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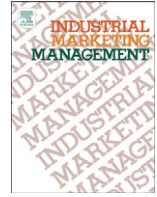
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# Coopetition and product innovation performance: The role of internal knowledge sharing mechanisms and formal knowledge protection mechanisms



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## ABSTRACT

Coopetition is an important new product development strategy; yet, studies addressing the impact of collaboration with competitors on product innovation performance provide mixed evidence. Conducting Tobit analyses on a sample of 627 manufacturing firms that responded to the fifth wave of the Flemish Community Innovation Survey, we find that the innovation performance implications of competitor collaboration depend on fine-grained intra-organizational design characteristics. In particular, our results show that competitor collaboration has a significant positive impact on product innovation performance only when internal knowledge sharing mechanisms and formal knowledge protection mechanisms are present. These findings contribute to the emerging contingency perspective on coopetition and provide specific recommendations to managers that are involved in cooperative endeavors.

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## 1. Introduction

The ability to create new products can be a source of sustainable competitive advantage for firms in almost any industry (Verona & Ravasi, 2003). Many scholars have pointed to coopetition or collaboration between two directly competing firms as a viable strategy to stimulate the development of new products and launch them into the market (e.g. Brandenburger & Nalebuff, 1996; Gnyawali & Park, 2009, 2011; Ritala & Hurmelinna-Laukkanen, 2009; Yami, Castaldo, Dagnino, & Le Roy, 2010). At the same time, coopetition is described as a paradoxical phenomenon that triggers a strong tension between value creation and value appropriation (Bengtsson & Kock, 2014; Raza-Ullah, Bengtsson, & Kock, 2014). Relying on capability-based view arguments, coopetition scholars suggest that collaboration with competitors stimulates value creation through fostering the recombination of complementary knowledge, which is a necessary condition to successfully develop new products (e.g. Dussauge, Garrette, & Mitchell, 2000; Ritala & Hurmelinna-Laukkanen, 2013). Adopting insights from transaction cost theory, they also emphasize that collaboration with competitors represents a transactional setting where unintended knowledge spillovers are likely to occur, triggering significant value appropriation liabilities (Hamel, 1991; Walter, Walter, & Müller, 2014). In line with these different theoretical arguments, existing studies on innovation

performance of coopetition provide mixed results. Whereas some studies (e.g. Belderbos, Carree, & Lokshin, 2004; Neyens, Faems, & Sels, 2010) have found a positive relationship between coopetition and product innovation performance, other studies (e.g. Nieto & Santamaria, 2007) report a negative relationship.

Given these mixed findings, several scholars have stressed the need for more research into how the tension between value creation and value appropriation can be managed within coopetition settings (Bengtsson & Kock, 2014). Some studies have started to address this call, exploring how specific inter-organizational mechanisms can help to alleviate the tension between value creation and value appropriation inherent to coopetition settings (e.g. Cassiman, Di Guardo, & Valentini, 2009; Faems, Janssens & Van Looy, 2010). They identified particular relational and contractual strategies that might help partners to successfully govern cooperative relationships. In this paper, we aim to complement these findings, shifting the focus from inter-organizational mechanisms toward intra-organizational mechanisms that might impact firms' ability to deal with coopetition tensions.

In the broader collaboration literature, it is increasingly emphasized that firms' internal organizational design might substantially influence firms' ability to benefit from inter-organizational collaboration efforts (Foss, Lyngsie, & Zahra, 2013; Lahiri & Narayanan, 2013). Moreover, some studies have started acknowledging the importance of internal design mechanisms in coopetition settings (e.g. Ritala & Hurmelinna-Laukkanen, 2013). Yet, a comprehensive understanding of whether and how different internal mechanisms might jointly help firms to balance the benefits and risks of coopetition strategies remains absent. In this paper, we therefore study whether the presence of (i) internal

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knowledge sharing mechanisms and (ii) formal knowledge protection mechanisms influences the relationship between competitor collaboration and firms' product innovation performance. Relying on insights from the knowledge management literature (Argote, McEvily, & Reagans, 2003; Zhou & Li, 2012) and knowledge spillover literature (Arrow, 1962; Jaffe, Trajtenberg, & Henderson, 1993), we expect that these particular mechanisms influence the core processes (i.e. complementary knowledge recombination and unintended knowledge spillovers) that are likely to emerge in the context of cooptation.

To test the impact of internal knowledge sharing and formal knowledge protection mechanisms on the relationship between competitor collaboration and firms' product innovation performance, we conduct Tobit analyses on a sample of 627 manufacturing firms that responded to the fifth wave of the Flemish Community Innovation Survey (CIS). Our results indicate that cooptation positively influences firms' product innovation performance only if both internal knowledge sharing mechanisms and formal knowledge protection mechanisms are present. These findings contribute to the emerging contingency perspective on cooptation, which emphasizes that the performance implications of cooptation relationships are contingent on the context in which such relationships are embedded (e.g. Cassiman et al., 2009; Luo, 2004; Ritala, 2012). In particular, our study shows that, to better understand the innovation performance implications of cooptation, it is not only relevant to look at the governance mechanisms that are applied within cooptation relationships, but also to study the internal organizational design of the involved firms.

The paper is structured in four sections. First, we theoretically discuss the value creation benefits and value appropriation challenges of competitor collaboration. Subsequently, we develop hypotheses on how different combinations of internal knowledge sharing mechanisms and formal knowledge protection mechanisms might influence the relationship between competitor collaboration and firms' product innovation performance. We then present our methodological approach and discuss the results of our analysis. In the final section, we discuss the theoretical and managerial implications of our findings, point to the main limitations of our study, and elaborate on avenues for future research.

## 2. Theory and hypotheses

In this section, we first rely on capability-based view and transaction cost theory to describe the fundamental cooptation tension between value creation and value appropriation. Subsequently, we rely on insights from knowledge management and knowledge spillover literature to ground our hypotheses.

### 2.1. Cooptation and innovation performance: value creation and value appropriation

During the past decades, collaboration between competitors has become increasingly popular (Hamel, Doz, & Prahalad, 1989; Ritala & Hurmelinna-Laukkanen, 2009). Browning, Beyer, and Shetler (1995), for instance, described the case of SEMATECH, a consortium created by 14 competing firms in the US semiconductor industry to jointly realize breakthrough innovations and win back market share from Japanese companies. More recently, several studies have empirically demonstrated that firms increasingly engage in collaboration with competitors for innovation purposes (e.g. Poot, Faems, & Vanhaverbeke, 2009; Tether, 2002; Yami & Neme, 2014).

