetition experience by systematically examining its relationship with firm

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profitability in the context of technological competition.

The dominant assumption in the extant literature is that coopetition experience is beneficial to firm profitability because firms can learn how to navigate the coopetition paradox and tensions more effectively as they become more experienced (Gnyawali et al., 2016; Park et al., 2014). However, empirical evidence on the actual effects of coopetition experience is scarce (one notable exception is Park et al., 2014) and anecdotal evidence remains rather equivocal. While some cases suggest a beneficial role of coopetition experience, such as the S-LCD joint venture between Samsung and Sony where the former profited more than the latter largely due to its greater coopetition experience (Gnyawali and Park, 2011: 657), other cases suggest a detrimental role of coopetition experience. An example of the latter can be found in the early history of the relationship between Apple and Google, which remained very cooperative up until Google unveiled Android in 2007 (Volgestein, 2013). Then, Apple began emphasizing competition over cooperation, probably afraid that history would repeat itself, as when the competition with Microsoft pushed Apple to the brink of bankruptcy. In the aftermath of such an experience, we can understand why Apple made some suboptimal decisions — like the decision to preload the iPhone with its own products instead of Google's star products — and why it took Apple significant time to reverse them, despite the evident opportunity costs of not cooperating closer with Google. Thus, in practice, coopetition experience may have unintended consequences that hurt firm profitability, such as flawed decisions that elicit salient opportunity costs (when not direct losses). Together, these examples show that the effects of coopetition experience on firm profitability remain puzzling and, thus, deserve research attention.

In this study, we challenge the assumption that coopetition experience is invariably beneficial and propose a contingency view on the relationship between coopetition experience and firm profitability. Our research questions are (i) what are the actual effects (i.e., beneficial vs. detrimental): of coopetition experience on firm profitability and (ii) under what conditions do these effects materialize? Drawing on the coopetition and organizational learning literature, we contend that coopetition experience can enhance firm profitability (due to learning) or hurt firm profitability (due to suboptimal management and inertia). Since the complexity of coopetition undermines managers' sensemaking ability (Gnyawali et al., 2016), firms may respond poorly when they confront the coopetition paradox for the first time. Such suboptimal response, in turn, may persist over time due to inertia (Castellaneta et al., 2017). Thus, a poor approach to managing coopetition may become institutionalized as the firm becomes more experienced, favoring value destruction rather than creation in its coopetition endeavors and, ultimately, hurting its profitability (Gnyawali and Ryan Charleton, 2018). Furthermore, we posit that the effect of coopetition experience on firm profitability is contingent on a firm's technological investments. Recent studies stress that information technology (IT) and R&D are the two most important technological investments for firms' learning abilities in technological settings (e.g., Bardhan et al., 2013; Ravichandran et al., 2017), as they are key sources of information-processing and knowledge absorption capacities and constraints. Hence, we focus on IT and R&D investments as core contingencies in this study.

By analyzing a large-scale panel data set from 911 Spanish manufacturing firms, we find that coopetition experience, on average, is detrimental to firm profitability and that this detrimental impact is weaker for higher levels of IT investment and stronger for higher levels of R&D investment. Thus, we provide evidence that the “dark side” of coopetition experience may overshadow its learning potential, depending on a firm's technological investments. Overall, our study enriches existing understanding of the role of coopetition experience by (i) introducing the dual effects of experience and revealing its “dark side” in the context of technological coopetition, and (ii) articulating a contingency view that connects the implications of coopetition experience to a firm's technological investments. By offering a nuanced view of the role of coopetition experience that challenges the rosy picture prevalent in extant research, we also contribute to mitigate the polarization problem of the coopetition literature (Gnyawali and Ryan Charleton, 2018).

The challenges of coopetition and the role of coopetition experience

Coopetition entails unique challenges. The paradox view of coopetition stresses that coopetition is a paradoxical phenomenon, as it involves the simultaneous pursuit of two opposite logics (i.e., cooperation and competition) that entail seemingly contradictory patterns (e.g., Raza-Ullah et al., 2014; Wilhelm and Sydow, 2018). Cooperation (i.e., “the pursuit of mutual interest and common benefits”, Das and Teng, 2000: 85) is needed to bring together the firms' resources, while competition (i.e., “pursuing one's interest at the expense of the others”, Das and Teng, 2000: 85) is needed to protect the firms' own competitive advantages. Thus, the simultaneous pursuit of both logics is required (Gnyawali et al., 2016; Raza-Ullah et al., 2014), which creates a paradox as “juxtaposing cooperation with competition makes coopetition irrational, inconsistent and even absurd” (Bengtsson et al., 2016: 20). In dealing with this coopetition paradox, organizational actors experience tensions (Das and Teng, 2000; Gnyawali et al., 2016). For instance, scholars stress the struggles and emotional ambivalence experienced by managers who oversee coopetition relationships (e.g., Raza-Ullah et al., 2014). These tensions, however, are intrinsic to the simultaneous pursuit of cooperation and competition and, thus, indispensable for successful coopetition (e.g., Das and Teng, 2000; Raza-Ullah et al., 2014). Thus, a core management challenge in coopetition is to understand and embrace the coopetition paradox and keep the resultant tensions at moderate levels, rather than trying to eliminate them (Bengtsson et al., 2016; Gnyawali et al., 2016).

Enriching the above insights, Gnyawali and Ryan Charleton's (2018) recent framework comprehensively explains the unique challenges of coopetition based on its two core elements: *simultaneity* (i.e., simultaneous cooperation and competition) and *value creation intent* (i.e., each firm's goal to reap additional benefits from the relationship). Thus, the first central challenge is to navigate the simultaneity effectively. The interaction between particular aspects of each logic results in what these authors refer to as “coopetition mechanisms”, which can have both positive and negative implications.¹ Thus, firms need to make the necessary

¹ For instance, the interaction between the “mutuality” principle of cooperation and the “rivalrous spirit” of competition leads to “mutual pursuits”, i.e., “firms are driven to pursue individual superiority while being simultaneously dependent on each other” (Gnyawali and Ryan Charleton, 2018: 2518), creating both opportunities and risks (e.g., mutual understanding facilitates joint work but also knowledge misappropriation).

adjustments in the relationship to promote the positive effects of coopetition mechanisms. Regarding the second core element of coopetition, Gnyawali and Ryan Charleton (2018: 2523–2524) distinguish between *joint value creation* (“the total pie generated by all partners from their mutual efforts”) and *firm value creation* (“additional benefits generated by individual firms in the relationship”). These authors theorize that another central challenge is to adequately navigate the firms’ value creation intent, which may imply modifying the relationship as it unfolds to keep balance between joint and firm value creation and address trade-offs between both dimensions.

Given these unique challenges, coopetition experience seems relevant in explaining why some firms are more successful at creating value through coopetition (Gnyawali et al., 2016; Gnyawali and Park, 2011; Park et al., 2014; Ritala, 2012; Ritala and Hurmelinna-Laukkanen, 2013). This idea has been developed by analogy with the notions of alliance experience and alliance capability (e.g., Anand and Khanna, 2000). Assuming that learning develops iteratively through experience accumulation (Zollo and Winter 2002), scholars argue that, through repeatedly establishing alliances, firms learn on both cognitive and behavioral levels (Doz, 1996). Over time, firms develop cognitive frames that help them to reflect on their collaborative experiences, improving their understanding of the ins and outs of alliances. Insights gained through this iterative process become gradually embodied in organizational practices, laying out the foundation for routines to address key alliance management challenges. Hence, alliance experience is central to alliance capability or a firm’s ability to create value from its alliances (Anand and Khanna, 2000). By extension, coopetition experience is seen as instrumental to a firm’s coopetition capability, which allows greater returns from coopetition (Gnyawali et al., 2016; Park et al., 2014).² Park’s et al. (2014) study in the semiconductor industry, one of the few attempts to examine these ideas empirically, suggests that coopetition experience helps alleviate the negative effects of balanced-strong coopetition in a firm’s alliance portfolio and, thus, positively moderates the relationship between balanced-strong coopetition and coopetition-based innovation performance. Overall, existing studies suggest that experience enhances profitability because firms can learn from it to effectively address the unique challenges of coopetition. This has become the dominant assumption in the extant literature, i.e., coopetition experience is beneficial to firm profitability due to the learning effects of experience.

Notwithstanding the value of these contributions, we argue that this assumption is conceptually debatable due to two major reasons. First, it implies that firms learn from their coopetition experience how to deal with the coopetition paradox while neglecting that the very same paradoxical nature of coopetition may disrupt how firms accumulate and reflect on experience. In contrast, we argue that the complexity of coopetition can induce a suboptimal approach to managing coopetition, which can eventually hurt firm profitability. This argument is rooted in (i) the coopetition literature’s idea that the paradoxical nature of coopetition can compromise a firm’s sensemaking and decision-making abilities (Raza-Ullah et al., 2014; Gnyawali et al., 2016), in combination with (ii) the organizational learning literature’s premise that, especially in complex contexts, experience can lead to inertia rather than learning (Castellaneta et al., 2017; Haas and Hansen, 2005). In complex contexts, firms may tend to infer erroneous lessons from experience, encode them into their frames and routines, and fail to use subsequent experiences to refine them. Eventually, this process may elicit organizational actions that are inadequate in content and timing, hindering firm profitability. By extension, in such an intricate context as coopetition, which entails “a serious test of the firm’s capacity to process information” (Gnyawali et al., 2016: 14), chances are that firms struggle to derive unambiguous lessons from their experiences with coopetitors. Thus, as coopetition experience accumulates, a poor coopetition mindset and inadequate routines may become institutionalized within the firm, ultimately damaging its profitability.

The second reason for which the assumption that coopetition experience is invariably beneficial is problematic is that it portrays the role of coopetition experience as being independent from the firms’ internal learning abilities, overlooking that some firms are better equipped than others to deal with paradoxes and profit from experience. Such heterogeneity in the firms’ learning abilities is a basic and well-documented premise in the organizational learning literature (e.g., Castellaneta et al., 2017; Cohen and Levinthal, 1990; Haas and Hansen, 2005). Research further shows that the extent to which a firm profits from experience depends on the extent to which its internal context favors effective learning over inertia (or vice versa). In turn, this is determined by key “deliberate learning” efforts carried out by a firm (Zollo and Winter 2002), resulting from a firm’s technological investments. These investments may enable or hamper the development of an adequate organizational context that favors effective learning through generating information-processing and knowledge absorption capacities and constraints that define a firm’s ability to effectively extract, store, apply, and reconfigure lessons from coopetition experience. By extension, we argue that firms are likely to differ in their abilities to capitalize on coopetition experience and circumvent its detrimental effects and that, in the context of technological coopetition, the firms’ technological investments are key to explaining such variation.

