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From cooperation to coopetition to meet future defense innovation challenges : A focus on tensions between SMEs and large groups in the French Defense Industrial and Technological Base (DITB)

Abstract

The literature on coopetition has attracted great interest from management scholars in recent years. The benefits of coopetition have been highlighted in the literature. However, scholars also urged that cooperating and competing simultaneously creates tensions between firms at different levels. Coopetitive tensions have been investigated between firms of similar size and characteristics, namely, between large groups and between SMEs. To day, no research examined the nature of coopetitive tensions between asymmetric firms. This research contributes to filling this gap by revealing the specific nature of asymmetric coopetitive tensions, here between SMEs and large groups within the French defense industrial and technological base (DITB). The findings are the result of qualitative research involving CEOs, managers, and project leaders engaged in the management of a coopetitive relationship with an asymmetric size rival firm, as well as experts of the defense industry. Our research reveals the nature of cooperative tensions between SMEs and large groups, that differ from coopetitive tensions between same-size firms. We discuss these results by comparing the nature of asymmetrical tensions with those already observed in the literature. We also announce possible fields of research for the future.

Key-words: Coopetition, SMEs, large groups, tensions, defense industry.

1. Introduction

The last decade has seen a growing body of research on coopetition (Chiambaretto et al., 2019). The literature on coopetition differs from that of strategic alliances by analyzing cooperative situations where firms compete simultaneously (Chiambaretto P. et al., 2022). Tensions called "coopetitive" tensions arise from this simultaneity and where studies in the field e.g. Gnyawali & Park, 2011; le Roy & Fernandez, 2015; Ritala P. & Hurmelinna-Laukannen P., 2019). However, research focuses on the study of coopetition between symmetric firms of the same size and characteristics (Baglieri et al., 2016; Bengtsson & Johansson, 2014; Granata et al., 2018). Indeed, a consensus exists in the literature that the most profitable collaboration is one that brings together partners with the same characteristics in terms of size, profitability, and position within the industry (Das & Teng, 2000). This consensus in research thus excludes the study of coopetitive relationships between asymmetric firms; i.e different sizes, profitability, and position in the market.

Empirically, recent years have seen the development of partnerships between asymmetric competitors. The arrival in industries of technological disruptions, i.e. biotechnologies, IoT, and digital technology, has upset competitive balances and led to the cohabitation of large groups that are historical leaders in their industries and small innovative companies that, being more agile, come to challenge them on a daily basis on innovation issues (Cozzolino & Rothaermel, 2018). The recent COVID-19 crisis has revealed the importance of these new types of partnerships between small and large competitors to innovate rapidly (Crick & Crick, 2020a). Recently, a small body of research has come to highlight the existence of these asymmetric coopetition strategies (e.g Baglieri et al., 2016; Hora et al., 2018; Soppe et al., 2014). The authors show that coopetition between small and large firms is beneficial for both partners (Hora et al., 2018). However, it is riskier for the smallest firm which, due to its lack of resources and structural competencies, is more sensitive to knowledge pilfering and opportunism on the part of its larger competitor (Lechner et al., 2016; Soppe et al., 2014).

Past research has helped to clarify the nature of coopetitive tensions. However, many questions remain regarding the specificity of asymmetric coopetitive tensions. Some studies examined coopetitive relationships between asymmetric firms. However, the specificity of tensions in the relationships wasn't included in their research object. Still, existing research shows that a priori, the nature of the tensions might be different because of the asymmetries of size and power between the firms, at the expense of the smaller partner (Baumard, 2018). Our

study aims to address this gap in the literature and answer the following research question: What are the specificities of coopetitive tensions between asymmetric firms?

We address this question through a qualitative study, allowing us to build a theory induced by our findings and observations of reality (Eisenhardt, 1989). We have chosen to study the case of the defense industrial and technological base, the security-defense industry being particularly innovative, historically dominated by large groups, and composed of numerous small companies facing important technological discontinuities. Indeed, nowadays, new technologies currently change the course of armed conflicts. A very recent example is the impact of drones in the Ukraine-Russia conflict. Hence, DITB companies must be ready to innovate and respond faster to the new needs of the Ministry of Defence. The security-defense industry is particularly cooperative and collaboration between small and large industrials is desired by the French Army, major client. 34 semi-structured interviews were conducted with key-persons in SMEs, large groups, French ministry of defense and industry experts. For triangulation purposes, the study was complemented by a documentary study allowing us to suture the data (website, company report, official documents ect).

Our results show that coopetition between SMEs and large groups creates tensions at different levels, i.e inter-organizational, intra-organizational, and inter-individual. Companies are facing dilemmas between the need for simultaneously cooperating and competing, commonly creating value and individually appropriate value, sharing and protecting resources and knowledge, and trusting and distrusting the partner. These tensions are intense, modified, and amplified by asymmetries and power imbalances between firms. Imbalances make competition unstable and unpredictable. Our discussion points out specificities of asymmetric coopetitive tensions. In this paper, we open new research perspectives on coopetition between different sizes of firms, i.e management of asymmetric coopetition, and study of asymmetric tensions in different empirical contexts. The highlighting of the tensions sheds light on the points of vigilance to be observed by managers when setting up a coopetition strategy with a partner of asymmetric size.

2. Literature review

Coopetition literature has seen a sharp increase in publications in management sciences in recent years. It is devoted to adopting cooperative and competitive strategies. It differs from the literature on alliances in that it involves the co-existence of paradoxical situations inherent in the implementation of the strategy, creating instability that is a source of tension (Das & Teng, 2000). The current state of research shows the existence of two bodies of work, one devoted to

the study of coopetition between large groups and the other between SMEs (Baglieri et al., 2016; Bengtsson & Johansson, 2014; Granata et al., 2018). However, a third is emerging and devoted to studying cooperative relationships between asymmetric firms in their sizes and characteristics.

Research on coopetition highlights the existence of tensions inherent to the paradoxical nature of coopetition. Little is known about coopetitive tensions between small firms and large firms. However, the literature on coopetition, which focuses mainly on the study of relationships between large groups and between SMEs (Baglieri et al., 2016; Granata et al., 2018; Hora et al., 2018), can give us some initial indications as to the nature of the tensions that might be found in the case of asymmetric coopetition. Furthermore, recent research on cases of asymmetric coopetition also provides some evidence of the tensions to be found. In our literature review, we will first report on the nature of coopetitive tensions that have been revealed in the existing literature. Then we will detail elements available in the field on asymmetric coopetition related to tensions and barriers to the setting up and management of the relationship.

2.1 Coopetitive tensions

Coopetitive tensions refer to the conflicting and paradoxical dynamics that can arise when organizations or individuals are simultaneously cooperating and competing with one another, causing instabilities (Das & Teng, 2000). This can occur at different levels : (1) Inter-organizational level when two or more firms are working together on a project while also competing for market share. (2) Intra-organizational level, when two or more strategic business. units (SBUs) inside the same company are competing with one another while collaborating, and (3) Inter-individual level, when, individuals in the same team are collaborating on a task while also competing to outperform their colleagues.