Despite its popularity, cooptation implies a fundamental tension between value creation and value appropriation (Bengtsson & Kock, 2014; Brandenburger & Nalebuff, 1996; Fernandez, Le Roy, & Gnyawali, 2014; Raza-Ullah et al., 2014). In particular, cooptation strategies simultaneously entail value creation opportunities and value appropriation liabilities (Das & Teng, 2003; Dussauge et al., 2000; Gnyawali & Park, 2011; Wu, 2014). In order to realize joint value creation opportunities, the competitors have to engage in close interaction that allows for synergistic

recombination of knowledge (Dussauge et al., 2000; Gnyawali & Park, 2011). In doing so, however, they face value appropriation concerns (Das & Teng, 2003), since competitors have both incentives and ability to absorb valuable knowledge from each other (Hamel, 1991; Lane & Lubatkin, 1998), triggering risks of knowledge spillovers.

In the cooptation literature, different theoretical frameworks have been used to illuminate the different core aspects of this tension. Relying on the capability-based view, it has been emphasized that cooptation brings along substantial opportunities for synergistic knowledge recombination. At the same time, applying insights from transaction cost theory, scholars also emphasize the probability of knowledge spillovers when firms collaborate with competitors. Below, we describe each of these theoretical explanations, which are summarized in Table 1.

#### 2.1.1. Knowledge recombination benefits in cooptation

The capability-based view has traditionally focused on explaining how single firms can outperform other firms, underlining the role of organizational capabilities and, specifically, dynamic capabilities – i.e. the firm's ability to alter its resource base (Eisenhardt & Martin, 2000). According to the capability-based view, recombination is a key organizational process underlying the firm's dynamic capabilities (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003). In particular, recombination concerns how existing knowledge is “untangled, altered and integrated with other knowledge bases to create novel business concepts and/or competences” (Galunic & Rodan, 1998: 1195). Therefore, the capability-based view emphasizes the role of recombination as a key determinant of the firm's new product development capabilities (Helfat & Peteraf, 2003; Verona & Ravasi, 2003). Scholars in this tradition also stress that innovation typically emerges out of the recombination of complementary knowledge (Kogut & Zander, 1992; Leiponen & Helfat, 2010), which often implies knowledge exchange between different sources (Galunic & Rodan, 1998). In this regard, it is important to note that competing firms share interests and positions in strategic, market, technology, and business domains (Kim & Parkhe, 2009; Luo et al., 2007). Therefore, collaboration between competitors facilitates bringing together complementary resources that are needed to turn product innovation projects into a success (e.g. Tether, 2002; Wassmer & Dussauge, 2011). Furthermore, competitors are likely to have complementary resources but also relatively similar knowledge bases (Dussauge et al., 2000; Park, Srivastava, & Gnyawali, 2014). Such knowledge similarity reduces ambiguity and enhances potential absorptive capacity (Lane & Lubatkin, 1998), facilitating the access to and acquisition of competitors' valuable knowledge (Ritala & Hurmelinna-Laukkanen, 2013). Competitors are thus able to exchange both codified and tacit knowledge, a necessary step in the recombination process (Galunic & Rodan, 1998), triggering substantial advantages in terms of realizing new-to-the-market innovations (Faems, Janssens,

**Table 1**

Cooptation and innovation performance: two theoretical perspectives.

	'Knowledge recombination'	'Knowledge spillovers'
Focus of analysis	Value creation opportunities	Value appropriation concerns
Theoretical framework	Capability-based view	Transaction cost economics
Basic premise	Cooptation is likely to possess complementary resources	Cooptation is likely to behave in an opportunistic manner
Predicted impact of cooptation on innovation performance	Positive	Negative
Relevant studies	Afuah (2000) Tether (2002) Belderbos et al. (2004) Luo, Rindfleisch, and Tse (2007) Neyens et al. (2010) Mention (2011)	Hamel (1991) Park and Russo (1996) Nieto and Santamaria (2007) Kim and Parkhe (2009) Lhuillery and Pfister (2009) Walter et al. (2014)

& Van Looy, 2007; Hamel et al., 1989). Overall, these insights suggest that, due to the extensive knowledge recombination benefits, cooperation may positively contribute to the firm's innovation performance.

Relying on a sample of Dutch firms in manufacturing and service industries, Belderbos et al. (2004) provide empirical evidence for these capability-based arguments. In particular, they show that competitor collaboration improves firms' innovation performance (i.e. growth in sales of new-to-the-market products per employee). In a similar vein, Neyens et al. (2010) show that long-term collaboration with competitors positively influences breakthrough innovation performance of start-up firms.

### 2.1.2. Unintended knowledge spillovers in cooperation

Whereas the capability-based view shows the joint resource combination benefits of competitor collaboration, transaction cost theory (Williamson, 1991) provides a theoretical foundation for the value appropriation risks of cooperation strategies. Relying on this latter framework, cooperation scholars (e.g. Park & Russo, 1996; Quintana-García & Benavides-Velasco, 2004; Ritala & Hurmelinna-Laukkanen, 2013; Walter et al., 2014) stress the likely emergence of opportunistic actions when competitors collaborate for realizing new product innovations. New product development projects are characterized by high uncertainty about the future value of the technology at hand and often require specific investments that have limited value outside the scope of that particular project (Nayak & Ketteringham, 1994). According to transaction cost theory (e.g. Geyskens, Steenkamp, & Kumar, 2006; Williamson, 1991), such presence of high technological uncertainty and extensive asset-specific investments increases partners' incentives to act opportunistically. Existing case study research on collaboration between competitors (e.g. Alvarez & Barney, 2001; Hamel, 1991) indicates that, in this particular collaborative setting, opportunistic action might manifest itself in terms of competitive learning races. Through collaborative interactions with competitors' boundary-spanners (Tushman & Scanlan, 1981), valuable knowledge can also spill over to the other partner. As stressed in the knowledge spillover literature (Phene & Tallman, 2014; Shu, Liu, Gao, & Shanley, 2014), knowledge can be easily transferred from knowledge producer firms to other firms that can capture the benefits of knowledge usage without sharing the costs of its creation. In the setting of cooperation, where there is a technological and competitive overlap between partners, unintended spillovers of valuable knowledge might substantially harm the innovative skills and capabilities of the individual firms (Lhuillery & Pfister, 2009; Nieto & Santamaria, 2007). In sum, due to potential of unintended knowledge spillovers, cooperation strategies entail important risks in terms of appropriating value, which can hamper firms' innovation performance.