In this study, therefore, we contest the assumption that coopetition experience must be beneficial by default and account for its possible downsides. Moreover, we follow up on the call to conduct further research on coopetition experience that identifies contingencies and examines how they affect value creation through coopetition (Gnyawali and Ryan Charleton, 2018: 2530) by focusing on a firm’s IT and R&D investments — the two most important technological investments a firm can make to develop its internal

² The contributions of coopetition experience to value creation are distinct from the contributions of alliance experience, as the challenges of coopetition are unique and distinct from the general challenges of alliances. The paradox and tensions firms face in coopetition are idiosyncratic, i.e., “(w)hile all inter-firm relationships embody some degree of paradox, those that by design entail simultaneous competition and cooperation such as the relationship between [rival firms] are highly paradoxical, involve high levels of tension” (Gnyawali et al., 2016: 8). Similarly, the interplay between competition and cooperation results in particular mechanisms “that make coopetition truly unique and intriguing” (Gnyawali and Ryan Charleton, 2018: 2513). Thus, coopetition experience has unique contributions because it allows firms to address the unique challenges of coopetition.

learning abilities.

Hypotheses

We start by developing competing hypotheses on the relationship between coopetition experience and firm profitability. Because we expect firms to profit from its coopetition experience to varying degrees depending on their learning abilities, we further hypothesize the moderating role of a firm's IT and R&D investments. In particular, we focus on IT and R&D investments due to two interconnected reasons. First, IT and R&D investments are central to a firm's ability to learn and leverage the value embedded in experience but also affect the extent to which a firm may be subject to inertia as it becomes more experienced (e.g., Cohen and Levinthal, 1990; Tippins and Sohi, 2003). Second, IT and R&D investments are key to a firm's ability to simultaneously pursue opposing value creation logics and navigate resultant paradoxes and tensions in technological contexts (e.g., Rothaermel and Alexandre, 2009; Im and Rai, 2014). Combining these two reasons, we argue that a firm's IT and R&D investments are pivotal to explaining the extent to which firms are subject to the beneficial and detrimental effects of coopetition experience, thereby representing two core contingencies of the relationship between coopetition experience and firm profitability.

Coopetition experience and firm profitability

Coopetition experience may enhance firm profitability because, through experience accumulation, a firm can learn to effectively address the unique challenges of coopetition. This process occurs in two main ways. First, firms can learn from their coopetition experience on a *cognitive* level (Doz, 1996). Every new experience brings new insights on the dynamics and intricacies of coopetition (Park et al., 2014). Over time, these insights become embodied in cognitive frames, which comprise a firm's understanding of what coopetition entails and explain how organizational actors make sense of coopetition endeavors (Bengtsson and Raza-Ullah, 2016; Bengtsson et al., 2016). Thus, experience may result in an adequate understanding of coopetition at the organizational level (Gnyawali et al., 2016). As firms become more experienced in managing coopetition, they develop a richer understanding of the key challenges and opportunities these coopetition relationships entail (Gnyawali and Park, 2011). As noted in the extant literature, such a fine-grained understanding is a necessary first step for managers to embrace the coopetition paradox, which is, in turn, central to value creation (Gnyawali et al., 2016). Scholars have referred to it as having a “coopetition mindset” (Gnyawali and Park, 2011) and, relatedly, have highlighted the ability to understand the coopetition paradox as a core dimension (i.e., analytical dimension) of a firm's coopetition capabilities (Gnyawali et al., 2016). Only those who are aware of, understand and accept the intricacies of coopetition will be able to undertake the actions required to make their coopetition relationships productive but also to generate additional benefits through them (Bengtsson et al., 2016; Lado et al., 1997).

Second, firms also learn from their coopetition experiences on a *behavioral* level (Doz, 1996). Through repeatedly engaging in relationships with different coopetitors, firms can build effective coopetition routines — i.e., routines tailored to the specific challenges a firm faces in coopetition (Gnyawali et al., 2016). A firm that has richer experience in coopetition is better positioned to build effective routines to manage the coopetition paradox and maintain the resultant tensions on a moderate level (Park et al., 2014). Scholars have referred to these routines as the “executional” dimension of a firm's coopetition capabilities (Gnyawali et al., 2016). For example, firms can learn to adequately combine integration and separation principles at different levels of coopetition relationships to deal with knowledge sharing-knowledge protection tensions (e.g., Le Roy and Fernandez, 2015). Furthermore, building on experience, firms can develop effective routines to navigate the simultaneity of cooperation and competition and pursue strong but balanced levels of both logics (Park et al., 2014). For example, firms can learn to effectively allocate decision-making and problem-solving responsibilities among the coopetitors without increasing risks of misappropriation (e.g., Enberg, 2012). Firms can also develop routines from experience to adequately manage trade-offs between joint and firm value creation (Gnyawali and Ryan Charleton, 2018). For example, a firm can learn to craft contracts to align the attention given to joint and individual value creation activities with key project characteristics, such as resource requirements (e.g., Castañer et al., 2014).

Finally, it is important to stress that, as prior studies indicate (e.g., Gnyawali and Park, 2011; Park et al., 2014), experience may result in cognitive frames and behavioral routines that, besides allowing for more productive coopetition relationships, can also generate greater additional benefits at the firm level (Gnyawali and Ryan Charleton, 2018). For example, due to “experience spillovers” (Zollo and Reuer, 2010), frames and routines developed in one coopetition setting may prove useful in other coopetition settings (Gnyawali and Park, 2011). Thus, a firm can use the lessons learned from its experience in working with external coopetitors to alleviate coopetition tensions within its own boundaries (e.g., Tsai, 2002), enhancing the effectiveness of its internal organization and improving firm profitability. Accordingly, we hypothesize the following:

H1a. Coopetition experience has a positive impact on firm profitability.

On the other hand, the extant literature also suggests that coopetition experience may have a detrimental impact on firm profitability. Our core argument here is that the suboptimal patterns of paradox response that are likely to emerge when firms confront the coopetition paradox (Gnyawali et al., 2016), can perpetuate over time due to the inertial forces that accompany experience accumulation (Castellaneta et al., 2017; Levinthal and March 1993), ultimately hurting firm profitability. In particular, the paradoxical nature of coopetition may affect how firms gain and reflect on coopetition experience throughout the entire cycle of experience accumulation, so that firms may (i) derive inaccurate lessons from their early coopetition experiences, (ii) subsequently redeploy and institutionalize such lessons to manage the firm's portfolio of coopetition relationships, and (iii) finally fail to revise such lessons in light of new experiences.

First, the complex nature of coopetition may undermine a firm's ability to make sense of ongoing interactions with coopetitors and, thus, to make optimal decisions to manage them. Overwhelmed by the coopetition paradox and the resultant tensions, managers may end up detrimentally overemphasizing one side of the coin (either competition or cooperation) (Bengtsson et al., 2016; Gnyawali et al., 2016). For a firm that is starting to gain experience in coopetition, making these suboptimal decisions can turn problematic, since a firm may derive inaccurate lessons from their early coopetition experiences regarding how to best navigate the inherent challenges (i.e., incorrectly assuming that a certain strategy is optimal to manage coopetition productively). The organizational learning literature stresses that managers are particularly prone to wrong inferences and assumptions in intricate contexts such as coopetition where decision-making requires interpreting complex and paradoxical information (Castellaneta et al., 2017; Zollo, 2009). As Heimeriks (2010) and Zollo (2009) suggest, managers may undergo superstitious learning, which implies a misspecification of the links between actions and outcomes (Levitt and March 1988), and become overconfident, assuming that their approach has been effective (even when it has not).

Second, holding wrong assumptions about what has worked or failed in a certain coopetition relationship, managers may re-deploy suboptimal strategies to manage other concurrent and future coopetition relationships of the firm. In this way, a firm's suboptimal patterns of response to the coopetition paradox may eventually become encoded in its coopetition mindset and routines, even if they convey a poor understanding of coopetition or prescribe patterns of interaction with coopetitors that are totally counterproductive. For example, managers may become accustomed to prioritizing competitive behaviors when managing alliances with competitors, even if this approach triggers mistrust and hostility, which may transfer from the alliance to the market as a lose-lose game, challenging firm profitability (Gnyawali and Ryan Charleton, 2018). The extant literature provides insight on this phenomenon, emphasizing that vicious paradox response cycles (Smith and Lewis, 2011) are likely to emerge when firms confront the coopetition paradox (Gnyawali et al., 2016).

Finally, the complex nature of coopetition not only implies that an inadequate coopetition mindset and routines may emerge as the firm becomes more experienced but also that once established, such a coopetition mindset and routines are challenging to alter. Generally, due to inertia, it tends to be difficult for firms to embrace insights emerging from new experiences that challenge established frames and routines built upon prior experiences (Levinthal and March 1993), limiting their ability to adapt (Leonard-Barton, 1992). The complexity of coopetition may exacerbate this tendency. One key reason that this may happen is because when confronting the coopetition paradox, managers may experience emotional ambivalence (Raza-Ullah et al., 2014) and, as a result, may become "paralyzed and indecisive" (Bengtsson et al., 2016: 22). When managers are unable to determine the best course of action, they are more likely to apply existing procedures per automat (i.e., without calibrating pros and cons), especially given the tendency of managers to solve problems immediately — even before fully understanding the problem (Bhardwaj et al., 2018). Thus, since routines are executed semi-automatically (Zollo and Winter 2002), a firm may persistently apply coopetition routines that are suboptimal or that did prove effective in the past but would not produce desirable results in new settings (Castellaneta et al., 2017). For example, information-sharing routines developed through repeated relationships with a particular coopetitor — a setting where mutual dependence curves opportunism — can be counterproductive in the context of a relationship with a new coopetitor, where overexposure places a serious threat on the firm's competitive position (e.g., Fernandez and Chiambaretto, 2016; Ritala and Hurmelinna-Laukkanen, 2013).

A second reason for which it may be particularly challenging to alter an established coopetition mindset and routines is because the high cognitive demands that coopetition entails for managers may reduce their ability to react to new phenomena and pick up crucial signals (Raza-Ullah et al., 2014; Gnyawali et al., 2016). As a result, managers may fail to refine established frames and routines in light of new experiences simply because they miss the learning window (Simonin, 1997). Thus, accumulation of coopetition experience can result in a coopetition mindset and repertoire of coopetition routines that become increasingly obsolete and ineffective over time. In turn, this has important implications for firm profitability. Eventually, having a coopetition mindset and routines that fail to address key competition challenges, such as the tensions between knowledge sharing and knowledge protection (e.g., Estrada, 2018; Estrada et al., 2016) or the trade-offs between joint and individual value creation (e.g., Enberg, 2012; Gnyawali and Ryan Charleton, 2018), may generate important opportunity costs (e.g., a firm's investment in a coopetition relationship that ends up in premature dissolution, such as GM's joint venture with Daewoo), if not direct losses, either way resulting in detrimental effects to firm profitability.

Together these arguments suggest that, because of the intricacy of coopetition that can trigger suboptimal firm responses, and the inertial effects of experience, a firm can forge a poor understanding of coopetition and inappropriate coopetition routines as it becomes more experienced. In turn, such inadequate frames and routines may become institutionalized and elicit counterproductive decisions in the context of coopetition, ultimately damaging firm profitability. Hence, we propose the following competing hypothesis:

H1b. Coopetition experience has a negative impact on firm profitability.