(1) At the inter-organizational level, adopting a coopetitive strategy causes two antagonistic behaviors to co-exist between both collaborative and competitive firms, a source of tension (Gnyawali & Park, 2011). Pursuing both cooperative and competitive interests increases the intensity of tension compared to a simple collaborative relationship between non-competitors or a purely competitive relationship (Clarke-Hill et al., 2003). This increased tension, however, has been described as creative, allowing firms to avoid self-satisfaction with the success of the collaboration (Quintana-García & Benavides-Velasco, 2004). The first paradox inherent to coopetition is the balance between the desire to create value collectively through cooperation and the willingness to appropriate value individually for competitive purposes (Das & Teng, 2000; Quintana-García & Benavides-Velasco, 2004; Ritala P. & Hurmelinna-Laukannen P.,

2019). The sharing phases are a source of tension between the partners. The tension can be related to an asymmetry in the involvement of partners in collaborative activities (Oliver, 2004) or the emergence of opportunistic behavior to capture unwanted value (Quintana-García & Benavides-Velasco, 2004). Le Roy and Fernandez (2015) also revealed the existence of tensions when partners attempt to discredit the other with an ordering institution and manipulate it to their advantage. The partners' awareness of their actions gives rise to coopetitive tensions. Tensions are exacerbated due to the collaboration when a collaborative product is individually marketed (Ritala & Hurmelinna-Laukkanen, 2009).

Coopetition allows organizations to explore and acquire these new skills with the competitive partner they could later use for competitive purposes. The competitive dimension in coopetition creates a competitive race to learn in collaboration (Prévot, 2007). Asymmetry of information between the partners is a source of tension and significant risks in coopetition (Prévot, 2007). Indeed, if, in the exploration phase, one of the competitors learns more than the other, then it risks having an advantage in exploiting this knowledge in the future (Bouncken & Kraus, 2013). On the other hand, partner learning risk is difficult to identify because the learning process within an organization is complex and not always conscious or intentional (Argyris & Schon, 1978). It can be active, passive, or interactive (Lane & Lubatkin, 1998) and, therefore, to be relativized in the coopetition relativized because the capacity of absorption of the competing firms is relative (Lane & Lubatkin, 1998). Coopetitors thus find themselves in a paradoxical situation, between trust and mistrust vis-à-vis the coopetitor, a source of strong tensions (de Rond & Bouchikhi, 2004). Trust between partners allows for exploiting existing synergies between rival firms (Morris et al., 2007). Distrust allows for caution in the cooperation phase, which is transitory, whereas competition is not. The tension is created by two opposing long-term and short-term visions. A long-term view of cooperation allows for distrust, while a short-term view allows for trust (Jarillo, 1988).

In coopetition, it is necessary to simultaneously protect know-how while sharing it with the competitor. This paradox between sharing and protection is a source of tension. Firms fear knowledge leakage and opportunistic behavior toward rivals with similar resource bases (Estrada et al., 2016). Due to this similarity in technical, market, technological, and capability knowledge bases, however, collaboration is more manageable for sharing and integration than with non-competitors, which explains the implementation of these types of strategies despite the risk (Ritala & Hurmelinna-Laukkanen, 2009). Authors have also shown the existence of coopetition strategies in the defense industry, even though, due to the secrecy and sensitivity of the information conveyed, firms should have been less concerned by collaborative strategies

(Depeyre & Dumez, 2007; Dupuy, 2013; Langlois et al., 2023). It is, therefore, appropriate for coopetitors to strike a balance between knowledge sharing and knowledge protection in the cooperative. This issue has so far received little attention in the literature (Gast et al., 2019).

(2) Coopetitive tensions have mostly been explored at the inter-organizational level, in dyadic relationships (Le Roy & Fernandez, 2015). However, authors in the field highlighted that implementing a coopetition strategy also creates tensions at the intra-organizational level. Firstly, cooperation with a competitor creates tensions within the firm between strategic business units (SBUs) (Luo et al., 2006). Internally, the competition between SBUs to access resources for a project for example can create conflicts between the cooperative SBU and the non-cooperative SBU (Durieux & Nguyen, 2005). A difference between SBUs in the obtention of ressources will reinforce internal tensions (Seran et al., 2016). They may be reflected at the individual level, among SBU managers with feelings of jealousy and injustice (Josserand & Perret, 2003). Secondly, coopetition creates intra-organizational tensions at the level of the cooperative project team created for the common project. The authors in the literature show that tensions within the project team are linked to the fact that the SBUs of two competitive structures working together do not perceive the stakes of collaboration with a competitor and show reluctance (Gnyawali & Park, 2011; le Roy & Fernandez, 2015). Gnyawali & Park (2011) revealed the existence of conflicts between Sony and Samsung SBUs during the R&D co-development project. Similarly, Le Roy & Fernandez (2015) highlighted tensions between Thales and EADS SBUs working jointly on a satellite co-development project. These conflicts between two SBUs of two different structures lead to the slowing down of the project.

(3) Less studied, coopetition at the inter-individual level concerns the paradoxical situation where the individual within his company is paradoxically led to cognitive dissonance in coopetition has a stressful impact on individuals involved in the collaborate and compete with another individual from his company or from a competing company. Coopetition can create a paradoxical situation where an individual might be in competition with his own colleagues inside the firm to obtain resources while having to collaborate with external partners (Tsai, 2002). This situation creates dialectical tensions that have repercussions on the individual's behavior and collective mindset (Das & Teng, 2000). Coopetition is a source of stress for employees, leading to lack of involvement. Indeed, the psychological balance of an individual is disturbed when he is asked to cooperate with a rival (Gnyawali et al., 2008).

2.2 Coopetitive tensions and asymmetrical coopetition

Very little research is devoted to studying coopetitive relationships between small innovative firms and large groups (e.g. Hora et al., 2018)). Existing research shows the interest of both to

collaborate, especially to find the resources and skills needed for innovation (Baglieri et al., 2016; Hora et al., 2018; Lacam & Salvetat, 2017). However, they also reveal that this type of coopetition is dangerous, especially for the smaller partner. Size asymmetries are likely to increase the risks of opportunistic behavior, unwanted knowledge leakage, and divergent interests in coopetition (Baglieri et al., 2016). The literature has shown that due to its structural lack of managerial, HR, and financial resources and skills, the smaller partner has more difficulty managing power asymmetries in the coopetition, which amplifies coopetitive tensions (Crick & Crick, 2020b; Tidström et al., 2018).

The risk of undesirable knowledge appropriation in coopetition is amplified. In an asymmetric collaboration, the partner with a higher absorptive capacity than the other will be tempted to unilaterally appropriate the results of the cooperation (Ingham, 2012; Mothe, 2001). This risk increases in the case of collaboration with an asymmetric competitor. Hora et al. (2018) showed that start-ups fear that large groups will exploit internally the innovative ideas they have observed at home and divert them into a competing product that they would develop alone internally without actually engaging in a collaboration. The authors have shown that when asymmetric firms compete in the same industries, the risk of imitation is high because the competing large group already has the internal skills to copy the product.

Added to this is an exacerbation of the risk of opportunism in collaboration on the part of the larger partner (Hora et al., 2018; Lechner et al., 2016; Soppe et al., 2014). Indeed, the weak bargaining power and the lack of managerial resources of the smaller partner prevent it from adequately managing the collaborative dynamics with the larger group, creating a strong risk of placing itself in a situation of dependence (material or financial), of losing control of its resources and knowledge, and ultimately of being bought out by the larger competitor (De Rond & Bouchikhi, 2004; Hora et al., 2018). Thus, the relationship strongly jeopardizes the small firm's very survival (Ketchen et al., 2007).

Finally, tensions appear on the side of the large group linked to the fear of seeing the smallest partner disappear or, on the contrary, of creating a future frontal competitor. Asymmetrical collaborations are characterized by this tension, known as instability, which comes from uncertainty regarding the partner's behavior in the future (Parkhe, 1993). This tension increases in a cooperative context where large groups consider horizontal collaboration with a start-up as extremely risky because the companies are too inexperienced and could disappear overnight, jeopardizing the purpose of the collaboration, leading to technological backwardness and a decline in reputation (Blackburn et al., 1990; Eisenhardt, 1989; Hora et al., 2018). Asymmetric coopetition would therefore be particularly risky. However, the tensions specific to asymmetric

coopetition mentioned above are not the object of research in the studies that reveal them. In contrast to large-group and small-firm coopetition, no study has investigated the coopetitive tensions between asymmetric firms.