Nieto and Santamaria (2007), using longitudinal data on Spanish manufacturing firms, provide evidence for the existence of such value appropriation risks. In particular, these authors report a significant negative impact of competitor collaboration on breakthrough innovation performance. In addition, other studies show evidence that the mere presence of opportunism risks is likely to reduce the transparency of the cooperators (Estrada, Martin-Cruz, & Martin-Pérez, 2014; Hamel, 1991), restricting their ability to generate and reap collaborative innovation benefits.

### 2.2. The role of internal knowledge sharing and formal knowledge protection mechanisms

In the inter-organizational collaboration literature, scholars increasingly emphasize that firm-level differences in organizational design might explain the heterogeneity in firms' ability to profit from collaboration (Foss et al., 2013; Lahiri & Narayanan, 2013). Extending these insights into our setting, we posit that a firm's ability to manage the cooperation tension between value creation and value appropriation is contingent on particular organizational design elements. Relying on insights from

the knowledge management and knowledge spillover literature we focus on two specific knowledge-related mechanisms, which we consider particularly relevant in cooperation settings: internal knowledge sharing mechanisms and formal knowledge protection mechanisms.

In this study, we define 'internal knowledge sharing mechanisms' as organizational incentives intended to encourage employees to diffuse and exchange knowledge inside the firm's boundaries (Bartol & Srivastava, 2002). By 'formal knowledge protection mechanisms', we refer to legal instruments firms can use to avoid unintended knowledge spillovers to external parties (Rivette & Kline, 2000). Below, we describe these mechanisms in detail. Subsequently, we develop hypotheses on how they influence the relationship between cooperation and innovation performance. Fig. 1 shows our conceptual framework.

#### 2.2.1. Internal knowledge sharing mechanisms

A core premise in the knowledge management literature is that both ability and motivation play a crucial role in the knowledge transfer process (Argote et al., 2003). In addition, knowledge management studies provide strong evidence that internal knowledge sharing mechanisms are key to foster firms' ability to continuously learn and innovate (Nonaka & Takeuchi, 1995; Szulanski, 1996; Tsai, 2001) and to motivate employees to mutually exchange knowledge (Bartol & Srivastava, 2002; Martin-Pérez, Martin-Cruz, & Estrada, 2012; Osterloh & Frey, 2000; Zhou & Li, 2012). Applying these insights into our setting, we argue that internal knowledge sharing mechanisms help firms to capitalize on the knowledge recombination benefits of cooperation, enhancing product innovation performance.

Internal knowledge sharing mechanisms strengthen firms' ability to absorb knowledge from the competitor. In order to exploit the knowledge recombination benefits of cooperation, firms first need to access and acquire valuable knowledge from the competitor and, subsequently, internalize, transform and exploit such new knowledge (Carlile, 2004; Foss et al., 2013). Knowledge similarity enhances potential absorptive capacity in cooperation settings (Lane & Lubatkin, 1998), such that knowledge from cooperators may be easily accessed and assimilated (Dussauge et al., 2000). However, firms may experience problems in internalizing such external knowledge, restricting their ability to recombine it with knowledge that resides within the firm (Ritala & Hurmelinna-Laukkanen, 2013; Walter et al., 2014). Internal diffusion of externally acquired knowledge plays a crucial role in the recombination process (Carlile, 2004; Galunic & Rodan, 1998). It is important that new knowledge navigates throughout the organization from the point where it was acquired to the point where it is actually relevant (Foss et al., 2013). In this regard, Zhou & Li (2012: 1092) argue that internal knowledge sharing facilitates recombination "by evoking a 'kaleidoscope thinking': ... the firm needs a good 'shake' to create a new perspective on its existing pieces of knowledge... Knowledge sharing provides such

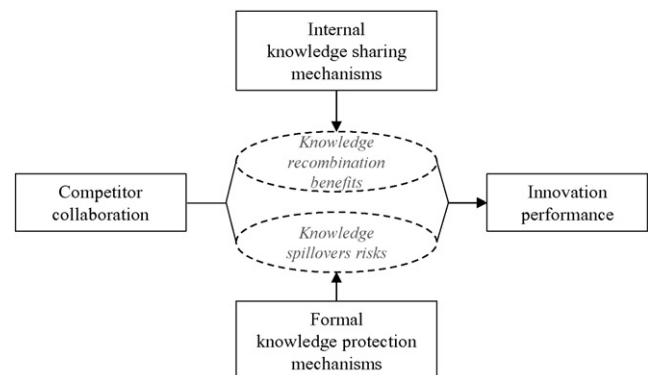


Fig. 1. Conceptual framework.

a shaking process". By promoting internal dissemination of knowledge, internal knowledge sharing mechanisms therefore reduce the gap between potential absorptive capacity – i.e. the ability to access and acquire knowledge – and realized absorptive capacity – i.e. the ability to transform and exploit knowledge that has been accessed and acquired (Zahra & George, 2002).

Internal knowledge sharing mechanisms also help the firm to capture knowledge recombination benefits of co-competition by motivating employees to internally disseminate knowledge from the competitor. Employees sometimes have negative attitudes toward external knowledge (Katz & Allen, 1982), which may be particularly problematic when the knowledge source is a competitor (Raza-Ullah et al., 2014; Wastyn & Hussinger, 2015). The incentive system of an organization conveys strong signals to its employees, making clear which behaviors are expected and will be rewarded (Bowen & Ostroff, 2004; Clark & Wilson, 1961). Knowledge management scholars stress that, through emphasizing that intra-firm dissemination of knowledge (either internal or external) is an organizational priority, internal knowledge sharing mechanisms can help mitigating employees' negative attitudes toward competitors' knowledge (Argote et al., 2003; Bartol & Srivastava, 2002). In sum, internal knowledge sharing mechanisms facilitate capturing the knowledge recombination benefits of co-competition by promoting the internal dissemination and absorption of knowledge from the competitor.

### 2.2.2. Formal knowledge protection mechanisms

Firms can obtain a sustainable competitive advantage if they control valuable and rare resources that are difficult to imitate by competitors (Barney, 1991; James, Leiblein, & Lu, 2013). The creation of new knowledge by a firm is a necessary but not sufficient condition for economic success (Katila, Rosenberger, & Eisenhardt, 2008). Sustainable competitive advantage can only be achieved if a firm is able to prevent unintended use of its knowledge by outside parties (Liebeskind, 1996).

According to the knowledge spillover literature, unintended knowledge spillovers occur when firms are not able to prevent the use of knowledge that they produce by external parties (Arrow, 1962; Griliches, 1992; Grossman & Helpman, 1991). Firms are especially vulnerable to unintended knowledge spillovers in contexts where there are intended knowledge exchanges such as co-competitive settings (Ritala & Hurmelinna-Laukkanen, 2013). Partners have privileged access to the knowledge base of the firms and may obtain additional knowledge without their consent and without proper compensation (Jaffe et al., 1993).