The moderating role of IT investment

Our arguments for H1 suggest that through experience accumulation, a firm gradually develops its coopetition mindset (Gnyawali and Park, 2011) and routines (Park et al., 2014), which, depending on how appropriate they are, enable or hinder the firm's ability to profit from coopetition (Gnyawali et al., 2016). Regarding the role that IT investment plays in this process, the extant literature offers opposing arguments. On the one hand, IT investment plays a central role in the construction of frames and routines through supporting a firm's information-processing capacity (Dong and Yang, 2015; Liu and Ravichandran, 2015). In our research setting, this

implies that IT investment may help firms to capitalize on their accumulated coopetition experience in two fundamental ways.

First, the information-processing capacity resulting from IT investment can help firms to develop an adequate coopetition mindset when learning from experience. Since information-processing equipment facilitates the storing and processing of paradoxical information, research indicates that firms with high IT investment are better equipped to cope with organizational paradoxes, such as the one resulting from the juxtaposition of exploration and exploitation (Im and Rai, 2014; Subramani, 2004). Extending these arguments, we argue that information-processing equipment helps managers to codify and process relationship-specific information and visualize the juxtaposition of cooperation and competition actions and the benefits generated through their simultaneous pursuit. In doing so, IT investment helps mitigate managers' ambivalence when learning from experience to oversee coopetition relationships (Raza-Ullah et al., 2014), a key first step for them to embrace the coopetition paradox. Thus, high levels of IT investment favor the development of an adequate coopetition mindset, thereby enhancing the learning effects of coopetition experience.

Second, the information-processing capacity resulting from IT investment may support the creation and refinement of coopetition routines when learning from experience. Information-processing equipment supports continuous knowledge accumulation, articulation and codification, which are critical to the development and renewal of organizational routines (Zollo and Winter 2002). IT investment also increases communication frequency and media richness (Dennis and Kinney, 1998), enabling social integration mechanisms that facilitate articulation and dissemination of best practices and know-how derived from coopetition experience within the firm (Joshi et al., 2010). Information-processing equipment allows managers to compare and exchange takeaways from their experiences in working with coopetitors (Dong and Yang, 2015; Kane and Alavi, 2007; Liu and Ravichandran, 2015). By supporting the creation and updating of best practices and an ongoing comparison across coopetition relationships (Heimeriks, 2010), IT investment supports effective learning from experience, enabling the development of effective routines to manage coopetition, as well as the continuous assessment and improvement of such routines.

In summary, the above discussion suggests that IT investment enhances a firm's ability to capture the learning potential of coopetition experience and mitigate its inertial effects, which allows the firm to use its coopetition experience effectively to develop an adequate coopetition mindset and more effective coopetition routines. Consequently, the impact of coopetition experience on firm profitability will be more positive (or less negative) when IT investment increases. Thus, we hypothesize the following:

H2a. IT investment strengthens (weakens) the positive (negative) impact of coopetition experience on firm profitability.

While there are potential benefits of IT investment for learning from coopetition experience, such as enhanced information-processing capacity, research also suggests that firms with high IT investment may face information overload (Dong and Netten, 2017). Furthermore, due to the limits of attention, managers tend to be selective rather than exhaustive in information-processing to make their decisions (Dong, 2016; Ocasio, 1997). In the context of our study, these ideas suggest that IT investment could also limit the extent to which firms capitalize on their accumulated coopetition experience for two reasons.

First, the information overload problem associated with IT investment may limit the development of a good coopetition mindset from experience. While the use of information-processing equipment increases a firm's capability to acquire and process information, it also provides abundant information to managers who have limited attention (Dong and Netten, 2017; Dong and Wu, 2015). In particular, advanced information-processing equipment (e.g., networks and mobile devices) exacerbates the information overload problem by accumulating "big data" that are extremely challenging to analyze and make sense of (Dong and Yang, 2018; McAfee and Brynjolfsson, 2012). In such an environment characterized by abundant information gathered from a firm's portfolio of cooperation relationships, managers are likely to become overwhelmed and may fail to learn from the paradoxical information gathered as experience accumulates. As a result, experience may result in a biased coopetition mindset, which is less valuable or more harmful for managing coopetition relationships.

Second, the information overload problem resulting from IT investment may limit the firms' abilities to productively reflect on coopetition experience and refine coopetition routines. When a firm is surrounded by a vast amount of information collected from coopetition relationships, changing and refining the routines to coordinate interaction with coopetitors becomes complicated and challenging (Hansen and Haas, 2001; Haas and Hansen, 2005). Such an information-overwhelming environment could induce inertia — since organizational routines are path-dependent, complex changes could be disruptive and extant routines are more likely to be retained (Nelson and Winter 1982) —, inhibiting the emergence of new routines that are more suitable for managing coopetition relationships, as well as the continuous assessment and refinement of such routines as experience accumulates.

In summary, the above discussion suggests that IT investment hampers a firm's ability to exploit the learning potential of coopetition experience and alleviate its inertial effects, which may lead the firm to develop an inadequate coopetition mindset and routines as it becomes more experienced, limiting its ability to profit from coopetition. Consequently, the impact of coopetition experience on firm profitability will be less positive (or more negative) when IT investment increases, leading to the following competing hypothesis:

H2b. IT investment weakens (strengthens) the positive (negative) impact of coopetition experience on firm profitability.

The moderating role of R&D investment

The extant literature also offers opposing lines of reasoning as to how R&D investment shapes the relationship between coopetition experience and firm profitability. On the one hand, R&D investment can help firms to profit from coopetition experience, as it is a central determinant of absorptive capacity — i.e., a firm's ability to "recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990: 128). By being instrumental to absorptive capacity, we argue, a firm's

R&D investment enables the firm to successfully use the insights gained from coopetition experience to develop a rich understanding of coopetition and an effective repertoire of coopetition routines, because of two main reasons.

First, absorptive capacity enables firms to grasp seemingly contradictory technological approaches, accept that they can provide equally valid solutions, and recognize that greater value may be created by accepting rather than rejecting such alternative solutions (e.g., [Cohen and Levinthal, 1990](#); [Wang et al., 2016](#); [Zhou and Wu, 2010](#)). Thus, absorptive capacity nurtures “morphogenetic mindscapes” or cognitive structures that favor the managers’ acceptance of paradoxical situations through emphasizing heterogeneity, dualities and organizational renewal ([Lado et al., 1997](#): 126). Accordingly, research shows that R&D investment, as a core determinant of absorptive capacity, aids the simultaneous pursuit of opposing logics (i.e., exploration and exploitation) in technological contexts (e.g., [Rothaermel and Alexandre, 2009](#)). We expect this to have important implications for how firms accumulate, reflect on, and use their coopetition experience, since a firm accustomed to dealing with simultaneity and paradoxes in certain strategic areas may be better equipped to understand and embrace simultaneity and paradoxes in other areas. In particular, R&D investment offers a lens through which firms look at their coopetition experiences on the premise that simultaneous pursuit of cooperation and competition and the resultant paradox and tensions are key conditions for success ([Lado et al., 1997](#); [Bengtsson and Raza-Ullah, 2016](#)). As a result, firms that carry substantial R&D investment are not only better equipped in terms of already having a coopetition mindset in early experiences with coopetitors, but they are also more able to make sense of these and subsequent interactions with coopetitors. Thus, we expect them to be more able to derive lessons from such experiences that allow them to continuously optimize how they construe and tackle coopetition challenges.

Second, R&D investment reinforces a firm’s ability to learn from coopetition experience effectively because, as a core building block of absorptive capacity, it mitigates the problem of “knowledge ambiguity” ([Simonin, 1999](#)) and, thus, allows firms to better understand knowledge accessed in the context of technological coopetition (e.g., [Estrada et al., 2016](#); [Ritala and Hurmelinna-Laukkanen, 2013](#)). Understanding such knowledge can aid firms in using insights from experience to create effective coopetition routines and continuously refine those routines. In this regard, it can help firms to, relying on their experiences, design more effective ways to acquire knowledge from coopetitors and integrate it into their own knowledge base (e.g., [Zaheer et al., 2010](#)). Furthermore, it can help firms to take advantage of their experiences to develop routines that allow them to successfully navigate paradoxes and tensions in forming and governing coopetition relationships. For example, understanding coopetitors’ knowledge helps firms to screen among potential coopetitors and identify the ones with the highest potential to build a productive relationship ([Park et al., 2014](#)), as well as to maintain meaningful knowledge exchange that supports trust-building with coopetitors ([Wilhelm and Sydow, 2018](#)). Thus, a firm that understands coopetitors’ knowledge can leverage its experiences in such activities to build up effective routines for partner selection, coordination and bonding in coopetition.

In summary, to the extent that R&D is central to absorptive capacity, we expect firms that carry greater R&D investment to be more likely to already display an adequate management approach in early experiences with coopetitors and to be more able to take advantage of every new experience to continuously optimize the frames and routines they apply to manage relationships with coopetitors. Thus, R&D investment promotes the learning effects of coopetition experience and mitigates its detrimental effects, enabling the firm to build an increasingly adequate coopetition mindset and routines as it becomes more experienced and, thus, profit from coopetition. Consequently, the impact of coopetition experience on firm profitability will be more positive (or less negative) when the R&D investment increases. Thus, we hypothesize the following:

H3a. R&D investment strengthens (weakens) the positive (negative) impact of coopetition experience on firm profitability.

On the other hand, the extant literature also suggests that R&D investment may have the opposite effect. R&D investment may enhance inertia and myopia in organizational learning due to the firms’ tendency toward overexploitation ([Levinthal and March 1993](#)). Furthermore, R&D investment may lead firms to adopt an introverted focus when selecting knowledge ([Zhou and Wu, 2010](#)), eliciting a “local search” problem or a firm’s tendency to search for solutions in the neighborhood of its established knowledge base ([Stuart and Podolny, 1996](#)). In the context of our framework, this has two important implications.

First, R&D investment may constrain how firms reflect on and use insights from their coopetition experience, as it inhibits a firm’s ability to embrace and cope with paradoxes in technological contexts (e.g., [Rothaermel and Alexandre, 2009](#)). High levels of R&D investment can be associated with “morphostatic mindscapes” that direct managers’ efforts to elude paradoxical situations through emphasizing “homogeneity, harmony, and maintenance of the status quo” ([Lado et al., 1997](#): 126). Managers accustomed to avoiding rather than embracing the paradox may struggle to grasp and accept the intricacies of coopetition ([Bengtsson and Raza-Ullah, 2016](#); [Lado et al., 1997](#)). Hence, a firm that places significant priority on R&D may address its first experiences with coopetitors with a poor coopetition mindset and, subsequently, fail to make sense of these and subsequent experiences, as it may lack the cognitive ability to understand the complex interplay between cooperation and coopetition. By the same token, a firm that carries significant R&D investment may fail to derive from such experiences lessons that allow it to improve how it construes coopetition and how it responds to the inherent challenges.