3. Methodology

For this research, we chose an exploratory and qualitative design allowing us to understand the phenomenon of coopetition, a complex and context-dependent research object (Blackburn et al., 1990; Eisenhardt, 1989). We have adopted a qualitative approach allowing us to build theories through the observation of phenomena and field observations from the real world (Eisenhardt, 1989).

3.1 Description of the research field

The research field chosen for this study is the French defense industrial and technological base (DITB). The DITB is defined as "all the companies that enable the Armed Forces to conduct their operations" (Chigolet & Nesterenko, 2022, p.1). The choice of this research field is explained by the fact that it concentrates a very large number, 80%, of small and medium-sized companies as well as a limited number of large groups (Chigolet & Nesterenko, 2022; Dupuy, 2013).

The French DITB is considered to be an integral part of the French National Innovation System (Dupuy, 2013). This implies that within the DITB, there is a multitude of interactions between private and/or public organizations for the benefit of the creation, modification, and diffusion of new technologies (Dupuy, 2013; Freeman, 1987; Nelson, 1993; Smith, 2000). The transmission of knowledge between the different actors within the French NIS, particularly the DITB provides the conditions for innovation. It has been shown that the defense industry is particularly innovative and collaborative, which favors the appearance of disruptive technologies (Smith, 2000; Dupuy, 2013). It is also particularly competitive, notably because it responds to the objective of the Ministry of the Armed Forces to "guarantee the best economic efficiency of purchases and investments made by the Ministry of Defense with more frequent use of competitive bidding, recourse to market mechanisms" (Gautier, 2009).

Faced with numerous technological changes (AI, big data, robotics, hypervelocity, IoT, hyperconnectivity, etc.), DITB companies must ensure their technological superiority by quickly mastering disruptive technologies (Revue Stratégique de Défense et de Sécurité Nationale (RSDS), 2017). Technological major disruptions challenge traditional weaponry production until today only performed by large groups and their subcontracting chains (RSDS, 2017). As Emmanuel Macron reminded in his speech on June 13, 2022, the war economy will

force the State to be more demanding with industrials and ask for: more innovation, faster, as well as a change in " the modes of relationships in order to be able to respond much more quickly to needs and help to have equipment that corresponds to the sometimes short-term needs of the army". By bringing together simultaneously cooperative and competitive dynamics, the DTIB, composed of large groups and high-tech SMEs (RSDS, 2017), is, therefore a nice field for studying the strategies of coopetition between these two actors.

3.2 Data Collection

We interviewed key-informants in SMEs and large groups, members of the DITB, and involved in one or several collaborative relationships within the DITB with a company of asymmetric size developing a competing technological brick meeting the needs of the Ministry of the Armed Forces. To ensure that they belong to the DTIB, we selected these companies on the sites of the industrial groups and competitiveness clusters for defense and security: System Factory, Safe, Cluster Eden, GICAN, GICAT, GIFAS. We took note of their technological bricks developed internally to compare them to those of their current partners.

The sample includes executives and project managers from SMEs and executives, innovation managers or open innovation managers from large groups. They are all involved in managing collaborative relationships with asymmetric partners. We also met the client, the French Ministry of Defence, and its principal, the Direction Générale de l'Armement (DGA) and its Agence Innovation Défense (AID). Indeed, the client's point of view as a neutral and trusted third party was essential for us to understand the tensions between the partners. Therefore, we interviewed project managers and program managers at the DGA. We went as far as collecting the vision of the Délégué Général pour l'Armement, a former SME manager and the director of the Defense Innovation Agency.

We also interviewed industry experts: researchers and leaders of the previously mentioned defense clusters. Following Flick (2007), we went to the interviewees with a detailed interview guide to avoid leaving room for unanswered questions and unpredictable discussions. We used a single uniform interview guide for all interviewees but adapted the questions asked according to the type of interviewee (Ministry of the Armed Forces, expert, large group, SME or former SME now ETI).

We also conducted an extensive literature review for triangulation purposes to reach data saturation (Leech & Onwuegbuzie, 2007). Our corpus of documents includes official public documents disseminated by the Ministry of the Armed Forces during trade fairs in which we participated and public data found on the Internet (interviews, partnership announcements, press releases...). Finally, we were integrated into discussion groups within industrial groups,

clusters, and defense associations to complete our analysis. Combining all these data allowed us to cope with the complexity of the coopetition as a research object where tensions are not always perceptible at first sight and competition is hidden in the displayed collaborative relationship (Huber & Power, 1985; Yin, 1994).

In total, we interviewed 34 key respondents in 19 different facilities (See tables 1, 2, 3, and 5 for details on the interviewees) For confidentiality reasons, we have limited the data visible in this article to the technological bricks and characteristics of the companies. The interviews were conducted in person or by video conference in 2021 and 2022 and lasted between 30 and 115 minutes, with an average of 57 minutes. To ensure the confidentiality of the data, the interviewees and their companies are presented anonymously. Furthermore, as this is a sensitive industrial sector, we will not detail the technological bricks developed by each partner. The interviews were entirely transcribed. The data were coded using the Nvivo story analysis software (Miles & Huberman, 1993).

Table 1 : Details of interviewees for the "client" category

Identification	Position	Service	Missions
Respondant 1	Head of Department	Defense Innovation Agency	Expertise, Defense technologies, Innovation
Respondant 2	General Manager	Defense Innovation Agency	Direction
Respondant 3	Manager	Defense Innovation Agency	Innovation Acceleration Projects
Respondant 4	General Delegate	General direction	Direction
Respondant 5	Director	Technical direction	Technical Direction
Respondant 6	Deputy Director	Industrial Affairs and Economic Intelligence Department	SME Officer

Table 2 : Details of interviewees for the "large group" category

identification	Company identification	Position	Missions
Respondant 7	Large group A	CEO	Direction
Respondant 8	Large group B	Manager	Innovation projects
Respondant 9	Large group C	Manager	Industrial projects and technological insertion
Respondant 10	Large group C	Officer	Strategy and Innovation
Respondant 11	Large group C	Manager	Strategy and open Innovation
Respondant 12	Large group D	Director	Open innovation
Respondant 13	Large group D	Manager	Purchasing, innovation, SME sourcing, state purchasing
Respondant 14	Large group E	Director	External cooperations
Respondant 15	Large group E	Manager	Procurement
Respondant 16	Large group F	Manager	Alliance
Respondant 17	Large group F	Manager	Business portfolio development

Table 3 : Details of interviewees for the "SME" and "ETI" category

Respondent identification	Company identification	Position	Mission
Respondant 18	SME H	Executive	Innovation operations
Respondant 19	SME L	CEO	Direction
Respondant 20	SME G	COO	Collaborations and day-to-day operations
Respondant 21	SME I	CEO	Direction
Respondant 22	SME J	CEO	Direction
Respondant 23	SME K	Executive	IP management in collaborations for innovation and commercialisation
Respondant 24	SME H	CEO	Direction
Respondent 25	ETI M	Executive	Marketing, commercialisation, day-to-day operations
Respondent 26	ETI N	Manager	Commercialisation, day-to-day operations