In order to minimize the occurrence of unintended knowledge spillovers, firms can formally protect their knowledge (Ceccagnoli, 2009; Levitas & McFadyen, 2009). Patents, industrial designs, trademarks, and copyrights are prominent formal knowledge protection instruments in this respect. These instruments are particularly effective in protecting established knowledge that can be codified and embodied in final products or services (James et al., 2013; Saviotti, 1998). They grant the exclusive usage and licensing rights of the knowledge for several years (Gelbert, Fosfuri, & Tribo, 2009). These rights are granted by a government agency (e.g. patent office) that evaluates the degree of novelty of the knowledge and attributes legal protection to the firm or individual that applied for the protection (Encaoua, Guellec, & Martinez, 2006).

Formal knowledge protection mechanisms enable the firm to define knowledge sharing boundaries and to mitigate the risks of unintended knowledge spillovers. Protecting knowledge with legal instruments is particularly important in a co-competition context where firms have similar knowledge bases and strategic goals (Kim & Parkhe, 2009; Park et al., 2014). In line with these arguments, Ritala and Hurmelinna-Laukkanen (2013) provide first empirical evidence on the relationship between appropriability and innovation performance in co-competition contexts. They find that firms that have

a strong appropriability regime have better innovation performance than firms with a weak appropriability regime.

### 2.2.3. Research hypotheses

Combining the above arguments, we hypothesize that different combinations of internal knowledge sharing and formal knowledge protection mechanisms affect the relationship between co-competition and firms' product innovation performance differently. Table 2 summarizes the main arguments underlying our hypotheses.

We argue that collaboration with competitors only results in higher product innovation performance when both internal knowledge sharing mechanisms and formal knowledge protection mechanisms are present. On the one hand, internal knowledge sharing mechanisms enable the firm to recombine firm-specific knowledge with knowledge of the competitor partner (Carlile, 2004; Foss et al., 2013). On the other hand, legal knowledge protection mechanisms limit the risk that core knowledge ends up in the hands of the competitor (James et al., 2013; Ritala & Hurmelinna-Laukkanen, 2013). Therefore, we expect that the joint presence of internal knowledge sharing mechanisms and knowledge protection mechanisms allows firms to successfully manage the value creation-value appropriation tension in co-competition settings.

In contrast, when neither type of mechanisms is in place, the firm faces a high risk of unintended knowledge spillovers toward competitors and restricted ability to successfully recombine knowledge that is accessed via competitor collaboration. In such circumstances, we expect competitor collaboration to have a negative impact on firms' product innovation performance. Based on these arguments, we formulate the following hypotheses:

**Hypothesis 1a.** When both internal knowledge sharing mechanisms and formal knowledge protection mechanisms are present, competitor collaboration positively impacts firms' product innovation performance.

**Hypothesis 1b.** When both internal knowledge sharing mechanisms and formal knowledge protection mechanisms are absent, competitor collaboration negatively impacts firms' product innovation performance.

Furthermore, we expect that, when internal knowledge sharing mechanisms are present, but formal protection mechanisms are absent, competitor collaboration exerts neutral effects (neither positive, nor negative) on the firm's product innovation performance. By promoting the internal diffusion of knowledge acquired from the competitor, the firm enhances its ability to reap knowledge recombination benefits inherent in co-competition strategies (Carlile, 2004; Galunic & Rodan, 1998). At the same time, however, the absence of formal knowledge protection mechanisms leaves the firm in a rather vulnerable position to competitors' opportunistic actions (e.g. Hamel, 1991; Walter et al., 2014). Misappropriation liabilities associated with unintended spillovers of core knowledge are likely to offset the benefits gained by recombining knowledge from the competitor (Das & Teng, 2003; Ritala & Hurmelinna-Laukkanen, 2013). In these circumstances, collaborating with competitors might entail no clear advantage or disadvantage for the firm's product innovation performance.

Finally, in the situation where the firm has formal knowledge protection mechanisms in place, but internal knowledge sharing mechanisms are absent, competitor collaboration is also expected to have neutral impact on the firm's product innovation performance. By protecting its core knowledge, the firm reduces its exposure to unintended knowledge spillovers (e.g. Ritala & Hurmelinna-Laukkanen, 2013; Walter et al., 2014). Without promoting internal diffusion of knowledge, however, the firm remains rather restricted in its ability to recombine knowledge from its competitor partner with its own internal knowledge (Foss et al., 2013). Under these circumstances, competitor collaboration may not entail serious risks to the innovation activities

**Table 2**  
Internal knowledge sharing, formal knowledge protection mechanisms, and the impact of competitor collaboration on product innovation performance.

	Internal knowledge sharing (KS) mechanisms present	Internal knowledge sharing (KS) mechanisms absent
Formal knowledge protection (KP) mechanisms present	<p><b>Hypothesis 1a:</b></p> <ul style="list-style-type: none"> <li>- The presence of internal KS mechanisms enhances the ability to capture knowledge recombination benefits</li> <li>- The presence of formal KP mechanisms enhances the ability to mitigate unintended knowledge spillovers risks</li> </ul>	<p><b>Hypothesis 2b:</b></p> <ul style="list-style-type: none"> <li>- In the absence of internal KS mechanisms, knowledge recombination benefits are less likely to be captured</li> <li>- The presence of formal KP mechanisms enhances the ability to mitigate unintended knowledge spillovers risks</li> </ul>
Formal knowledge protection (KP) mechanisms absent	<p><b>Hypothesis 2a:</b></p> <ul style="list-style-type: none"> <li>- The presence of internal KS mechanisms enhances the ability to capture knowledge recombination benefits</li> <li>- In the absence of formal KP mechanisms, unintended knowledge spillovers are more likely to emerge</li> </ul>	<p><b>Hypothesis 1b:</b></p> <ul style="list-style-type: none"> <li>- In the absence of internal KS mechanisms, knowledge recombination benefits are less likely to be captured</li> <li>- In the absence of formal KP mechanisms, unintended knowledge spillovers are more likely to emerge</li> </ul>

Positive impact
  Neutral impact
  Negative impact

of the firm, but the firm might also face substantial limitations in realizing the potential knowledge recombination benefits that competitor collaboration entails. In sum, we hypothesize:

**Hypothesis 2a.** When internal knowledge sharing mechanisms are present but formal knowledge protection mechanisms are absent, competitor collaboration does not significantly impact firms' product innovation performance.