Second, R&D investment can impede firms from making use of experience to develop effective coopetition routines and to continuously refine these routines because it introduces biases in how firms look at current and past experiences. For example, since R&D investment reinforces a firm’s tendency toward local search, R&D-intensive firms may fail to use accumulated experience to develop routines that target novel knowledge from coopetitors. An R&D-intensive firm will not only tend to rely more on internal knowledge ([Zhou and Wu, 2010](#)) but will also tend to disregard external knowledge not closely related to its current knowledge stock ([Stuart and Podolny, 1996](#)). By the same token, an R&D-intensive firm may find it very challenging to use coopetition experience to develop routines that efficiently integrate the knowledge derived from coopetition, due to potential substitution between internal knowledge and the knowledge accessed through coopetition (e.g., [Grigoriou and Rothaermel, 2017](#)). Furthermore, R&D investment

reinforces a firm's tendency to inward focus (e.g., Zhou and Li, 2012), which, in turn, makes the firm proud and protective of its own knowledge. Thus, a firm with strong R&D capabilities, because it does not recognize the value of competitors' knowledge or because it is extremely afraid of opportunism, may tend to routinize practices that limit the opportunities to learn in the context of technological cooperation, such as the inclusion of contractual clauses that overemphasize individual versus joint value creation or knowledge protection versus knowledge sharing. In turn, these tendencies of R&D-intensive firms to rely on proprietary and established solutions reinforce myopic learning and inertia (Leonard-Barton, 1992; Levinthal and March 1993), impeding them from using new experiences to alter and refine their existing cooperation routines.

In summary, to the extent that R&D investment is associated with local search, inward focus and inertia, we expect firms that carry greater R&D investment to be less likely to display an adequate management approach in early experiences with competitors and to be less able to use new experiences to create and refine their cooperation frames and routines. Thus, R&D investment diminishes the learning potential of experience and reinforces its detrimental effects, resulting in an increasingly poor cooperation mindset and routines as the firm becomes more experienced, and, thus, limiting its ability to profit from cooperation. Consequently, the impact of cooperation experience on firm profitability will be less positive (or more negative) when R&D investment increases, leading to this competing hypothesis:

H3b. R&D investment weakens (strengthens) the positive (negative) impact of cooperation experience on firm profitability.

Methods

Data

We use data from the Survey on Business Strategies (ESEE, in Spanish, *Encuesta sobre Estrategias Empresariales*) to test our hypotheses. The ESEE database aims to provide information on the strategic activities of firms in the Spanish manufacturing sector. The survey has been conducted annually since 1990 by the *Sociedad Estatal de Participaciones Industriales* (SEPI) Foundation, which is a public foundation linked to SEPI, a state-owned entity under the Spanish Ministry of Finance and Civil Service. The initial sample included 2188 firms, representative of ESEE's population of reference (i.e., firms from the Spanish manufacturing sector with 10 or more employees). In each subsequent year, the survey was conducted for approximately 1400–1800 firms, rigorously selected to preserve the annual sample's representativeness and consistency within a panel structure.³ Based on these criteria, each year, selected firms are invited to participate in the survey. Although the survey can also be submitted via post mail, fax or electronic mail, currently, most of the firms complete the survey online (this option has been available since 2012). Rigorous procedures to validate the data are established, which involve several rounds. To facilitate data validation, firms are asked to designate a responsible respondent, who may occupy managerial and nonmanagerial roles. However, multiple informants are often involved to validate the survey, especially in larger firms, given that the survey is complex and requires information concerning many different areas of the firm.⁴

Given the good coverage of the data, numerous prior studies have used the ESEE database as the main data source (e.g., Gómez et al., 2017; Estrada, de la Fuente and Martín-Cruz, 2010; Myles Shaver, 2011).⁵ The ESEE database is particularly suitable for our study due to three main reasons. First, it provides relevant information to operationalize the core variables of our study, including firms' involvement in cooperation relationships, IT and R&D investments, and firm profitability. Second, it allows a longitudinal design, which is crucial for examining the relationships of interest in our study. Third, it allows us to control for a wide range of firm and industry factors that can contribute to firm profitability, enabling us to generate rigorous empirical results. In this study, we used a recent 8-year panel data set from the ESEE database in the period between 2007 and 2014. After removing the observations with missing values in our variables, our final sample consists of 2954 firm-year observations from 911 unique Spanish manufacturing firms.

Measures

Firm profitability

To measure our dependent variable, *firm profitability_{it}*, we use the profit margin calculated by a firm's income over total sales in the focal year. The profit margin is widely used as a direct indicator of firm profitability (Soliman, 2008), representing the ultimate managerial objective and business outcome (e.g., Lewis and Thomas, 1990; Palepu, 1985). This measure is particularly suitable for our study, as prior literature has documented that other performance measures are either not appropriate for a cross-industry sample, such as return on assets (Cool and Dierickx, 1993), or are not appropriate to capture firm profitability, such as return on equity (Sullivan, 1974). In the ESEE database, firms annually report the percentage (0–100) that represents their profit margin.

³ More information about the ESEE and its methodological procedures is available on <https://www.fundacionsepi.es/investigacion/esee/en/spresentacion.asp>.

⁴ The ESEE reports provide detailed information about these issues per wave and are available on https://www.fundacionsepi.es/investigacion/esee/en/sesee_informes.asp.

⁵ A complete list of articles using the ESEE database is available on https://www.fundacionsepi.es/investigacion/esee/en/sesee_articulos.asp.

Coopetition experience

Prior studies stressed the importance of operationalizing alliance experience or coopetition experience in a cumulative basis (e.g., Hoang and Rothaermel, 2005; Park et al., 2014). Thus, we capitalize on the longitudinal nature of our data and calculate a firm's accumulated coopetition experience in all prior years over the period of this study. In the ESEE database, firms indicate annually whether they have been involved or not in technological cooperation agreements with competitors. Building on this information, our measure *coopetition experience_{it}* cumulatively counts the number of years that a firm has collaborated with competitors in the preceding years (up to but not including the focal year). Therefore, every year, this variable has a time lag to firm profitability of one year.

IT investment

The information systems literature guides us to measure *IT investment_{it}* as a firm's yearly expenditure in information-processing equipment. In the ESEE database, this information is provided as a firm's spending in information-processing equipment in a given year on the purchases of tangible fixed assets in that year, as a percentage. Thus, we calculated the amount of spending in absolute terms by dividing it by 100 and multiplying it by tangible fixed assets. We then took the natural logarithm to reduce the skewness of this variable. This measure is consistent with the IT investment measures in recent studies (e.g., Dong and Netten, 2017; Dong and Yang, 2015; Gómez et al., 2017), which have been suggested to be highly correlated with cumulative IT capital (Chwelos et al., 2010) and other costs in software and IT personnel (Hitt and Brynjolfsson, 1996; Tambe and Hitt, 2012). Thus, our measure reflects a firm's level of IT investment reasonably well.

R&D investment

In the ESEE database, firms also report their total expenditure in R&D activities annually, including internal expenditures for R&D activities carried out by the firm and external expenditures for R&D activities that were contracted out to third parties. We measure *R&D investment_{it}* as the total expenditure in R&D activities incurred by a firm per year. Again, we took the natural logarithm to reduce the skewness of this variable.

Control variables

We control for a number of firm and industry factors that may influence firm profitability. First, we control for market share, indicating a firm's market power and competitiveness, which is important for gaining superior profitability (Wernerfelt, 1986). Specifically, we include a ratio variable, *market share_{it}*, which shows the share in the main marketplaces for a firm's products. The value 0 is assigned to those firms that report having no significant share. Second, we control for the *number of markets_{it-1}* in which a firm was present in that year, because it is also relevant to market power and diversification. Third, we control for some important firm characteristics that may impact profitability, including *size_{it}* as the natural logarithm of the number of employees (Hall and Weiss, 1967), *age_{it}* as the natural logarithm of the number of years since the establishment of the firm (Majumdar, 1997), and *exports_{it}* as the percentage of total sales (0–100) (Vu et al., 2014). Fourth, the ESEE database also provides information about the diversification of firms (non-diversified, related diversification or unrelated diversification), depending on the number of products and industries defined by the firm. We use this information to control for potential spillovers across products and industries (e.g., reputation effects) in diversified firms, which could potentially influence firm profitability (Rumelt, 1982). We create a binary indicator, *diversification_{it}*, which takes the value 1 if the firm is diversified, and 0 otherwise. Fifth, we control for the impact of a firm's technological cooperation with external partners other than competitors, which are potentially beneficial for the firm's profitability (Das et al., 1998). In the ESEE database, firms indicate separately whether they have been involved or not in technological cooperation agreements with different types of partners each year. Based on this information, we include a binary variable, *alliances with partners_{it}*, which takes the value 1 if the firm had cooperation agreements with clients, suppliers and/or universities and technological centers during the year, and 0 otherwise. Sixth, since firm profitability may be significantly altered by the introduction of new products or services and new marketing methods, we also control for these two types of innovations (Leiponen, 2000). We include two dummy variables, *product innovation_{it}* and *marketing innovation_{it}*, each of which takes the value 1, if the firm has introduced any new products or services and new marketing methods (e.g., changes in product design or packaging), respectively, during the year, and 0 otherwise.

Regarding industry factors, as market growth decreases, rivalry increases, making it more difficult to gain and retain firm profitability. First, we control for the level of environmental dynamism in a firm's main market, which could largely influence firm profitability (Igor Ansoff and Sullivan, 1993). We include an ordinal variable, *market dynamism_{it}*, taking the values 1 (expansive market), 2 (stable market), or 3 (recessive market). Second, as another indicator of rivalry, we control for the quality of information that a firm has about its competitors' market prices. The ESEE database provides information on how the firm assesses the information it has about the prices set by its competitors (accurate and on time, accurate and late, or inaccurate). In a high-rivalry market, competing firms might have less accurate information about each other's prices (Galzer and Weiss, 1993). We create a binary variable, *information quality_{it}*, which takes the value 1 if the firm indicated inaccurate information about its competitors' prices, and 0 otherwise, based on the information available every four years.⁶ Third, we control for the geographic scope of the main market of the firm, which can systematically influence a firm's knowledge spillovers from others that contribute to the firm's profitability (Nguyen et al., 2011). In the ESEE database, firms indicate the geographical scope of their main market (local, provincial, regional, national, abroad, or domestic and abroad). Based on this, we create a dummy variable, *domestic market_{it}*, which takes the value 1 if the market

⁶ The ESEE database provides this information every four years (2006, 2010, and 2014). We assume the firm's assessment remains constant within that period (e.g., *information quality_{it}* = *information quality₂₀₀₆*, with 2007 ≤ *t* ≤ 2009).

Table 1
Descriptive statistics and correlations.