Table 4: Details of interviewees for the "expert" category

Respondent identification	Structure identification	Position	Mission
Respondent 27	Structure O	Researcher	Researcher in management sciences, former officer of the French Navy, responsible for international security and economic intelligence departments of large companies.
Respondent 28	Structure P	General Director	Specialist in the creation, management and strategic management of intellectual property assets. Managing Director of a national company, dedicated to helping companies enhance the value of their innovations through the structuring of their intellectual property.
Respondent 29	Structure Q	Vice President	Co-founder of a start-up accelerator, he was director of public affairs and innovation in a defense industrial group. He is also co-founder of the France Angels defense sector network.
Respondent 30	Structure R	General Director	Responsible for and founder of a regional defense industrial cluster dedicated to linking SME innovations with the needs of the defense sector.
Respondent 31	Structure S	General Director	Former President of France Angels and co-founder of its defense sector network.
Respondent 32	Structure T	CEO	Formerly in charge of defense partnerships within major groups, he has held commercial and operations management positions for combat systems for major programs. Auditor of the 54th national session of the IHEDN, operational reservist in the French Navy. He is CEO of a company dedicated to supporting the defense ecosystem in collaborative dynamics.
Respondent 33	Structure U	CEO	A specialist in economic intelligence, he is CEO of a consulting firm for CAC 40 companies and SMEs. The consulting firm is specialized in the defense and security sector.
Respondent 34	Structure W	General Director	Formerly a researcher and manager at the Institut des Hautes Etudes de Défense Nationale, he was then in charge of a think-tank project attached to the cabinet of the Minister of Defense. Today he is the general manager of a national service placed under the French Minister of Economy, dedicated to the support of public or private organizations facing difficulties in their commercial relations with a partner.

3.3 Data Analysis

Data coding was conducted in two main stages following the method of Yami et al. (2010). First, we completed an open coding phase to identify all the possible codes in the interviews. In the second phase, we conducted a second reading to determine the different levels of codes. This allowed us to identify three levels: Agglomerated theoretical dimensions, theoretical categories, and first-order codes. The first agglomerated theoretical dimension aims at identifying purely collaborative-based tensions. The two sub-categories identified for this class are organizational tensions and cultural tensions. The second agglomerated theoretical dimension aims at studying the coopetitive-based tensions. The first sub-category highlights inter-organizational tensions of a paradoxical nature. Finally, the second sub-category highlights the internal tensions caused by the coopetitive relationship, with first-order codes corresponding to internal tensions in large groups and SMEs, respectively.

4. Results

Our results answer our research question and shed light on the nature of the tensions underlying the relationship between LFs and SMEs, which are competitors on technological bricks. The *"always very complicated cooperation"* (R29). We have identified two categories of tensions, purely collaborative tensions linked to the asymmetries between the two structures and tensions that can be described as cooperative because they are induced by the paradoxical situation of collaborating with a competitor.

4.1 Cooperation-based tensions

Our results show the existence of tensions between firms related to their difficulties to collaborate. These tensions are of a purely collaborative nature and are not related to the co-existence of cooperation and competition dynamics but rather to existing asymmetries between firms.

Organizational tensions

Our results show that SMEs and large groups have a different relationship to time, which generates tensions (R7, 19, 24). Indeed, due to their weaker cash flow, small companies are in a hurry (R19) and are confronted with LFs' particularly long and heavy decision-making processes (R7, 14). Respondents point out LFs' lacking agility, which requires too many documents to be signed and validated, and their business practices seem to be not adapted to working with an SME (R12, 3). The lack of speed in the processes creates tensions that prevent the formation of the collaborative relationship: *"The teams in small firms don't want to collaborate anymore because it takes too much time" (R10).*

With relatively few financial and managerial internal resources to dedicate to collaboration management, SMEs struggle adapting to LFs' requirements and constraints (e.g certification, cybersecurity, operating rules, defense clearances, etc.) (R21, 22). On the other hand, LFs cannot derogate from these requirements, which are required by their clients (R15,17). In addition, in the project management process, they are faced with a vast number of interlocutors that the large group puts in front of them and that *"suffocates"* them (R21).

There is also tension between two opposing ways/processes of innovating in large groups and SMEs, which inevitably clash during collaboration (R7). The SME criticizes the LF for its lack of agility in the innovation process, for example, when it establishes specifications to meet an already established need (R24). "*LFs do not know how to do open innovation, they are not agile, their processes are too complex"* (R30).During the collaborative relationship, *"the LF is suffering"* to be more agile (R3) and criticizes its small partner for its lack of organization in the innovation process: *" LFs who find that SMEs are not precise"* (R34); "*They put their innovations on Google, they talk to everyone, they are not strategists"* (R12). The collaborative tension is heavy because LFs are risk-averse and *"do not have the right to fail"* in the innovation process (R12).

Moreover, the very objectives of the collaboration for innovation between the two partners are not aligned. In order not to be dependent on the extended timeframe of defense markets, the small innovative company, with its technological brick, seeks to develop applications to meet several needs. In contrast, the large prime contractor wants to prioritize this and asks the SME

to restrict its markets (R10). "*The SME's first market is not necessarily defense, whereas, for the LF, it is"* (R22).

Cultural tensions

Beyond the differences in size and operation, tensions arise in the collaboration due to cultural asymmetries between the two structures. "*It's a question of behavior and communication"* (R21). Vertical integration is an *"old reflex*" (R3) that persists among LFs that sometimes close themselves off to open innovation with SMEs that they have long considered as their subcontractors (R3,12,20,21,25,32). Respondent 32 claims an *"arrogance of the large group*" towards the SME. *"These mechanisms (horizontal collaboration) are not easy to digest for our general managers. There is an acculturation, an understanding that needs to be done"* (R12).

In addition, SMEs and LFs also have a different vision of innovation, which causes tensions. There is a *"cultural issue about the mindset of inventors and business creators"* (R7). The LFs criticize SMEs for having *"too many ideas"* and for *"being too dispersed"* in innovation (R7). Respondents note a cognitive bias among SMEs that overestimate the value of their innovations according to LFs (R9, 17, 34). *"They overestimate the value of their innovation, it is not revolutionary"* (R9); *"there is not enough maturity in the innovation of small companies*" (R17).

4.2. Coopetition-based tensions

Our research highlights the existence of tensions inherent to the paradoxical situation induced in a coopetition relationship. We find dyadic tensions, between firms and tensions that emerge internally due to the collaboration. In the dyadic tensions, it is the simultaneity between paradoxical behaviors that provoke tensions: between collaborative and competitive activities, between trust and mistrust towards the partner, between common exploration and exploitation of internal competencies, and finally, between sharing and appropriation of the value created.

4.2.1. Dyadic tensions

Collaboration versus competition

Our results show that SMEs and LFs maintain a simultaneously collaborative and competitive relationship. A *"schizophrenic*" relationship (R28). The term coopetition was used by one of our respondents: *"It's a bit complicated because there is this notion of coopetition, perhaps you have already heard it"* (R22). The simultaneity of these two relational modes creates tensions that we describe below. Our results reveal the existence of three forms of competition between the partners simultaneously to collaboration: a market competition, a technological competition, and a competition to access the same human and financial resources.

The first point to note is the existence of historically highly unbalanced market competition to the benefit of the LFs, creating a strong tension between the two partners. SMEs find that*"the*

large group is scary" and *"see it as a competitor"* (R11), it is even its biggest competitor. The French General Delegate for Armement, a former entrepreneur, explains that *"We are always competitors of a large group" and"there is always competition because large groups have the impression that they can do everything internally"* (R4). However, there has been a change in mentality among LFs who realize that they cannot be solely competitive and are therefore turning to collaboration with small firms (R4).