**Hypothesis 2b.** When formal knowledge protection mechanisms are present but internal knowledge sharing mechanisms are absent, competitor collaboration does not significantly impact firms' product innovation performance.

### 3. Methodology

#### 3.1. Sample

In this study, we use data from the fifth wave of the Flemish Community Innovation Survey (CIS), which provides data on the innovation activities of Flemish firms and follows the OECD's Oslo Innovation Manual (OECD, 2005). Decision makers on innovation activities are asked directly if and how their firms are able to create innovative products, services or processes. In this way, the CIS allows generating accurate measures for innovation processes and outputs, whilst providing a broad picture of firm-level innovation activities. Therefore, the CIS represents a reliable source to investigate a wide range of innovation activities of firms (e.g. Laursen & Salter, 2006; Leiponen & Helfat, 2010). Prior research has extensively relied on CIS data to provide insights on firms' collaborative innovation strategies with different types of partners, including competitors (e.g. Belderbos et al., 2004; De Faria, Lima, & Santos, 2010; Faems, de Visser, Andries & Van Looy, 2010; Mention, 2011).

The fifth wave of the Flemish CIS provides a unique opportunity to test our research hypotheses. Apart from information on collaborative activities and formal knowledge protection mechanisms, which are standardized questions in the CIS, this particular wave of the Flemish CIS asked respondents to provide information on their internal knowledge sharing mechanisms. We thus relied on this particular wave of the Flemish CIS because it allowed us to study the role of both internal

knowledge sharing mechanisms and formal knowledge protection mechanisms in cooperation settings.

The fifth wave of the Flemish CIS was conducted in 2007 and had the participation of 1196 Flemish manufacturing firms. Only the firms that had introduced at least one product or process innovation or that had initiated innovation activities between 2004 and 2006 needed to fill out questions on innovation performance and collaborative activities. Due to this survey design characteristic, the database to be used in this study was restricted to 768 innovative manufacturing firms. Because of missing values in the variables that we constructed, we further excluded 141 firms from our analysis.<sup>1</sup> Our final sample therefore consists of 627 innovative manufacturing firms.

#### 3.2. Measures

In this section, we describe our measures for the dependent variable (i.e. product innovation performance), the main independent (i.e. competitor collaboration) and moderating variables (i.e. internal knowledge sharing mechanisms and formal knowledge protection mechanisms), as well as the control variables (i.e. firm size, part of group, internal R&D efforts, collaboration with other kinds of partners, and industry).

##### 3.2.1. Product innovation performance

In line with previous research on the innovation performance implications of competitor collaboration (Belderbos et al., 2004; Neyens et al., 2010; Nieto & Santamaria, 2007), we measure product innovation performance as the share of turnover in 2006 attributed to products that the company introduced between 2004 and 2006 and that were not only new to the firm but also new to the market. The analyses do not incorporate this proportion itself but instead the natural logarithm of 1 + the percentage in order to obtain a normal distribution for non-zero values.

##### 3.2.2. Competitor collaboration

In the CIS V survey, respondents had to indicate whether they participated in R&D or other innovation-related projects with competitors between 2004 and 2006. Based on this information we created a binary variable. This variable received the value of 1 when respondents indicated that they had engaged in collaboration with competitors and the value of 0 when this kind of collaboration did not exist.

##### 3.2.3. Internal knowledge sharing mechanisms

In the Flemish CIS V survey, respondents were asked whether or not their company provided incentives to employees to share information within the company between 2004 and 2006. In this study, we use this question to measure the presence/absence of internal knowledge sharing mechanisms. We created a binary variable, which takes the value of 1 if the firm has internal knowledge sharing mechanisms in place, and the value of 0 otherwise.

##### 3.2.4. Formal knowledge protection mechanisms

Respondents were also asked to indicate whether their company had its knowledge protected with (i) patents,<sup>2</sup> (ii) industrial designs,

<sup>1</sup> In the sample of 768 innovative manufacturing firms, 123 firms did not answer the question on internal knowledge sharing mechanisms and 18 firms did not report data on one or more of the control variables (e.g. internal R&D efforts).

<sup>2</sup> Many studies use the patent stock of a firm as a measure of its innovation performance (e.g. Lahiri & Narayanan, 2013; Noseleit & de Faria, 2013; Sampson, 2007). Our formal knowledge protection variable, however, cannot be interpreted as a proxy of innovation performance. The Community Innovation Survey (CIS) question that is the base for this variable and that is used in other knowledge protection studies (e.g. Leiponen & Byma, 2009; Spithoven & Teirlinck, 2015), is framed as a knowledge protection query (is the firm using patents/industrial designs/copyrights/trademarks to protect its knowledge?). Moreover, as the correlation matrix indicates, the correlation between the innovation performance variable and the formal knowledge protection variable is not excessively high (i.e. 0.18). Therefore, we are confident that our formal knowledge protection variable is consistent with the theoretical arguments developed in the hypotheses development section.

(iii) trademarks and (iv) copyrights during the period 2004–2006. Based on this information, we created a binary variable, which received the value of 1 for companies that used at least one of these formal knowledge protection mechanisms between 2004 and 2006. We assigned the value of 0 for companies that did not use any of the listed formal knowledge protection mechanisms in the period under analysis.

### 3.2.5. Control variables

Several variables have been introduced in order to control for possible confounding effects: industry, firm size, whether the organization is part of a larger corporation, internal R&D intensity, and collaboration with other kinds of partners. In order to control for industry specificities regarding innovation performance, we included industry binary variables. Relying on the NACE codes, we made a distinction between 6 industries. Table 3 provides an overview of the frequencies of the different industries.

We control for firm size by including the natural logarithm of the number of employees in 2006. Companies also had to indicate the number of people that were employed in order to support internal R&D activities. In line with previous research (e.g. Faems, de Visser, et al., 2010; Neyens et al., 2010), we consider the relative number of R&D employees (i.e. the ratio of employees that support internal R&D activities by the total number of employees) as a proxy for the firm's internal innovation efforts. We therefore constructed the variable 'internal R&D efforts', representing the relative number of R&D employees in 2006. To control for the differential behavior of subsidiaries of larger corporations, a binary variable labeled 'part of group' has also been included in the analyses.