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Firm profitability (%)	7.791	21.868															
(2) Coopetition experience	0.309	1.003	-0.092														
(3) IT investment	9.947	1.799	0.076	0.162													
(4) R&D investment	12.726	1.900	0.015	0.238	0.503												
(5) Market share	0.141	0.210	0.023	-0.028	0.107	0.090											
(6) No. of markets	2.302	1.253	0.035	0.053	0.102	0.076	-0.009										
(7) Size	5.253	1.204	0.028	0.218	0.713	0.603	0.148	0.067									
(8) Age	3.398	1.204	0.016	-0.005	0.125	0.087	0.009	0.025	0.126								
(9) Exports (%)	37.859	30.543	-0.009	0.001	0.090	0.199	-0.045	0.140	0.107	0.071							
(10) Diversification	0.182	0.386	0.001	-0.004	0.061	0.035	0.106	0.049	0.063	0.039	-0.030						
(11) Alliances with partners	0.806	0.396	0.012	0.139	0.132	0.236	0.038	0.001	0.143	0.052	0.108	0.006					
(12) Product innovation	0.447	0.497	-0.005	0.052	0.076	0.181	0.044	0.058	0.055	0.021	-0.015	0.080	0.133				
(13) Marketing innovation	0.342	0.474	0.024	0.105	0.092	0.065	-0.024	0.042	0.079	0.011	-0.141	0.049	0.080	0.282			
(14) Market dynamism	2.159	0.742	-0.064	0.012	-0.077	-0.066	-0.001	-0.083	0.001	0.018	-0.107	0.010	-0.009	-0.016	-0.005		
(15) Information quality	0.466	0.499	-0.043	0.002	-0.060	-0.034	0.051	0.061	-0.071	-0.016	0.112	-0.042	0.040	-0.027	-0.137	-0.031	
(16) Domestic market	0.427	0.495	0.015	0.020	-0.057	-0.126	0.166	0.019	-0.020	-0.068	-0.493	-0.009	-0.064	-0.010	0.105	0.094	-0.088

Note: $n = 2954$. Correlations in bold are significant with $p < 0.05$.

is domestic (i.e., local, provincial, regional or national scope), and 0 otherwise. Finally, we include industry and year dummies in all analyses to control for the fixed effects of sector and time. Table 1 shows the descriptive statistics and correlations for all the variables. The correlations among the explanatory variables are not excessively high.

Analysis strategy

To capitalize on the longitudinal nature of our data, we use panel data models. In particular, we use a random effects model for hypotheses testing and a fixed effects model for the robustness check because random effects are more efficient than fixed effects in estimation. Our main model is specified as follows:

$$\begin{aligned} \text{Firm profitability}_{it} = & \beta_0 + \beta_1 \text{Coopetition experience}_{it} + \beta_2 \text{IT investment}_{it} + \\ & \beta_3 \text{R\&D investment}_{it} + \beta_4 \text{Coopetition experience}_{it} \times \text{IT investment}_{it} + \\ & \beta_5 \text{Coopetition experience}_{it} \times \text{R\&D investment}_{it} + \gamma \text{Controls} + \\ & \beta_{0k} + \beta_{0t} + u_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where i represents the firm, t is the year, β_{0k} is the industry fixed effects, β_{0t} is the year fixed effects, and $u_i + \varepsilon_{it}$ is the composite panel error term, including a time-invariant and firm variant error term u_i and a fully random error term ε_{it} .

Results

Hypotheses testing

Table 2 reports the random effects regression results. Model (1) is the baseline model with control variables only. We found that market dynamism and information quality have statistically significant and negative effects on firm profitability. These results indicate that environmental turbulence — i.e., the changeability and unpredictability of market environment (Igor Ansoff and Sullivan, 1993) — makes it harder for firms to gain profit. In Model (2), we added the independent variable (i.e., coopetition experience) to the model. We found that coopetition experience had a statistically significant and negative effect on firm profitability ($\beta_1 = -0.024$; $p < 0.001$). We observed that a firm's coopetition experience, on average, has a negative impact on firm profitability, without considering the contingency factors. Thus, H1a was not supported and H1b was supported. Subsequently, we added IT investment and the interaction term between coopetition experience and IT investment, then R&D investment and the interaction term between coopetition experience and R&D investment to test H2 and H3. Since H1a was not supported, we will focus on the moderation effects in H1b — namely, a negative relationship between coopetition experience and firm profitability.

Table 2
Random effects regression results.

	(1)	(2)	(3)	(4)
Market share	−0.001 (0.022)	−0.006 (0.022)	−0.008 (0.022)	−0.013 (0.022)
No. of markets	0.004 (0.004)	0.005 (0.004)	0.003 (0.004)	0.003 (0.004)
Size	0.004 (0.004)	0.008 ⁺ (0.005)	−0.005 (0.006)	−0.003 (0.006)
Age	−0.000 (0.007)	−0.002 (0.007)	−0.002 (0.007)	−0.002 (0.007)
Exports	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
Diversification	0.004 (0.012)	0.003 (0.012)	0.001 (0.012)	0.000 (0.012)
Alliances with partners	0.003 (0.011)	0.007 (0.011)	0.010 (0.011)	0.007 (0.011)
Product innovation	−0.008 (0.009)	−0.008 (0.009)	−0.009 (0.009)	−0.010 (0.009)
Marketing innovation	0.008 (0.010)	0.010 (0.010)	0.008 (0.010)	0.009 (0.010)
Market dynamism	−0.016 ^{**} (0.006)	−0.015 ^{**} (0.006)	−0.014 [*] (0.006)	−0.015 ^{**} (0.006)
Information quality	−0.016 ⁺ (0.009)	−0.016 ⁺ (0.009)	−0.018 ⁺ (0.009)	−0.018 [*] (0.009)
Domestic market	0.000 (0.011)	0.001 (0.011)	0.003 (0.011)	0.003 (0.011)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Coopetition experience		−0.024 ^{***} (0.005)	−0.168 ^{***} (0.024)	−0.106 ^{***} (0.030)
IT investment			0.007 [*] (0.003)	0.005 (0.003)
Coopetition experience × IT investment			0.013 ^{***} (0.002)	0.019 ^{***} (0.003)
R&D investment				0.003 (0.003)
Coopetition experience × R&D investment				−0.009 ^{***} (0.002)
Constant	0.075 (0.063)	0.061 (0.063)	0.062 (0.065)	0.047 (0.070)
R ²	0.031	0.037	0.051	0.054
Wald Chi-sq.	77.400 ^{***}	100.800 ^{***}	151.990 ^{***}	165.290 ^{***}

Note: $n = 2954$; $p < 0.1$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$. Standard errors are in parentheses. Dependent variable is firm profitability.

Fig. 1. The relationship between competition experience and firm profitability at different levels of it investment.

Regarding IT investment, we proposed a weakening (H2a) or strengthening (H2b) moderation effect of IT investment on the negative relationship between competition experience and firm profitability. In Model (3), we found that IT investment had a statistically significant and positive effect on firm profitability ($\beta_2 = 0.007$; $p < 0.05$), and the coefficient of interaction term between competition experience and IT investment was statistically significant and positive ($\beta_4 = 0.013$; $p < 0.001$). Since competition experience has a negative relationship with firm profitability, this result indicates that IT investment weakens this negative relationship. Thus, H2a was supported and H2b was not supported.

Regarding R&D investment, we also proposed two competing hypotheses. H3a suggests that R&D investment weakens the negative effect of competition experience on firm profitability, whereas H3b suggests a strengthening moderation effect. In Model (4), we found that the coefficient of the interaction term between competition experience and R&D investment was statistically significant and negative ($\beta_5 = -0.009$; $p < 0.001$). Given the negative relationship between R&D investment and IT investment, this result indicates that R&D investment strengthens this negative relationship. Thus, our results provided support for H3b, but not for H3a.

To facilitate the interpretation of these results, we plot the moderation effects. We plot the moderation effect of IT investment in Fig. 1. Since we measure IT and R&D investments by the amount of expenditure, the mean is much larger than the standard deviation (see Table 1). We, therefore, use two standard deviations to define the high and low levels of investment in plotting. As shown below, firm profitability increases with competition experience when firms have *high* IT investment, compared to the case in which firm profitability decreases with competition experience when firms have *low* IT investment. Consistent with H2b, these patterns jointly suggest that the negative relationship between competition experience and firm profitability is weakened by IT investment and, more importantly, changes to a positive relationship when IT investment is high.

We further plot the moderation effect of R&D investment in Fig. 2. As shown below, firm profitability decreases more rapidly with competition experience when firms have *low* R&D investment, compared to the case when firms have *high* R&D investment. Consistent with H3a, this result suggests that the negative relationship between competition experience and firm profitability is strengthened by R&D investment. Overall, our results reveal interesting insights into the asymmetric moderation effects of IT and R&D investments by respectively weakening and strengthening the negative impact of competition experience on firm profitability. We discuss the implications in the next section.

Robustness checks

We conducted several robustness checks (see Table 3). First, we address the endogeneity of competition experience and firms' investments in IT and R&D by using a firm fixed effects model to control for the time-invariant unobservable firm characteristics that

Fig. 2. The relationship between competition experience and firm profitability at different levels of R&D investment.

Table 3
Robustness checks.

	(1)	(2)	(3)	(4)
	Fixed effects model	Five-year coopetition experience	Coopetition experience only	Orthogonalized IT/R&D investments
Market share	−0.080* (0.037)	−1.253 (2.229)	0.080 (0.122)	−1.330 (2.233)
No. of markets	0.006 (0.008)	0.321 (0.387)	0.005 (0.020)	0.332 (0.388)
Size	0.007 (0.029)	−0.257 (0.626)	0.014 (0.037)	−0.329 (0.627)
Age	−0.004 (0.024)	−0.244 (0.736)	−0.035 (0.035)	−0.219 (0.736)
Exports	−0.000 (0.000)	−0.003 (0.019)	−0.002 (0.001)	−0.004 (0.019)
Diversification	0.005 (0.020)	−0.027 (1.186)	−0.014 (0.055)	0.048 (1.187)
Alliances with partners	−0.018 (0.017)	0.548 (1.128)	0.005 (0.086)	0.650 (1.132)
Product innovation	−0.012 (0.012)	−0.971 (0.903)	−0.101* (0.044)	−1.007 (0.905)
Marketing innovation	0.033** (0.013)	0.971 (0.956)	0.049 (0.044)	0.926 (0.958)
Market dynamism	−0.004 (0.007)	−1.510** (0.573)	−0.002 (0.027)	−1.479** (0.574)
Information quality	−0.036** (0.014)	−1.788* (0.905)	−0.045 (0.048)	−1.790* (0.906)
Domestic market	0.013 (0.017)	0.353 (1.063)	−0.026 (0.051)	0.326 (1.064)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Coopetition experience	−0.126* (0.053)	−13.985*** (4.012)	−0.147 (0.107)	−2.738*** (0.604)
IT investment	0.002 (0.004)	0.479 (0.345)	−0.005 (0.021)	1.181 ⁺ (0.679)
Coopetition experience × IT investment	0.026*** (0.003)	2.749*** (0.356)	0.030*** (0.009)	2.559*** (0.389)
R&D investment	−0.001 (0.005)	0.267 (0.329)	0.012 (0.022)	0.415 (0.547)
Coopetition experience × R&D investment	−0.013*** (0.004)	−1.355*** (0.337)	−0.016 ⁺ (0.009)	−1.456*** (0.406)
Constant	−0.021 (0.250)	5.231 (6.965)	0.065 (0.340)	13.054 ⁺ (6.722)
R ²	0.012	0.058	0.099	0.054
F/Wald Chi-sq.	3.540***	179.140***	55.800***	165.290***
n	2954	2954	526	2954

Note: + $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Standard errors are in parentheses. Dependent variable is firm profitability.

may be omitted variables in our analysis (e.g., Wang et al., 2016). As Model (1) in Table 3 shows, the fixed effects model generated consistent results. Thus, endogeneity is not a major concern in our results.