Despite this historical turn towards horizontality, SMEs still feel the hard competitive mindset on the part LFs in collaboration. For example: LFs *"think they have the expertise and knowledge and are not in the mindset of collaboration"* (R19); they *"feel they can do everything"* (R22). The CEO of a LF explains that they turn to collaboration when they do not have *"the desire and the vocation to do something internally or when the SFs' device brings more value"* for commercialization (R7). Therefore, the intensity of competition in the collaboration is volatile, depending on the strategic orientations of LFs. It also happens that LFs collaborate with SFs only because it is a request of the customer while they consider their competing solution in-house more powerful (R22): *" It can be complicated because the industrialist, perhaps that it has a competing solution. It's not as good, but he prefers to ask for a lot of money to improve it rather than bring in a competitor. So these are things that are not obvious, but we try to guide (R3).*

On the other hand, the LFs also feel a strong competitive mindset from the part of the SME with which it collaborates. They are even reluctant to involve SMEs in certain projects as they are *"afraid that they will take over some of their activities"* (R18): "*The innovative supplier who takes a lot of importance in the finished product and who is going to step on the toes of the big group, it is a subject that worries us a lot*" (R7). Very aggressive, many SMEs are ready to answer to call for tenders alone, or in a coalition, *"to hunt in pack"* and so avoid collaborating with LFs (R19, R33). This is the strategy that SME J adopted after having felt a rejection from large groups to collaborate. However, the path of coopetition with LFs makes it easier for SMEs to address the defense market (R22, 23, 11). SMEs adopt several strategies simultaneously. At the same time, they are subcontractors of large groups, partners and competitors in response to different competitive tenders. This is the case for SME G. Respondent 17 says that is *"clever on their part"* but also "schiz*ophrenic*".

"When you tell a small or medium-sized company: you have to go through a large group are not necessarily, it depends. But what is true is that we (as a state) need large groups, often because they are technology integrators, and when we put technology in a Corvette or a Rafale, we can't put it in a native way directly, we have to collaborate" (R4).

When collaborating with LFs, SMEs try to show their best side to the institution and demonstrate that they can do as best, if not better, than their LF partner. This is a complex discourse insofar as they maintain a historical barrier to entry. Indeed, in France, "*if you are a large group, you are the best*" (R24).

In parallel with unstable market competition, both large and small partners are engaged in a race for innovation. Indeed, each one dreams about the technology that will give it a competitive edge. Our results show that when it comes to innovation, the importance of each role in the industry disappears, and LFs and SMEs compete. Despite their role as systems architects and technological integrators, large companies continue to innovate and develop technological bricks for subsystems.

"There are frequent questions about: What is my core business? What is my core business?" (R13), *"What is the role of my company and how do I see myself? Is my role to produce, is it to be an architect?"* (R9).

"I think everyone dreams of a place. Maybe the large group wants to dream of being THE firm that invented the right technological brick. But the reality is that it is rather good at integrating it. The SME also dreams about inventing the brick but also would like to have the system. It takes dialogue and time for understanding each other's issues, but to do that, we have to be more mature than just saying I'll take an order." (R12).

"There is always competition. Just because the big groups have the impression that they can do everything in-house. Then we explain to them that they don't have to do everything in-house and that they can refocus on their core business from time to time. So what is the core business? Assembly and integration of complex systems. It's also long cycles and long programs, with very upstream research. Indeed, an SME that creates a small, specific technological brick won't be making money tomorrow with ...." (R4).

Our results reveal a third form of competition between the two collaborating firms not based on market access or intellectual assets but on access to the same resources, such as R&D budgets and HR talents (R11, R31). Both sides need to participate in various national R&D projects to cope with financial pressure. This adds tension to the collaborative relationship (R8). LFs are more inclined to collaborate horizontally with SMEs as long as the amount allocated is low to moderate. When funding increases, opportunistic behaviors in LFs increase and drives them toward verticalization to *"be sure that there is no added value that leaves their house"* (R25). "*It's a shark's world"* to the point that SMEs risk being bought out as soon as the large group senses a strong interest from the State and an increase in R&D budgets for a specific technology

to come (R1). SMEs criticize LFs for being "*bulimic*" and for *"grabbing all the markets, even those that are set up for SMEs*" (R24, 32).

Trust versus mistrust

Our results revealed a dilemma between trust, essential to the establishment and smooth functioning of the relationship, and distrust toward the asymmetrical partner. LFs appear to be more open and less suspicious of coopetition when the SME is in a weak position in the market: *"As long as the partner company is small, the large group is inclined to collaborate and even to sponsor it*" (R22). On the side of LFs, distrust is proportional to SMEs' competitive power and appeal to the client in the market.

Trust breaks down completely when SMEs start contracting directly with the client for a large amount of money. The case of company J is illustrative: *"They were having meetings with some of the big groups and the guys were telling them <If you continue to talk directly to the DGA, to talk directly to the DRM and even if you won't have a strong backbone anyway, we're going to do the lobbying necessary so that you don't succeed in signing your contracts>"* (R29). Temporality is at the heart of the dilemma between trust and distrust for LFs (R7, 11, 16, 22). Coopetition contributes in making the smallest competitor stronger. Tension intensity *"depends on whom you talk to and at what point in the project. It's like the fable of the kitten or the baby tiger. The baby tiger is cute when it's small but when it grows up, it hurts a bit more. So the project at the beginning everyone is very happy because we are small. When you become stable, when the companies become competitors, it's not the same equation"* (R20).

The LF also lacks trust in its small partner, has lesser financial means, and fears that it will fail with the mastery of a key technology (R4, 12, 17, 30). During the collaboration, the LF can adopt a carnivorous behavior by contractually implementing so-called "*escort clauses*", allowing him to capture the IP if the partner crashes (R17). The client fully understands his role in having: *"to contribute to managing the cohabitation between large trees and small plants as a good nurseryman and by making sure that the large ones do not overshadow the small ones"* (R1), so moderating the tension.

SMEs are also stuck in this dilemma between trust and distrust toward their LF partner. They are afraid of being kicked out of the collaboration to which they've committed a lot of resources, which could even lead to bankruptcy of the firm: *"And indeed, the question that has been bothering me for a long time is (...) : What would prevent them tomorrow, to put us out of business and to do it themselves or to do it with someone else?" (R19).* LFs' management of internal activities and rapid strategic changes between make, buy and collaborate attitudes is subtle and difficult to predict for SMEs. When collaborating, they stay cautious of a time,

depending on budgets allocated for technology by the client, where the LF will stop the collaboration to innovate and address the client alone (R9, 19, 22, 25). This uncertainty creates tension on the side of SMEs, which are wary about LFs waiting for high demands to be competitive (R22). This ambivalent posture is clear among LFs, below the example for LF C :

"I'm just waiting for [uh] things to mature in parallel. And then, by the time others are ready, [well] potentially, I have to get my boxes out" (R9).

"For example, I work with SME X for quantic technology today. Quite honestly, we don't know what we're going to do with quantic. It is a new technology. However, we know that there can be applications in different fields" (R10).

The customer himself is aware of this cooperative attitude as long as the market for a technologist is weak or moderate:

"*They exploit it rather for exploration: - We know that there is a company that masters it (...) so we are really in an exploratory phase-. But the question will arise in a few months, a few years, when we(client) will be able to express a real need and that it will be necessary to launch an armament operation that will come to draw several tens, even hundreds of million euros. In my opinion, (SME X) will want to position themselves to really get in and become a major player. (LF C) won't necessarily let them" (R3)*.

Despite all the mistrust towards each other, SMEs and large groups must simultaneously trust each other.

"*In any case, for cooperation to take place, there must be a certain level of trust, a certain level of transparency, otherwise, there will be no cooperation. So you have to find the right balance. But it starts with a relationship of trust."* (R7).

Exploration versus unexpected knowledge spillover

Our results show the existence of a tension between the exploration of knowledge through collaboration and the exploitation of this knowledge internally for competitive purposes.

"*We are on (...) paradoxes between knowledge exchange and knowledge protection"* (R11).