Companies may not only engage in collaboration with competitors, but can also have collaboration activities with other types of partners such as customers, suppliers, universities, consultants and other knowledge institutes. Moreover, indications are present that these alternative modes of collaboration can also impact innovation performance (e.g. Belderbos et al., 2004; Faems, Van Looy, & Debackere, 2005; Rothaermel & Deeds, 2006). In this study, we therefore control for the presence of collaboration with other types of partners. When respondents indicated in the CIS V survey that they had collaborated with universities, consultants or other knowledge institutes (explorative partners) between 2004 and 2006, they received the value of 1 on the variable 'Collaboration with knowledge institutes.' If they had not collaborated with any of these partners between 2004 and 2006, they received the value of 0. In a similar vein, firms received the value of 1 on the variable 'Collaboration with customers or suppliers' when they had collaborated with suppliers or customers (exploitative partners) between 2004 and 2006 and the value of 0 when they did not engage in such collaboration within the focal period. Finally, we control for the presence of formal collaboration with the government between 2004 and 2006.

### 3.3. Descriptive statistics

Table 4 gives an overview of the most important descriptive statistics.

The mean for the innovation performance variable is 0.07. Taking into account the use of a logarithmic transformation for this variable,

**Table 3**  
Industry frequencies.

Industry	Frequency	Percentage
Textile, wood and paper industry	102	16.26%
Electrical equipment industry	71	11.32%
Food industry	95	15.15%
Chemical industry	98	15.63%
Metals and manufacturing industry	234	37.32%
Other industries	27	4.31%

the implication is that on average 8.23% of firms' turnover is associated to products that the company introduced between 2004 and 2006 and that were new to the market. From Table 4 it becomes apparent that the extent to which firms engage in competitor collaboration is rather limited. Only 12.60% of the respondents engage in competitor collaboration between 2004 and 2006. At the same time, 44.81% of the companies collaborate with explorative partners, whereas 46.57% of them engage in exploitative collaboration. 25.84% of the firms indicate that they collaborated with the government between 2004 and 2006.

### 3.4. Method

The dependent variable contains a substantial amount of 0 values: 299 (48%) firms had a value of 0 on the innovation performance indicator. In other words, our dependent variable takes on the value of 0 with positive probability but is a continuous random variable over strictly positive values. In line with the recommendations of Wooldridge (2002), we use Tobit regression to analyze such left-censored solution model. We also conducted standard regression analyses to calculate the variance inflation factor values, which were well below the cutoff value of 10, indicating that the extent of multicollinearity was well within the acceptable range. To test the hypotheses we split the sample in the following way: (i) firms with no internal knowledge sharing mechanisms and with no formal knowledge protection mechanisms; (ii) firms with internal knowledge sharing mechanisms and with no formal knowledge protection mechanisms; (iii) firms with no internal knowledge sharing mechanisms and with formal knowledge protection mechanisms; and (iv) firms with internal knowledge sharing mechanisms and with formal knowledge protection mechanisms.

## 4. Results

Table 5 displays the main findings of the Tobit analyses on the full sample (Model 1 and 2), whereas Table 6 summarizes the main findings of the Tobit analyses on the subsamples, which allow testing our hypotheses (Models 3 to 6). Our baseline model (Model 1), which only includes control variables, shows that collaboration with customers and suppliers and collaboration with the government have a positive significant effect on firm's product innovation performance. Collaboration with knowledge institutes, however, turns out non-significant. A potential explanation for this later finding could be that collaboration with knowledge institutes might stimulate breakthrough inventions (Ahuja & Lampert, 2001), but has less impact on the ability to successfully launch new products onto the market. Not surprisingly, we find that internal R&D efforts have a positive and significant effect on firms' product innovation performance. In Model 2, we add our core independent variables, showing that, when considering the full sample, the presence of competitor collaboration positively influences product innovation performance. In line with prior studies (e.g. Andries & Faems, 2013), we also find that the presence of formal knowledge protection mechanisms positively influences firms' product innovation performance.

Regarding our hypotheses, we only find a significant impact of competitor collaboration when both internal knowledge sharing mechanisms and formal knowledge protection mechanisms are present (see Model 6 in Table 6). In all other subsamples, the impact of competitor collaboration on innovation performance is non-significant. These results give support to Hypotheses 1a, 2a, and 2b. As we predicted in Hypothesis 1a, collaboration with competitors only has a positive impact on product innovation performance when firms are able to internally disseminate and recombine new knowledge and, at the same time, actively protect their own knowledge from unintended spillovers. In line with Hypotheses 2a and 2b, we find that when only one of the two mechanisms is in place, competitor collaboration does not have a significant impact on product innovation performance.

Contrary to our expectations, however, the joint absence of internal knowledge sharing mechanisms and formal knowledge protection

**Table 4**  
Descriptive statistics and correlation matrix.

Variable	Mean	S	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Innovation performance	0.07	0.12	1.00								
2. Competitor collaboration	0.13	0.33	0.22***	1.00							
3. Firm size	4.36	1.35	0.09*	0.29***	1.00						
4. Part of group	0.57	0.50	0.01	0.15***	0.50***	1.00					
5. Internal R&D efforts	0.02	0.07	0.33***	0.17***	−0.01	0.01	1.00				
6. Collaboration with customers or suppliers	0.47	0.50	0.20***	0.40***	0.32***	0.25***	0.15***	1.00			
7. Collaboration with knowledge institutes	0.45	0.50	0.14***	0.36***	0.31***	0.21***	0.12**	0.68***	1.00		
8. Collaboration with government	0.26	0.44	0.22***	0.40***	0.30***	0.21***	0.16**	0.48***	0.49***	1.00	
9. Internal knowledge sharing mechanisms	0.48	0.50	0.12**	0.12**	0.16***	0.17***	0.11**	0.11**	0.08*	0.10*	1.00
10. Formal knowledge protection mechanisms	0.35	0.48	0.18***	0.18***	0.27***	0.20**	0.15***	0.25***	0.29***	0.26***	0.12**

Note: Pearson's correlation coefficients.

\* Correlation is significant at the  $p \leq 0.05$  level.

\*\* Correlation is significant at the  $p \leq 0.01$  level.

\*\*\* Correlation is significant at the  $p \leq 0.001$  level.

mechanisms does not imply a negative impact of cooptation on firms' product innovation performance (Model 3). **Hypothesis 1b** is therefore not supported. Our underlying argument for **Hypothesis 1b** was that, in such a situation, the firm is not able to exploit its complementarities with the cooptator, whilst facing substantial value appropriation liabilities because of unintended knowledge spillovers. A potential explanation for our non-significant finding could be that, in the absence of formal knowledge protection mechanisms, the cooptation setting is perceived as an extremely unsafe arena for knowledge exchange (Ritala & Hurmelinna-Laukkanen, 2013). In such a situation, firms may deliberately reduce their transparency (Hamel, 1991) and limit the knowledge-sharing interactions with the cooptator to a minimum level (Estrada et al., 2014; Park & Russo, 1996). In addition, when core knowledge is not subject to legal safeguards, firms might devote significant attention to monitoring if the cooptator is misappropriating such knowledge (Liebeskind, 1997), restricting the efforts they are able to allocate to other key activities such as collaborative knowledge exchange (Rindfleisch & Moorman, 2003). By limiting knowledge spillovers in its collaboration with competitors, the firm might not reap direct innovation benefits, but might also not incur serious knowledge misappropriation risks.