Second, we created alternative measures for coopetition experience by using a different time window. In addition to counting all years in which firms had coopetition experience, we tried a 5-year moving window that was also used in the literature (e.g., Hoang and Roathemmel, 2005; Park et al., 2014). Again, we found consistent results, as shown in Model (2), Table 3 — the recent 5-year coopetition experience had a negative effect on firm profitability, which is weakened by IT investment and strengthened by R&D investment. Thus, our results are robust to the time window used.

Third, we further derived a subsample by focusing on firms with coopetition experience for at least one year in a 5-year moving window. In our sample, a large number of firms had no coopetition experience. An analysis based on a subsample ruling them out helps in examining whether they have substantially influenced our results. We then tested our hypotheses again for firms with coopetition experience only. As shown in Model (3) in Table 3, the results were largely consistent with our main results, while the significance level of coefficients dropped due to a much smaller sample size.

Finally, we considered the collinearity of the two types of technological investments (i.e., IT and R&D investments), as firms may tend to invest more or less in both. Although we only observed a modest correlation between IT and R&D investments ($r = 0.503$), we orthogonalized these two variables and then tested our hypotheses. Orthogonalization helps partial out the common variance between correlated variables by subtracting the vector from its projection through a modified Gram-Schmidt process (e.g., Sine et al., 2006). As reported in Model (4), Table 3, we found consistent results.

Discussion and implications

Main findings and implications

Combining arguments from the coopetition (e.g., Gnyawali et al., 2016; Raza-Ullah et al., 2014) and organizational learning literature (e.g., Castellaneta et al., 2017; Levinthal and March 1993), this study sought to systematically examine the relationship between coopetition experience and firm profitability in the context of technological coopetition. Analyzing a 7-year panel data set from 911 Spanish manufacturing firms, we have addressed two research questions. The first research question concerned whether coopetition experience is actually beneficial or detrimental to firm profitability. Our results show that coopetition experience is, generally speaking, detrimental to firm profitability. In our large-scale sample from Spanish manufacturing industries we found that, on average, firm profitability suffers from coopetition experience, suggesting that these firms face a considerably challenging paradox when managing technological coopetition relationships. We interpret this result as supporting the existence of the “dark side” of coopetition experience, which we theoretically attribute to the combined effect of the vicious cycles of response that emerge when firms confront the coopetition paradox (e.g., Gnyawali et al., 2016) and the inertial forces that accompany experience accumulation

(e.g., [Castellaneta et al., 2017](#)).

The second research question entailed examining firms' internal context to explain variation in the effects of coopetition experience across firms. Interestingly, we found that the detrimental effects of coopetition experience on firm profitability become more pronounced as R&D investment increases, whereas the effect of coopetition experience shifts from detrimental to beneficial as IT increases. This result supports our arguments that IT investment enables effective learning by facilitating information processing, while R&D investment favors suboptimal decisions and inertia in coopetition management. There are fundamental differences between IT and R&D investments that can explain their asymmetric effects, at least in two ways.⁷ First, while IT investment is instrumental to a firm's knowledge base (i.e., helps organizing and structuring it), R&D investment is more influential contentwise (i.e., determines knowledge depth vs. breadth). Because firms tend to focus on exploitation, a firm's knowledge base tends to become deeper as R&D investment increases, which in turn reinforces its tendency to inward-focus ([Zhou and Li, 2012](#)) and, thus, the detrimental effect of coopetition experience. Second, firms face risks of unintended knowledge leakage in coopetition ([Oxley and Sampson, 2004](#)). The consequences of R&D knowledge leakage for firm profitability may be more severe than the consequences of IT knowledge leakage. Thus, firms with stronger R&D investment may be particularly affected by knowledge leakage as they become more experienced in coopetition. More broadly, our results suggest that in the "digital age", firms' investments in digital technologies have become increasingly critical to their learning abilities ([Dong and Yang, 2015](#); [Kane and Alavi, 2007](#)), while too much emphasis on conventional R&D could be detrimental. Thus, our finding is consistent with recent work showing, in a broader context than coopetition, that IT investment could be a remedy to the challenges of innovation (e.g., [Gómez et al., 2017](#); [Ravichandran et al., 2017](#)).

The framework and evidence provided in this study have important implications for coopetition research. Generally, our study corroborates the idea that coopetition experience is central to explaining variation in coopetition outcomes across firms (e.g., [Gnyawali and Park, 2011](#); [Gnyawali et al., 2016](#); [Park et al., 2014](#)). At the same time, interpreting insights from previous studies through the lens of our study reveals a different picture than the one portrayed in the extant literature. While prior research has tended to assume a beneficial role of coopetition experience by analogy with general alliance experience ([Park et al., 2014](#)), our results point to the differing effects of both types of experience, echoing fundamental differences between coopetition and other interorganizational relationships. Numerous studies (see [Wang and Rajagopalan, 2015](#) for a review) report positive effects of alliance experience — suggesting that the beneficial effects of alliance experience may prevail. Our results suggest that, in the context of coopetition, the detrimental effects of experience seem to be predominant. General alliance challenges (e.g., partner selection, negotiation) become more salient in coopetition due to its complexity, namely, the simultaneity of cooperation and competition ([Gnyawali and Ryan Charleton, 2018](#)) and the associated paradox and tensions (e.g., [Raza-Ullah et al., 2014](#)). Our study adds to this discussion by suggesting that not only is it particularly challenging to manage coopetition relationships but firms may also struggle to make sense and learn from their experiences in such relationships. These arguments also offer a compelling explanation for the nonsignificant effects of general alliance experience on the performance of coopetition relationships that some studies have reported (e.g., [Walter et al., 2015](#)). Thus, we show that it is crucial for scholars to account for the idiosyncratic nature of coopetition (*vis-à-vis* alliances) when examining the effects of coopetition experience.

Furthermore, our results complement [Park et al.'s \(2014\)](#) evidence on the effects of coopetition experience, suggesting that they may be different for different facets of performance. While coopetition experience may help firms to boost their innovation performance ([Park et al., 2014](#)), our results indicate that the costs of doing so may be excessive, which may, in turn, hurt profitability, especially for R&D-intensive firms (as shown by our results for Hypothesis 3b). This can be attributed to a substitution effect between knowledge created through R&D activities and knowledge embedded in coopetition experience, and the high coordination costs that maintaining a sophisticated knowledge network entails ([Grigoriou and Rothatermel, 2017](#); [Zhou and Li, 2012](#)). For these firms, the added value of the knowledge acquired from coopetition experience may be lower (i.e., it is more difficult to find novel knowledge that is not already available through the firm's R&D activities), while the costs of integrating it may rise disproportionately, hindering firm profitability. Innovation outcomes, such as patents, are highly risky in commercialization, leading to mixed results regarding the innovation-profitability relationship (e.g., [Ghapar et al., 2014](#)). Thus, our study suggests that it is important to consider potential nuances and variation when examining the implications of coopetition experience.

Through providing evidence on the dual effects of coopetition experience and the moderating role of technological investments, our study also provides novel theoretical insight into the building process of coopetition capability. Existing studies theorizing coopetition capability have argued that firms can develop the analytical and executional capabilities required to manage coopetition successfully as they become more experienced ([Gnyawali et al., 2016](#)). Our study adds nuance to this argument, suggesting that this capability-building process may occur neither automatically nor independently from a firm's technological investments. IT investment may be a prerequisite to translate coopetition experience into capability, while R&D investment may frustrate such capability-building efforts. Thus, our study points to the relevance of revisiting the experience-capability relationship in the context of coopetition such that the potential capability-building (capability-inhibiting) role of technological investments is accounted for. Also, our results stress that future studies examining how key technologies, such as IT, help manage coopetition (e.g., [Fernandez and Chiambaretto, 2016](#)), should pay attention to the interplay between a firm's investments in those technologies and its coopetition experience.

By illuminating the "dark side" of coopetition experience and the specific conditions that can exacerbate or mitigate it, this study also complements recent efforts to develop a contingency perspective on coopetition (e.g., [Estrada et al., 2016](#); [Ritala, 2012](#); [Dong](#)

⁷ We thank one anonymous reviewer who suggested this point.

et al., 2017), which has been regarded as crucial to better understand the outcomes of coopetition (Le Roy and Czakon, 2016). These studies have mostly focused on the links between technological coopetition and innovation and market performance, emphasizing the moderating role of firm (e.g., Estrada et al., 2016), environment (e.g., Ritala, 2012), and relationship characteristics (e.g., Dong et al., 2017). Our work adds to these studies by uncovering the contingent nature of the relationship between coopetition experience and firm profitability and by revealing the role of a firm's technological investments as key boundary conditions. Overall, our results conceptually suggest that, while a firm's first endeavor into coopetition might be more or less beneficial, each subsequent experience might be less profitable unless the firm carries out the necessary technological investments.

Contributions

The contribution of this study to the coopetition literature is two-fold. The major contribution of this study lies in providing an enriched understanding of the role of coopetition experience. We do so in two critical ways. First, we introduce the dual effects of experience (i.e., beneficial and detrimental), arguing and providing evidence that salient detrimental effects (Castellaneta et al., 2017; Zollo, 2009), while underemphasized in prior research (Gnyawali and Park, 2011; Park et al., 2014), can arise as firms accumulate coopetition experience. Specifically, we theorize that coopetition experience can impact firm profitability either positively or negatively through eliciting learning opportunities and inertial constraints that enable or impede the development of a firm's coopetition mindset and routines. Second, we develop a contingency view on the relationship between coopetition experience and firm profitability, highlighting the pivotal but nuanced moderating role of a firm's technological investments. We conclude that firms can mitigate the detrimental effects of experience by carrying substantial IT investment, whereas R&D investment may predate the learning potential embedded in coopetition experience. Overall, we provide a more comprehensive understanding of the role of coopetition experience by (i) accounting for the dual effects of coopetition experience, (ii) articulating the mechanisms underlying the coopetition experience-firm profitability relationship, and (iii) revealing key boundary conditions of this relationship.