During the exploration phase, SMEs fear that LFs, because they are competitors and have the necessary technological and financial resources in-house and more firepower, develop a competing product on their own thanks to the knowledge acquired through collaboration. However, the similarity of resources and skills between competitors allows R&D collaboration to work well and fast: "You need people on the other side who are capable of taking it on. And indeed (LFs E and F) have the necessary skills" (R19). SMEs have inherent resource scarcities, so their capacity to absorb shared knowledge is lower than that of their larger partner (R10). During the cooperation, SMEs feed their most significant competitor (R30).

Many respondents talked about instinctive opportunistic behavior on the part of large groups in the exploration phase (R1,8,15,16,17,22, 24,28,29,31,34). *"We find a very unhealthy culture of relations between large groups and SMEs in France, which is not necessarily the case in Germany. Right away, I'll steal your idea."* (R28). These behaviors create tensions in the collaboration. Respondent 16, alliance manager in LF F explains: *" it's not because I'm going to tell them that we won't steal their ideas. It's not because I tell them we're not going to steal your ideas and your IP that they're necessarily going to believe me. Because obviously, we (the large group) have a power that in absolute terms allows us to do certain things (while obviously remaining within the law)"*. His colleague ads : *"There is a very strong point of what we call at (LF F), the "Not Invented Here". I didn't invent it here, I'll do it again. You have to know, this may shock you, but at (LF F), in the part where I am, radio-communications, we tend to do haute-couture on demand."* (R17).

The above describes the case of a collaboration dedicated to the co-creation of a subassembly technological brick. We found that the tension between common exploration and unexpected exploitation of co-created value is also very strong when the collaboration is dedicated to the adaptation with the LF of an SME's subassembly technological brick to integrate it into a LF's complex system. Indeed, integration implies providing the LF with strategic information on the technical component developed by the SME (R8, R22) :

"*To be able to do integration, you really need to understand what is in the component, in the grid that you are going to integrate. That's often where it gets stuck. Entrepreneurs say to themselves, -Ah yes, but you're going to know exactly all my lines of code, you're going to know exactly all my algorithmic operating points, you're going to know exactly how I make this camera, how I make that infrared scope- And that's what, it seems to me, creates frustration.*" (R22).

Whether it is in the context of a project to co-create a technological subassembly or to co-adapt a technological subassembly to integrate it into a complex system, the tension between joint exploration and undesirable knowledge spillover is rather on the side of the smaller partner. "*We have rarely seen the little ones steal the ideas of the big ones. In the other direction, it's still more visible."*(R1).

The tension is strong firstly because the risk is difficult to mitigate through legal contracts because of SMEs' weaker means of waging a legal battle with the LF (R24). SMEs hence rely on their pace of development to maintain a technological lead and on the fact that LFs *"play the game"* of collaboration (R22).

Secondly, LFs' opportunistic behavior may be unconscious because "*for the SME, IP is the reason for the existence of its company and necessarily has a lot of value, whereas for us it is information, a value that is underestimated, one element among many others*" (R9).

Thirdly, undesirable knowledge spillover would lead the smallest partner to bankruptcy as its core business is often based on developing a specific technical brick that it adapts to other civil markets. "*So yes, there is already a problem for (SME X) in this partnership with a large group which is not to lose its intellectual property because they have a civil market on the side, they make air shows, and therefore if they lose their intellectual property, they die. They will no longer be market leaders.* (R3).

The tension between the benefits of joint exploration for innovation purposes and unwanted exploitation of knowledge passed on to the partner is also found on the side of large groups: "*We, too, are asking ourselves how far we can go in sharing information. It's a real issue* (R7). "*In my experience, I have as many examples of collaborative projects were either on the one hand, it is the large group that comes to take knowledge from the SME or the other way around, in other cases, it is the SME that takes the knowledge of the large group and then protects it."* (R9).

Sharing versus appropriation of the co-created value

Our results reveal the existence of a tension between knowledge sharing during the sharing phase and appropriation of the co-created value, especially during the market launch. Uncertainty about the purpose of the collaboration is at the heart of the dilemma for SMEs.

The most sensitive and almost always frequent case is that of the adaptation of a technological brick from a SME in order to integrate it into a complex system . In this case, the LF is the only one to put the final system on the market in its name. The SME is often hidden in this system and is not at the forefront (R 8,18,19): "It *is a fundamental tension on the appropriation and value of innovation. On the one hand, you find yourself with a large group that is the only one able to commercialize the SME's technology, which gives it a considerable advantage*" (R11).

This situation is particularly complex. Firstly, in the case of co-development for the adaptation of a technological sub-assembly on a complex system, there is a difference between SMEs' earnings from collaboration and LFs' earnings from the sale of the complex system as a whole. "*They pump out the innovation and give crumbs behind it", "we get screwed...Because we spend dozens of hours on a project. At the end, they say, well, we'll give you €30,000. What do I do with 30 000 €. I don't want peanuts. It's a project worth hundreds of millions of euros and you're telling me I'm going to get 30,000 €. You're kidding me."* (R29).

The tension between value creation and appropriation is real for both partners (R10,11, 12) : "It'*s just that, effectively, the SME always has a partial vision of the finished product, that's clear and it's even desired.*" (R11). Respondent 11, open innovation manager in LF C explains the reasons for this attitude in collaboration from LFs' side: *"In reality, it's much more complex than that. Because when you put an external brick on your system, you create a vulnerability and this vulnerability, you have to be able to address it, so you always have a tension between: do you manage to internalize the brick you have developed with your partner? Or on the contrary, do you trust your partner to let him develop that brick?".*

Even in collaboration for subsystem development, it is often criticized to the LFs not giving information on the final purpose of the adaptation or collaboration, aiming to hide the value of the final product on which the LF thinks to integrate the technological brick. Beyond the tension of integration, there is a significant risk for SMEs that the exploration is not followed by a co-development phase (R2,11,25). The large group will not exploit or exploit the technology alone to integrate it into its system (R1). "*It can have an effect, it is that the SME invests a lot of time, human resources, and possibly money in these technologies with a large group that will say "yes, yes, it is very good for our market needs it", but in the end nothing can happen and there it is programmed death for the SME...* " (R25).

LFs are also subject to this dilemma between investing in resource sharing and the final value appropriation. Naturally risk-averse, LFs fear that results from the exploration phase will not be exploitable on the market. They are, therefore, more reluctant than SMEs to invest resources during the collaboration phase. *"Do I invest resources saying to myself that I will be able to exploit this technology in five years, six years, seven years, eight years? Okay, but the problem is that if I do this, it may work very well (...) or on the contrary, do I say to myself that it is much too uncertain...? I don't have final control over the exploitation of my technology because I'm not the one who will decide in fine"* (R11).

SMEs and LFs regularly fight over exploiting the IP created during the collaboration (R6,9, 13, 19, 23, 24). This is particularly true when LFs collaborate with SMEs to address internal needs. The collaboration often takes the form of a "service" contractualisation that is particularly unfavorable to SMEs in terms of appropriating the co-created value. *"Most of the companies that have worked with large groups have very rarely been able to exploit the results of their work"* (R6); "*The big groups like to pass on the services. Why? Because it allows them, within the framework of a service contract, to say that what you will generate belongs to them"* (R24).

Even in the case of a partnership contract, the end of the collaboration is tense and the partners wage a war over who owns the initial idea: *"It's not you, it's us the drone inventory is us, it's our baby, it's our invention. You don't have the right to talk about it, it's not right at all (...). I was at the time a little bit under the knife (...). I was taken in by a speech, nice words and then contractually, it was all for their account and nothing for us" (R19).*

"We also potentially fall back on a war of ego and on who owns the idea. Does the idea belong to the person who came up with it? (...) The idea is put forward by us in a joint meeting with the SME. And then they are ideas, ideas in the air, as French, they are not very protected things and behind ideas that are taken up by SMEs that, behind them, put them into practice. So in this case, whose idea is it? (R9).