**Table 5**  
Tobit regression analyses: product innovation performance (full sample).

	Model 1 Full sample	Model 2 Full sample
Intercept	−0.08 (0.03)*	−0.07 (0.03)*
Collaboration with customers or suppliers	<b>0.05 (0.02)*</b>	<b>0.04 (0.02)*</b>
Collaboration with knowledge institutes	−0.00 (0.02)	−0.02 (0.02)
Collaboration with government	<b>0.06 (0.02)**</b>	<b>0.05 (0.02)*</b>
Electrical equipment industry	0.01 (0.03)	0.01 (0.03)
Food industry	−0.03 (0.03)	−0.02 (0.03)
Chemical industry	−0.02 (0.03)	−0.02 (0.03)
Metals and manufacturing industry	−0.03 (0.02)	−0.03 (0.02)
Other industry	0.02 (0.04)	0.01 (0.04)
Part of group	−0.02 (0.02)	−0.03 (0.02)†
Firm size	0.01 (0.01)	0.01 (0.01)
Internal R&D efforts	<b>0.60 (0.11)***</b>	<b>0.52 (0.11)***</b>
Internal knowledge sharing mechanisms		0.02 (0.02)
Formal knowledge protection mechanisms		<b>0.06 (0.02)***</b>
Collaboration with competitors		<b>0.05 (0.02)*</b>
Number of observations	627	627
Number of left-censored observations	299	299
−2 Log Likelihood	159.137	139.389
AIC	185.137	171.389
BIC	242.869	242.444

Notes: Tobit regression analyses on the full sample ( $N = 627$ ). Standard errors are given in parentheses. Significant results are highlighted in bold.

† Impact is significant at  $p \leq 0.10$  level.

\* Impact is significant at  $p \leq 0.05$  level.

\*\* Impact is significant at  $p \leq 0.01$  level.

\*\*\* Impact is significant at  $p \leq 0.001$  level.

The models in **Table 6** also suggest that collaboration with other types of partners has different effects depending on the combination of the two mechanisms considered. These results seem to indicate that these mechanisms might also affect the impact of collaboration with other types of partners on the firm's product innovation performance. Exploring this issue more in depth is beyond the scope of this study, but represents an interesting avenue for future research.

## 5. Discussion

In this study, we examine the role that internal knowledge sharing mechanisms and formal knowledge protection mechanisms play in explaining the innovation performance implications of cooptation strategies. Our results show that cooptation is a successful new product development strategy when both mechanisms are in place, since firms are able to capture knowledge recombination benefits while, at the same time, avoiding unintended knowledge spillovers. Below, we discuss the implications of these findings.

### 5.1. Theoretical implications

Although the fundamental cooptation tension between value creation and value appropriation has received increasing scholarly attention (e.g. Bengtsson & Kock, 2000, 2014; Raza-Ullah et al., 2014), the actual management of this tension remains poorly understood. To address this gap in the cooptation literature, scholars have started applying a contingency perspective on cooptation (e.g. Luo, 2004; Ritala, 2012), exploring the conditions under which the value creation advantages outweigh the value appropriation liabilities of competitor collaboration. This paper contributes to this emerging contingency perspective, illuminating how internal knowledge sharing mechanisms and formal knowledge protection mechanisms play out and jointly determine firms' ability to balance the knowledge recombination benefits and knowledge appropriation risks of cooptation strategies. Our findings complement previous studies (e.g. Cassiman et al., 2009; Faems, Janssens & Van Looy, 2010; Oxley & Sampson, 2004; Walter et al., 2014), which tended to focus on inter-firm relational and contractual conditions (e.g. inter-partner communication, narrow alliance scope) as important contingency factors in understanding the performance implications of cooptation strategies. In contrast, we show the key role that intra-firm knowledge management mechanisms can play in dealing with cooptation tensions. Shifting attention from the inter-organizational to the intra-organizational level, our study contributes to a more comprehensive view of the contingency factors that determine firms' ability to deal with the paradoxical nature of cooptation. Our findings provide an interesting extension to the recent work of Ritala and Hurmelinna-Laukkanen (2013), which provided first evidence on the role of intra-firm characteristics in managing collaboration with competitors. These authors show that the firm's potential absorptive capacity



**Table 6**  
Tobit regression analyses: product innovation performance (subsamples).

	Model 3 Internal KS: no Formal KP: no	Model 4 Internal KS: yes Formal KP: no	Model 5 Internal KS: no Formal KP: yes	Model 6 Internal KS: yes Formal KP: yes
Intercept	<b>−0.13 (0.06)***</b>	0.03 (0.07)	−0.11 (0.07)	0.05 (0.06)
Collaboration with customers or suppliers	−0.01 (0.04)	0.05 (0.05)	<b>0.12 (0.05)*</b>	0.02 (0.04)
Collaboration with knowledge institutes	−0.01 (0.04)	0.00 (0.05)	<b>−0.08 (0.05)†</b>	0.01 (0.04)
Collaboration with government	0.06 (0.04)	<b>0.11 (0.05)*</b>	0.03 (0.04)	0.00 (0.03)
Electrical equipment industry	0.09 (0.06)	−0.07 (0.07)	0.09 (0.06)	−0.02 (0.05)
Food industry	0.01 (0.04)	−0.05 (0.07)	0.04 (0.05)	−0.07 (0.06)
Chemical industry	0.00 (0.05)	−0.03 (0.07)	0.03 (0.05)	−0.01 (0.05)
Metals and manufacturing industry	−0.00 (0.04)	−0.07 (0.05)	0.03 (0.05)	−0.03 (0.04)
Other industry	0.05 (0.06)	−0.04 (0.13)	−0.02 (0.08)	0.01 (0.08)
Part of group	<b>−0.06 (0.03)†</b>	−0.01 (0.04)	−0.01 (0.04)	−0.05 (0.04)
Firm size	0.02 (0.01)	−0.02 (0.02)	0.02 (0.01)	0.01 (0.01)
Internal R&D efforts	<b>1.34 (0.52)*</b>	0.28 (0.32)	<b>1.26 (0.55)*</b>	<b>0.52 (0.11)***</b>
Collaboration with competitors	0.02 (0.05)	0.05 (0.07)	0.01 (0.04)	<b>0.08 (0.04)*</b>
Number of observations	231	177	97	122
Number of left-cornered observations	138	99	32	30
−2 Log Likelihood	83.151	88.646	−33.209	−45.243
AIC	111.151	116.646	−5.209	−17.243
BIC	159.344	161.112	30.837	22.013

Notes: Tobit regression analyses conducted on the subsamples. Standard errors are given in parentheses. KS stands for 'Knowledge sharing mechanisms'; KP stands for 'Knowledge protection mechanisms'. Significant results are highlighted in bold.