As a second and broader contribution, our study contributes to the coopetition literature by helping to mitigate the extant research's tendency toward polarization.⁸ As noted by Gnyawali and Ryan Charleton (2018), coopetition scholars have traditionally tended to overemphasize either the opportunities or hazards of coopetition strategies, resulting in a polarized, fragmented view of the phenomenon, thus hampering theoretical progress in the field. In the context of our framework, what can inhibit further theoretical progress, we have argued, is the tendency of scholars to paint a too rosy picture of the role of coopetition experience and to assume that such a role remains unaffected by the coopetition paradox and a firm's internal context. Thus, focusing on the central issue of coopetition experience and its implications for firm profitability, we have followed up on the call to “consider multiple perspectives and potential for multiple outcomes from coopetition and to examine key conditions that lead to variation in outcomes” (Gnyawali and Ryan Charleton, 2018: 2530). In particular, we have challenged the prevalent rosy view of coopetition experience by offering a nuanced analysis that theoretically distills and empirically examines the multifaceted relationship between coopetition experience and firm profitability. Not only does our study reveal the potential “dark side” of coopetition experience, but it also points to specific conditions that can mitigate or exacerbate it.

Implications for practice

Coopetition may be the way forward to cope with emerging strategic challenges. Intuition may suggest that more experienced companies will do better in managing coopetition relationships. However, and although it may seem paradoxical, our study reveals that a company's profitability may suffer as its experience with these relationships increases. Coopetition is complex. For example, it is not easy to work with a competitor and, at the same time, safeguard the company's own interests. As such, decision-making in coopetition implies many moving parts, impeding managers from figuring out what failed (or succeeded) in the firm's relationships with cooperators. Hence, experience may lock companies into a poor approach to managing coopetition. This is a key conclusion from our study.

Fortunately, we also point to some remedies managers can apply to lessen these problems and turn their companies' coopetition experience into superior profitability. Managers need to pay close attention to the company's technological investments. According to our study, a remedy to the lock-in problem is investing sufficiently in IT resources. For companies with strong IT investment, we found that coopetition experience may enhance profitability. Thus, a company that sufficiently nurtures its IT infrastructure seems to be better equipped to unlock the learning opportunity of coopetition experience. In contrast, we show that when the level of R&D investment is high, coopetition experience is associated with poorer profitability. An R&D-intensive company may be too focused on its own knowledge and, thus, may be poorly positioned to cope with the complexity of coopetition and the pitfalls of experience. Hence, we recommend that managers of R&D-intensive companies carefully consider the potential downsides of increasing coopetition experience.

Finally, our study also shows the importance of understanding the heterogeneous nature of different technological investments such as IT and R&D investments. This is critical because, depending on the level and type of investment, coopetition experience may boost or hurt a company's profitability. Therefore, our results remind managers of the danger of oversimplifying technological investment decisions if their companies are to take full advantage of their experience in managing complex relationships such as coopetition.

⁸ We thank one anonymous reviewer who suggested this point.

Limitations and future research

There are some limitations inherent to this study. First, our data provided a long panel and allowed us to adopt a longitudinal design to test the hypothesized effects over time. However, as is commonly performed in surveys such as the ESEE, to encourage response and avoid recall biases, coopetition experience is measured by using a simple binary scale. Accordingly, our measure of coopetition experience essentially captures the cumulative number of years of experience. Future research can validate our results by collecting more fine-grained data on a firm's cumulative number of coopetition relationships (or competitors). This approach will allow higher variation in coopetition experience to be captured while accounting for its fade-out pattern, for example, by depreciating the number of coopetition relationships over years (Park et al., 2014; Sampson, 2005).

Furthermore, in line with prior studies (e.g., Park et al., 2014), our measure of coopetition experience focuses on a firm's experience in technological alliances with competitors, which the literature portrays as the archetypes of coopetition (e.g., Brandenburger and Nalebuff, 1996; Gnyawali and Park, 2011; Walter et al., 2015). However, coopetition can also occur within the firm's boundaries (Tsai, 2002). In fact, we have argued that a firm can redeploy routines developed in relationships with external partners to manage intrafirm coopetition tensions. By the same token, intrafirm coopetition experience may also influence a firm's alliances with competitors (Gnyawali and Park, 2011). Thus, a promising avenue for future research is to explore and compare different types of "experience spillovers" (Zollo and Reuer, 2010) in the context of technological coopetition.

Second, as core contingencies in our model, we focus on two technological investments (i.e., IT and R&D investments), because the literature provides strong reasons to assert that they are central for firms to capitalize on coopetition experience in the context of technological coopetition. However, we acknowledge that other types of investments may be at play. For example, prior studies indicate that certain organizational factors, such as a firm's HR system (Gnyawali et al., 2016) or internal structure (Gnyawali and Park, 2011), can act as "supporting capabilities" of a firm's coopetition capability. To the extent that coopetition experience is a core building block of coopetition capability (Park et al., 2014), these factors may also shape how a firm copes with the dual effects of coopetition experience. Thus, there is an important opportunity ahead for scholars to build upon and extend our model on the contingent relationship between coopetition experience and firm profitability by exploring the role of other strategic investments.

Finally, though our sample is largely representative of firms operating in manufacturing industries in Spain, we should be cautious when generalizing our findings to service industries or to other country settings. Moreover, we have focused on technological coopetition. While our theory is not necessarily context-specific, some of its elements, such as the magnitude of the moderation effects of technological investments, might differ across industrial, national and coopetition contexts. Thus, future research can gather data from other contexts to examine the generalizability of our findings and can possibly identify additional nuances in the coopetition experience-firm profitability relationship.

Conclusion

As coopetition is a paradoxical phenomenon, managers may fail to make sense of their experience in managing coopetition relationships. Thus, experience may lock firms into a poor approach to managing coopetition, eventually hurting firm profitability. This paper documents theoretical explanations and empirical evidence revealing the "dark side" of coopetition experience and how key technological investments counteract or exacerbate it. We hope to encourage scholars to continue developing this promising line of inquiry and further distill the nuanced connections between coopetition experience, technological investments and firm profitability.

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References

- Anand, B.N., Khanna, T., 2000. Do firms learn to create value? The case of alliances. *Strat. Manag. J.* 21 (3), 295–315.
- Bardhan, I., Krishnan, V., Lin, S., 2013. Business value of information technology: testing the interaction effect of IT and R&D on Tobin's Q. *Inf. Syst. Res.* 24 (4), 1147–1161.
- Brandenburger, A.M., Nalebuff, B.F., 1996. *Co-opetition*. Harper Collins, London.
- Bengtsson, M., Raza-Ullah, T., 2016. A systematic review of research on coopetition: toward a multilevel understanding. *Ind. Market. Manag.* 57 (1), 23–39.
- Bengtsson, M., Raza-Ullah, T., Vanyushyn, V., 2016. The coopetition paradox and tension: the moderating role of coopetition capability. *Ind. Market. Manag.* 53 (1), 19–30.
- Bhardwaj, G., Crocker, A., Sims, J., Wang, R.D., 2018. Alleviating the plunging-in bias, elevating strategic problem-solving. *Acad. Manag. Learn. Educ.* 17 (3), 279–301.
- Chwelos, P., Ramirez, R., Kraemer, K.L., Melville, N.P., 2010. Does technological progress alter the nature of information technology as a production input? New evidence and new results. *Inf. Syst. Res.* 21 (2), 392–408.
- Castañer, X., Mulotte, L., Garrette, B., Dussauge, P., 2014. Governance mode vs. governance fit: performance implications of make-or-ally choices for product innovation in the worldwide aircraft industry, 1942–2000. *Strat. Manag. J.* 35 (9), 1386–1397.
- Castellana, F., Valentini, G., Zollo, M., 2017. Learning or inertia? The impact of experience and knowledge codification on post-acquisition integration. *Ind. Corp. Change* 27 (3), 577–593.