As the open innovation director at LF D points out, the challenge today is to reduce these tensions and rebalance the relationship *"so that the SME can also benefit from this collaboration",* to avoid a *"one-way relationship" (*R12)

4.2.2. Internal tensions

The paradoxical situation created by the coopetition between SMEs and LFs is the source of internal tensions within the company. This is particularly true for LFs that face tensions within the SBU that cooperates with the SME and between the SBU that cooperates and the other SBUs of the firm.

Within the coopetitive SBU

Coopetition, if desired by the high managerial spheres in LFs, is not necessarily accepted by the employees in SBUs themselves. People do not always perceive an interest of collaborating with an SME (R10, 12,16,18,19,23, 32). By "arrogance" and competitive spirit, they hinder collaboration (R 23, 32). At the LFs, the decision to cooperate comes from corporate management teams. In their mindset, the advantage of cooperating with a competing SME is clear: SME/LF cooperation accelerates innovation and challenges the R&D teams. It is an *"extremely interesting aspect for the big groups, (...) it challenges the internal R&D teams. Because [they] go at the speed of the group. Now, R&D has to go much faster and the fact of challenging, challenging, challenging the internal R&D teams by saying: Say [so], you took me a year and a half to get to such and such a result [whereas] look at Startup what's-his-name, it started six months ago, look where it got to, [it's very interesting for the large group]."* (R31).

However, this interest is perceived differently by executives within SBUs who are asked to implement the collaboration: "*After the projects, it is the engineers who will take them over after a while (...) So the management of collaborative projects really needs to involve the engineers from the start to try to make them understand that there is a real interest. And the*

engineer must also be intelligent enough to say to himself: "Maybe I'm not capable of doing everything and maybe the small company opposite can bring me something. (R18)

The alliance managers interviewed in large groups mentioned this tension between strategic management and engineering and this refusal to cooperate frequently. In LF F, respondent 15 explains: *"Obviously, I can do it internally and we have the engineers to do it ect. To set up a partnership, you have to fight internally against this desire that the teams may have to do it themselves..."*.

The same observation on the side of LF 10: *"It's sometimes a blockage internally, an N&H syndrome. It's saying, 'No, but we do it very well internally. This is our core business. They're not going to teach us anything about it. And so the internal version does everything it can to sabotage the thing*"; *"We know how to do it too, we don't need them, or we are competitors and sometimes they have this vision and say to themselves: They are competitors, so no, I'm not going to join them. That's just not understanding the principle of partnership, of alliance! Because, in fact, they bring us complementary bricks. Honestly, (...) I have a case in mind where the internal teams said "no, we don't need them, we're fine on our own. And then, and then in fact, we are, we are competitors on this subject, so we will not work with them. And then we'll be better." In the end, we just didn't work with the SME."* (R10).

The open innovation manager in LF D sees here a cultural issue that hinders the group's strategy: *"One of my jobs will also be to tell the technical teams that the strategy is to work with this company. Now, I ask you to work with this company, and if you don't work with this company, I'll fire you. Because the problem with large groups is also a cultural issue, i.e., everyone does what they want and no one respects the group's strategy"* (R12).

Tensions between internal SBUs and coopetitive SBU

In addition to the internal tensions within the cooperative SBU, there are tensions between the SBUs in LFs. Coopeting SBUS fight with non-coopetitive SBUs that develops a product alone (R11,17,19, 20,29). These two SBUs, therefore, find themselves in competition for the allocation of internal budgets and compete with each other in certain markets. *"You can have internal competition on competing technologies. You can have internal competition on competing technologies. But the question is: the project team that works with your SME, what is their situation? Are they competing with internal projects or not? Often yes"* (R11).

The first example is in SME L / LF F partnership. The response to the recent national calls for tenders COLIBRI and LARINAE generated internal tensions between the coopetitive SBU and other internal SBUs. "*The concrete example is the COLIBRI and LARINAE call for tenders.*

There were several Thales divisions that wanted to respond internally, we agreed (not with the Business Unit with which we were already collaborating on Cohoma but another one in the LF). It was a fight between the two Business Units. The Business Unit I was working with was disgusted because [in fact] they have internal wars, between SBUs, they have different levels of drone expertise and slightly different perceptions of what a drone should be." (R19)

Another example is given by the case of the SME G/ LF F partnership in competition with another LF F's internal SBU for the PARADE call for tenders: "*In fact, the competition for us in the context of the partnership with LF f was not against a company but against LF F itself. So on this point, the people in charge of the program offer for the Parade project had to decide between taking an "in-house" solution from another department or taking an outside solution, well, they took us, an outside solution. We were better and cheaper, faster to deliver. And in addition, our advantages for them were that they fulfilled their commitment to include start-ups and SMEs in the programs"* (R20). *"You're running a project with SME G. Well[LF F potentially internally, they also have a team that does RF and UAV. It's just that it's not that team (non-collaborative) that was chosen [to win the tender]. Since the DGA also pushed to give a market to SMEs and to supply SMEs. So they also push for collaboration. That doesn't mean there aren't tensions and conflicts."* (R11). "*At LF F, the right hand doesn't know what the left hand is doing*." (R17)

5. Discussion

Our research sheds light on the nature of coopetitive tensions between SMEs and LFs. We observed and analyzed tensions using a coopetitive perspective, i.e considering the simultaneity between cooperative and competitive dynamics. In line with the definition of coopetition, we analyzed an inter-organizational, intra-organizational, and individual tensions resulting from the paradoxical nature of the relationship. Our research allows us to respond to the lack of research on the nature of coopetitive tensions between asymmetrically sized firms (Baglieri et al., 2016; Bengtsson & Johansson, 2014; Granata et al., 2018). We highlight that the simultaneity between competitive and cooperative dynamics between LFs and SMEs is a very recent phenomenon that firms have difficulty integrating at all levels, creating tensions. Moreover, we reveal that all dilemmas revealed in past literature on coopetition between symmetric firms as inherent to coopetition are amplified and modified by existing asymmetries between the firms.

5.1 From a cooperative to a coopetitive dynamic between LFs and SMEs

In coopetition, adopting cooperative and competitive behaviors simultaneously is a source of tension (Gnyawali & Park, 2011). This simultaneity makes coopetition harder to gasp than simple collaboration because firms simultaneously pursue conflicting interests (Clarke-Hill et al., 2003). Competition requires firms to maintain a "creative tension" and not to be complacent about the success of the collaboration to stay in the competitive race (Quintana-García & Benavides-Velasco, 2004).

Regarding large group/SME relations, an assumption gathers authors in management sciences on the fact that SMEs cannot compete with the strike force of large groups and must either position themselves on niches or position themselves as suppliers to LF (Barabel et al., 2014; Julien, 2002; Marchesnay, 2003). Past research indicates that direct competition between the two asymmetric structures is not beneficial and desirable for SMEs (Julien, 2002; Marchesnay, 2003). The consensus on competition between SMEs and LFs thus explains that this relationship has been little explored in the field of coopetition research (Chiambaretto P. et al., 2022). Existing studies on the relations between large corporations and SMEs assume that they are subject to tensions of the cooperation/conflict type, i.e., conflict distribution channel in our study (Brown & Day, 1981; Dant & Schul, 1992). Our results contradict this view and highlight the existence of cooperation/competition-type tensions in the relationship. We reveal the simultaneity between three types of competition between SMEs and LFs and two forms of collaborative relationships, which makes the tension between cooperation and competition particularly complex.