† Impact is significant at  $p \leq 0.10$  level.

\* Impact is significant at  $p \leq 0.05$  level.

\*\*\* Impact is significant at  $p \leq 0.00$  level.

and appropriability regime contribute independently to competitor collaboration performance. Our study highlights that internal knowledge sharing mechanisms and formal protection mechanisms *jointly* enable firms to bridge the gap between potential and realized absorptive capacity, while preventing spillovers of valuable knowledge. In sum, our findings contribute to an emerging contingency perspective on cooptation, emphasizing that not only inter-organizational conditions, but also intra-organizational conditions determine firms' ability to reap value from collaboration with competitors. Moreover, we show that, to better understand how firms address the tension between value creation and value appropriation challenges in cooptation, it makes sense to consider the combination of different contingency factors.

Our study also has a broader theoretical implication. As discussed in our theory section, different literature streams focus on different processes to explain how firms can transform internal and/or external knowledge into valuable outcomes such as innovation. Whereas dynamic capability research emphasizes the process of recombination (Eisenhardt & Martin, 2000; Verona & Ravasi, 2003), knowledge management research traditionally stressed the processes of transfer and integration (Nonaka & Takeuchi, 1995; Szulanski, 1996). Finally, literature on knowledge spillovers points to the importance of knowledge protection (Arrow, 1962; Katila et al., 2008). Our study makes clear that, in order to fully understand how firms can benefit from strategic phenomena such as cooptation, these different knowledge processes and their interactions need to be considered simultaneously. In particular, our findings suggest that, to maximize the knowledge recombination benefits of collaboration with competitors, firms need to actively invest in recombining and integrating the external knowledge within the firm and, at the same time, protecting their own knowledge base.

## 5.2. Implications for practice

Firms increasingly feel the need to or are even forced to work together with their competitors. For instance, to get funding from national and supra-national government agencies, firms increasingly need to create networks or clusters of companies in which competing organizations are likely to be present. For individual firms, a major challenge in this kind of collaborative settings is to make sure that they can appropriate more value from such collaborative activities than their competitors.

Our data suggest that, in order to create such 'appropriation advantage' (Di Minin & Faems, 2013) in cooptation settings, firms need to pay special attention to their internal organizational design. In particular, we show that the implementation of mechanisms that stimulate knowledge sharing within the firm (e.g. incentives to employees) significantly increases the ability to reap innovation benefits from competitor collaboration. At the same time, we find strong indications that managers should complement the use of such internal knowledge sharing mechanisms with the implementation of formal mechanisms such as patents that allow mitigating the risk of unintended knowledge spillovers.

## 5.3. Limitations and future research

In this study, we adopt a firm-level perspective to understand how certain contingency factors shape the innovation performance implications of cooptation strategies. At the same time, we acknowledge the presence of important opportunities for future research to further enrich this contingency perspective on cooptation. We believe that studies, adopting a dyadic perspective, could provide complementarity findings that would help us to understand how the characteristics of partnerships (e.g. intensity of interaction) and differences between partners (e.g. age and size) may influence the success of cooptation activities. In particular, it would be very interesting to see studies that look at combinations of inter-organizational and intra-organizational mechanisms and how such particular contingency bundles drive the innovation performance implications of cooptation.

Moreover, we identify internal knowledge sharing mechanisms and formal knowledge protection mechanisms as contingency factors that affect the relationship between a firm's participation in cooptation activities and its product innovation performance. In order to explain their innovation performance implications, we theoretically elucidate the links between these mechanisms and the core aspects of the value creation-value appropriation tension in cooptation settings (i.e. knowledge recombination benefits and knowledge spillovers risks). However, our study does not provide fine-grained empirical insights on the processes behind the identified relationships. Future studies adopting case study designs in cooptation settings can complement our work and provide a deeper understanding of the processes underlying the effects of these contingency factors (e.g. Cassiman et al., 2009).

Furthermore, recent research on knowledge protection emphasizes that, in addition to formal knowledge protection mechanisms, firms can also rely on more informal knowledge protection mechanisms (e.g. secrecy, lead time and complex design) to prevent undesirable knowledge spillovers (e.g. de Faria & Sofka, 2010; Sofka, Shehu, & de Faria, 2014). Due to unavailability of data, we could not include these informal knowledge protection mechanisms in our empirical analysis. Therefore, a promising line for future research could be examining the role that informal knowledge protection mechanisms such as secrecy can play in mitigating knowledge misappropriation risks in coopetition settings.

## 6. Conclusions

Does collaboration with competitors enhance firms' product innovation performance? Despite the increasing importance of coopetition as a product development strategy, extant research does not provide a clear answer to this question (e.g. Quintana-García & Benavides-Velasco, 2004; Park et al., 2014; Wu, 2014). In this paper, we aim to shed new light on the phenomenon and contribute to disentangling the innovation performance implications of coopetition.

Building on insights from different theoretical frameworks (i.e. capability-based view, transaction cost theory) and streams of literature (i.e. knowledge management, knowledge spillover), we develop the argument that innovation performance implications of coopetition depend on particular intra-firm design mechanisms. Using a sample of 627 Flemish manufacturing firms, our analysis shows that competitor collaboration is a successful product innovation strategy for firms that have implemented both internal knowledge sharing mechanisms and formal knowledge protection mechanisms. Jointly, our findings reveal that these two internal mechanisms allow the firm to seize the knowledge recombination advantage of coopetition, whilst minimizing knowledge misappropriation risks.

Overall, our study contributes to building a contingency perspective on coopetition through theorizing and testing the impact of different combinations of intra-organizational mechanisms (i.e. internal knowledge sharing mechanisms and formal knowledge protection mechanisms) on the relationship between competitor collaboration and firms' product innovation performance. We hope that our findings inspire scholars to further examine the added value of coopetition in different settings and under different conditions and help practitioners in effectively managing the challenges and opportunities that cooperative endeavors bring along.

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