- Cohen, W.M., Levinthal, D.A., 1990. Absorptive capacity: a new perspective on learning and innovation. *Adm. Sci. Q.* 35 (1), 128–152.
- Cool, K., Dierickx, I., 1993. Rivalry, strategic groups and firm profitability. *Strat. Manag. J.* 14 (1), 47–59.
- Das, S., Sen, P.K., Sengupta, S., 1998. Impact of strategic alliances on firm valuation. *Acad. Manag. J.* 41 (1), 27–41.
- Das, T.K., Teng, B.-S., 2000. Instabilities of strategic alliances: an internal tensions perspective. *Organ. Sci.* 11 (1), 77–101.
- Dennis, A.R., Kinney, S.T., 1998. Testing media richness theory in the new media: the effects of cues, feedback, and task equivocality. *Inf. Syst. Res.* 9 (3), 256–274.
- Dong, J.Q., 2016. On the contingent rent-generating potential of firm-specific managerial experience. *J. Bus. Res.* 69 (10), 4358–4362.
- Dong, J.Q., McCarthy, K.J., Schoenmakers, W.W.M.E., 2017. How central is too central? Organizing interorganizational collaboration networks for breakthrough innovation. *J. Prod. Innovat. Manag.* 34 (4), 526–542.
- Dong, J.Q., Netten, J., 2017. Information technology and external search in the open innovation age: new findings from Germany. *Technol. Forecast. Soc. Change* 120 (1), 223–231.
- Dong, J.Q., Wu, W., 2015. Business value of social media technologies: evidence from online user innovation communities. *J. Strat. Inf. Syst.* 24 (2), 113–127.
- Dong, J.Q., Yang, C.-H., 2015. Information technology and organizational learning in knowledge alliances and networks: evidence from U.S. pharmaceutical industry. *Inf. Manag.* 52 (1), 111–122.
- Dong, J.Q., Yang, C.-H., 2018. Business Value of Big Data Analytics: A Systems-Theoretic Approach and Empirical Test. *Information and Management* (in press).
- Doz, Y.L., 1996. The evolution of cooperation in strategic alliances: initial conditions or learning processes? *Strat. Manag. J.* 17 (S1), 55–83.
- Enberg, C., 2012. Enabling knowledge integration in cooperative R&D projects — the management of conflicting logics. *Int. J. Proj. Manag.* 30 (7), 771–780.
- Estrada, I., de la Fuente, G., Martín-Cruz, N., 2010. Technological joint venture formation under the real options approach. *Res. Pol.* 39 (9), 1185–1197.
- Estrada, I., 2018. Knowledge management in cooptation. In: Chiambaretto, P., Czakon, W., Fernandez, A.S., Le Roy, F. (Eds.), *Routledge Companion on Cooptation*.
- Estrada, I., Faems, D., de Faria, P., 2016. Cooptation and product innovation performance: the role of internal knowledge sharing mechanisms and formal knowledge protection mechanisms. *Ind. Market. Manag.* 53 (1), 56–65.
- Fernandez, A.S., Chiambaretto, P., 2016. Managing tensions related to information in cooptation. *Ind. Market. Manag.* 53, 66–76.
- Ghapor, F., Brooks, R., Smyth, R., 2014. The impact of patenting activity on the financial performance of Malaysian firms. *J. Asia Pac. Econ.* 19 (3), 445–463.
- Galzer, R., Weiss, A.M., 1993. Marketing in turbulent environments: decision processes and the time-sensitivity of information. *J. Market. Res.* 30 (4), 509–521.
- Gnyawali, D.R., He, J., Madhavan, R., 2006. Impact of co-optation on firm competitive behavior: an empirical examination. *J. Manag.* 32 (4), 507–530.
- Gnyawali, D.R., Madhavan, R., He, J., Bengtsson, M., 2016. The competition–cooperation paradox in inter-firm relationships: a conceptual framework. *Ind. Market. Manag.* 53 (1), 7–18.
- Gnyawali, D.R., Park, B.-J.R., 2011. Co-optation between giants: collaboration with competitors for technological innovation. *Res. Pol.* 40 (5), 650–663.
- Gnyawali, D.R., Ryan Charleton, T., 2018. Nuances in the interplay of competition and cooperation: towards a theory of cooptation. *J. Manag.* 44 (7), 2511–2534.
- Gómez, J., Salazar, I., Vargas, P., 2017. Does information technology improve open innovation performance? An examination of manufacturers in Spain. *Inf. Syst. Res.* 28 (3), 661–675.
- Grigoriou, K., Rothaermel, F.T., 2017. Organizing for knowledge generation: internal knowledge networks and the contingent effect of external knowledge sourcing. *Strat. Manag. J.* 38 (2), 395–414.
- Hansen, M.T., Haas, M.R., 2001. Competing for attention in knowledge markets: electronic document dissemination in a management consulting company. *Adm. Sci. Q.* 46 (1), 1–28.
- Haas, M.R., Hansen, M.T., 2005. When using knowledge can hurt performance: the value of organizational capabilities in a management consulting company. *Strat. Manag. J.* 26 (1), 1–24.
- Hall, M., Weiss, L., 1967. Firm size and profitability. *Rev. Econ. Stat.* 49 (3), 319–331.
- Hoang, H., Rothaermel, F.T., 2005. The effect of general and partner-specific alliance experience on joint R&D project performance. *Acad. Manag. J.* 48 (2), 332–345.
- Heimeriks, K.H., 2010. Confident or competent? How to avoid superstitious learning in alliance portfolios. *Long. Range Plan.* 43 (1), 57–84.
- Hitt, L.M., Brynjolfsson, E., 1996. Productivity, business profitability, and consumer surplus: three different measures of information technology value. *MIS Q.* 20 (2), 121–142.
- Igor Ansoff, H., Sullivan, P.A., 1993. Optimizing profitability in turbulent environments: a formula for strategic success. *Long. Range Plan.* 26 (5), 11–23.
- Im, G., Rai, A., 2014. IT-enabled coordination for ambidextrous interorganizational relationships. *Inf. Syst. Res.* 25 (1), 72–92.
- Joshi, K.D., Chi, L., Datta, A., Han, S., 2010. Changing the competitive landscape: continuous innovation through IT-enabled knowledge capabilities. *Inf. Syst. Res.* 21 (3), 472–495.
- Kane, G.C., Alavi, M., 2007. Information technology and organizational learning: an investigation of exploration and exploitation processes. *Organ. Sci.* 18 (5), 796–812.
- Lado, A.A., Boyd, N.G., Hanlon, S.C., 1997. Competition, cooperation, and the search for economic rents: a syncretic model. *Acad. Manag. Rev.* 22 (1), 110–141.
- Leiponen, A., 2000. Competencies, innovation and profitability of firms. *Econ. Innovat. N. Technol.* 9 (1), 1–24.
- Leonard-Barton, D., 1992. Core capabilities and core rigidities: a paradox in managing new product development. *Strat. Manag. J.* 13 (S1), 111–125.
- Levitt, B., March, J.G., 1988. Organizational learning. *Annu. Rev. Sociol.* 14 (1), 319–338.
- Le Roy, F., Czakon, W., 2016. Managing cooptation: the missing link between strategy and performance. *Ind. Market. Manag.* 53 (1), 3–6.
- Le Roy, F., Fernandez, A.S., 2015. Managing cooperative tensions at the working-group level: the rise of the competitive project team. *Br. J. Manag.* 26 (4), 671–688.
- Levinthal, D.A., March, J.G., 1993. The myopia of learning. *Strat. Manag. J.* 14 (S2), 95–112.
- Lewis, P., Thomas, H., 1990. The linkage between strategy, strategic groups, and performance in the U.K. retail grocery industry. *Strat. Manag. J.* 11 (5), 385–397.
- Liu, Y., Ravichandran, T., 2015. Alliance experience: IT-enabled knowledge integration, and ex ante value gains. *Organ. Sci.* 26 (2), 511–530.
- Majumdar, S.K., 1997. The impact of size and age on firm-level performance: some evidence from India. *Rev. Ind. Organ.* 12 (2), 231–241.
- McAfee, A., Brynjolfsson, E., 2012. Big data: the management revolution. *Harv. Bus. Rev.* 90 (10), 60–68.
- Myles Shaver, J., 2011. The benefits of geographic sales diversification: how exporting facilitates capital investment. *Strat. Manag. J.* 32 (10), 1046–1060.
- Nelson, R.R., Winter, S.G., 1982. *An Evolutionary Theory of Economic Change*. The Belknap Press of Harvard University Press, Cambridge, MA.
- Nguyen, D., McCracken, V., Casavant, K., Jessup, E., 2011. Geographic location, ownership and profitability of Washington log trucking companies. *Regional Science Policy and Practice* 3 (2), 115–125.
- Ocasio, W., 1997. Towards an attention-based view of the firm. *Strat. Manag. J.* 18 (S1), 187–206.
- Oxley, J.E., Sampson, R.C., 2004. The scope and governance of international R&D alliances. *Strat. Manag. J.* 25 (8–9), 723–749.
- Palepu, K., 1985. Diversification strategy, profit performance and the entropy measure. *Strat. Manag. J.* 6 (3), 239–255.
- Park, B.J., Srivastava, M.K., Gnyawali, D.R., 2014. Impact of cooptation in the alliance portfolio and cooptation experience on firm innovation. *Technol. Anal. Strat. Manag.* 26 (8), 893–907.
- Ravichandran, T., Han, S., Mithas, S., 2017. Mitigating diminishing returns to R&D: the role of information technology in innovation. *Inf. Syst. Res.* 28 (4), 812–827.
- Raza-Ullah, T., Bengtsson, M., Kock, S., 2014. The cooptation paradox and tension in cooptation at multiple levels. *Ind. Market. Manag.* 43 (2), 189–198.
- Ritala, P., 2012. Cooptation strategy—when is it successful? Empirical evidence on innovation and market performance. *Br. J. Manag.* 23 (3), 307–324.
- Ritala, P., Hurmelinna-Laukkanen, P., 2013. Incremental and radical innovation in cooptation — the role of absorptive capacity and appropriability. *J. Prod. Innovat. Manag.* 30 (1), 154–169.
- Rothaermel, F.T., Alexandre, M.T., 2009. Ambidexterity in technology sourcing: the moderating role of absorptive capacity. *Organ. Sci.* 20 (4), 759–780.
- Rumelt, R.P., 1982. Diversification strategy and profitability. *Strat. Manag. J.* 3 (4), 359–369.
- Sampson, R.C., 2005. Experience effects and collaborative returns in R&D alliances. *Strat. Manag. J.* 26 (11), 1009–1031.
- Simonin, B.L., 1997. The importance of collaborative know-how: an empirical test of the learning organization. *Acad. Manag. J.* 40 (5), 1150–1174.
- Simonin, B.L., 1999. Ambiguity and the process of knowledge transfer in strategic alliances. *Strat. Manag. J.* 20 (7), 595–623.
- Sine, W.D., Mitsuhashi, H., Kirsch, D.A., 2006. Revisiting Burns and Stalker: formal structure and new venture performance in emerging economic sectors. *Acad. Manag. J.* 49 (1), 121–132.

- Smith, W.K., Lewis, M.W., 2011. Toward a theory of paradox: a dynamic equilibrium model of organizing. *Acad. Manag. Rev.* 36 (2), 381–403.
- Soliman, M.T., 2008. The use of DuPont analysis by market participants. *Account. Rev.* 83 (3), 823–853.
- Stuart, T.E., Podolny, J.M., 1996. Local search and the evolution of technological capabilities. *Strat. Manag. J.* 17 (S1), 21–38.
- Subramani, M., 2004. How do suppliers benefit from information technology use in supply chain relationships? *MIS Q.* 28 (1), 45–73.
- Sullivan, T.G., 1974. Market power, profitability and financial leverage. *J. Finance* 29 (5), 1407–1414.
- Tambe, P., Hitt, L.M., 2012. The productivity of information technology investments: new evidence from IT labor data. *Manag. Sci.* 23 (3), 599–617.
- Tippins, M.J., Sohi, R.S., 2003. IT competency and firm performance: is organizational learning a missing link? *Strat. Manag. J.* 24 (8), 745–761.
- Tsai, W., 2002. Social structure of “coopetition” within a multiunit organization: coordination, competition, and intraorganizational knowledge sharing. *Organ. Sci.* 13 (2), 179–190.
- Vogelstein, F., 2013. *Dogfight: How Apple and Google Went to War and Started a Revolution*. Macmillan.
- Vu, H., Holmes, M., Lim, S., Tran, T., 2014. Exports and profitability: a note from quantile regression approach. *Appl. Econ. Lett.* 21 (6), 442–445.
- Walter, S.G., Walter, A., Müller, D., 2015. Formalization, communication quality, and opportunistic behavior in R&D alliances between competitors. *J. Prod. Innovat. Manag.* 32 (6), 954–970.
- Wang, Y., Rajagopalan, N., 2015. Alliance capabilities: review and research agenda. *J. Manag.* 41 (1), 236–260.
- Wang, H., Choi, J., Wan, G., Dong, J.Q., 2016. Slack resources and the rent-generating potential of firm-specific knowledge. *J. Manag.* 42 (2), 500–523.
- Wernerfelt, B., 1986. The relation between market share and profitability. *J. Bus. Strat.* 6 (4), 67–74.
- Wilhelm, M., Sydow, J., 2018. Managing coopetition in supplier networks — a paradox perspective. *J. Supply Chain Manag.* 54 (3), 22–41.
- Zaheer, A., Hernandez, E., Banerjee, S., 2010. Prior alliances with targets and acquisition performance in knowledge-intensive industries. *Organ. Sci.* 21 (5), 1072–1091.
- Zhou, K.Z., Li, C.B., 2012. How knowledge affects radical innovation: knowledge base, market knowledge acquisition, and internal knowledge sharing. *Strat. Manag. J.* 33 (9), 1090–1102.
- Zhou, K.Z., Wu, F., 2010. Technological capability, strategic flexibility, and product innovation. *Strat. Manag. J.* 31 (5), 547–561.
- Zollo, M., 2009. Superstitious learning with rare strategic decisions: theory and evidence from corporate acquisitions. *Organ. Sci.* 20 (5), 894–908.
- Zollo, M., Reuer, J.J., 2010. Experience spillovers across corporate development activities. *Organ. Sci.* 21 (6), 1195–1212.
- Zollo, M., Winter, S.G., 2002. Deliberate learning and the evolution of dynamic capabilities. *Organ. Sci.* 13 (3), 339–351.

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