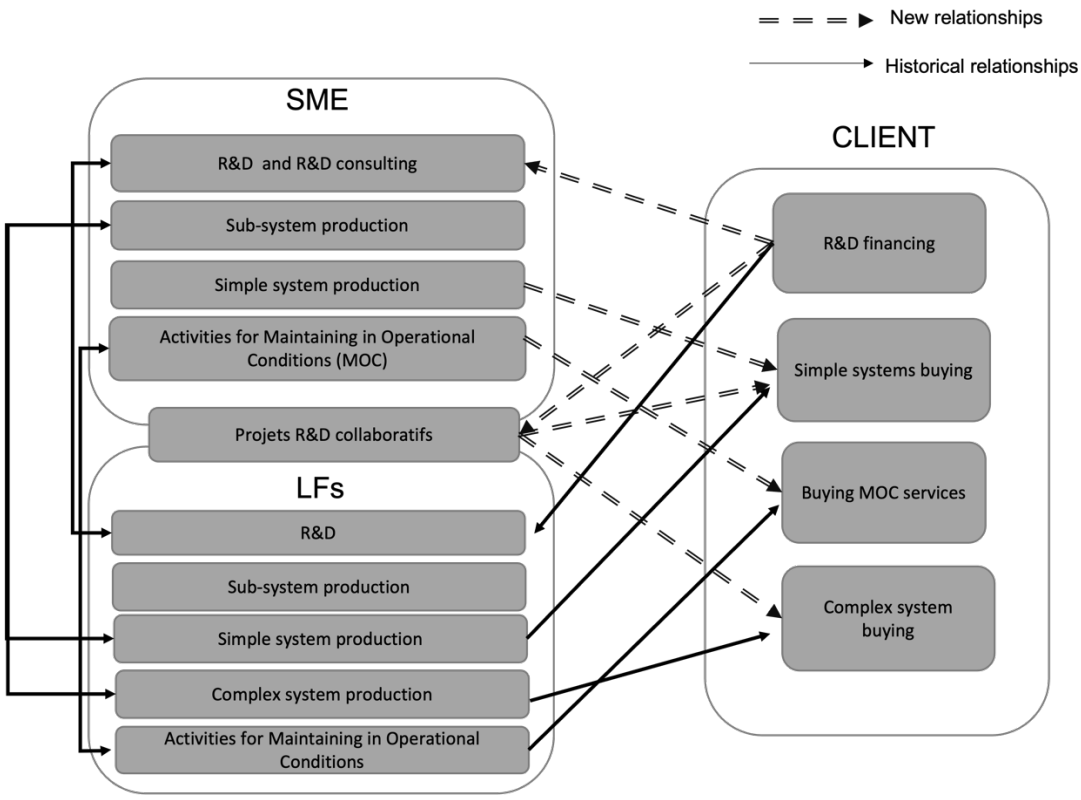
There is market, technological, and access to resources competition between SMEs and LFs driven by two antecedents that are: a change in client's behavior and the introduction of technological discontinuities (see chart 2.). The client's aim to contract directly with SMEs disrupted the competitive equilibrium in the defense market and the emergence of new technological standards eased access to commercialization for SMEs (e.g. AI, Big Data, hyper-velocity, hyperconnectivity...) (RDSN,2017) (see chart 1.). SMEs and LFs are also engaged in a race for innovation, each one dreaming of the technology that will give him a competitive advantage in the eyes of the customer.

In addition, the client having opened access to external financing for R&D historically reserved for large groups has created competition for access to financing between SMEs and large groups. We thus confirm that the introduction of technological discontinuities and deregulatory orders can lead to the emergence of asymmetrical coopetition phenomena

(Cozzolino & Rothaermel, 2018; Jakobsen, 2020). Furthermore, we confirm the importance of the customer's role in the destabilization of competitive equilibrium (Depeyre & Dumez, 2007).

SMEs and large groups maintain two types of collaborative relationships. The first is the historical one where the SME brings a know-how to the large group. This can be a technological brick, an innovative material or a maintenance service or expert R&D advice. In this framework, the two maintain an interdependence: The SME to access certain markets via the large group and the GG to access technologies and innovative know-how. We find a second type of collaboration where the SME and the large group answer together to a call for the project in a voluntary way or imposed by the customer. Here, both partners try to manipulate the institution to their advantage. This was highlighted by Le Roy and Fernandez (2015), who described the case of two large group competitors who tried to discredit the partner in the eyes of the ordering institution. As in our case, the awareness of the partner's actions creates tensions.

Chart 1 : Evolution of relationships between LFs, SMEs and the client in DITB



Hence, coopetition is a strategy for small firms to better position themselves on the market, and improve their market position in order to be more competitive. For large firms, it allows them to address disruption and not miss a technological shift. Here we find the "creative tension" characteristic of coopetition, enabling them to remain competitive (Quintana-García

& Benavides-Velasco, 2004). In line with the literature on coopetition, both partners do not deny the coopetitive paradox but adopt both behaviors simultaneously (Farjoun, 2010). It has been shown that firms with conservative and competitive cultures are more sensitive to the tensions between simultaneous cooperation and competition (Eriksson et al., 2008). We revealed LFs' conservative behavior where during the collaborative phase tend to culturally returns to a conservative posture and intend to verticalize the relationship with a smaller partner. This consists of considering the SME as a subcontractor rather than a real partner. The conservative and competitive culture of the large firm with its SME competitor amplifies the tensions of a cooperation/competition nature.

From the paradox inherent to coopetition arises several dilemmas for the firms involved that we have identified.

5.2 Approaching coopetitive dilemmas despite power asymmetries between competitors

The dilemma between resource sharing and resource protection.

In coopetition, partners are torn between the need to share resources to carry out the collaboration and the critical risk coming from undesirable knowledge leakage to the partner (Ritala & Hurmelinna-Laukkanen, 2009). If one competitor learns more than the other when sharing knowledge, then it may have an advantage when the collaboration ends to exploit the knowledge internally (Bouncken & Kraus, 2013). In coopetition between SMEs and LFs, the dilemma between sharing and protecting is higher than in coopetition between symmetric firms.

Our results confirm previous assumptions in the field that SMEs fear that the larger partner will benefit from a learning asymmetry in collaboration due to its higher internal resources (Baumard, 2018). The largest competitor has the ability to understand the shared knowledge and reproduce it internally, providing him with stronger absorptive capacity. The consequences of an undesirable knowledge spillover for SMEs are stronger in asymmetrical than in classical coopetition. Indeed, they share their core business with their biggest competitor while the multi-skilled large group shares only part of its skills. This reinforces the paradoxical situation in coopetition of simultaneously protecting one's core business know-how while trying to share it with one's competitor (Prévot, 2007).

The dilemma between value creation and value appropriation.

In coopetition between large firms, it has been shown that their strong competitive culture results in a high level of tension during the phase of appropriation of co-created value and marketing (Gnyawali & Park, 2011). In the coopetition between SMEs and LFs, our results show that due to the stronger competitive culture on the LF side and the power asymmetry in the relationship, there is a higher risk of unilateral appropriation of the collaboration's results.

There is a strong tension between the high degree of involvement of the SME in the creation of knowledge and the risk of seeing opportunistic behavior on the part of the large firm linked to the pursuit of private interests in the integration of the technological brick co-adapted to be integrated into the complex system. The SME feels left out in the appropriation phase in front of the large firm which is on the front stage as the final integrator of the co-developed technological solution. However, we also notice that this tension is found on the side of the large group, in the case of a collaboration with the SME for its own research and development (not to meet the customer's need). The small companies are criticized for putting innovations on the market that originally met a need of the large firms for which they did the R&D. The nature of the conflict is about who owns the idea.

The dilemma between trust and distrust.

In asymmetric coopetition, SMEs and LFs are more uncertain about the strategic intentions of their partners, which reinforces the dilemma between trust and distrust in coopetition compared to a coopetitive relationship where the partners have similar strategic interests. One of the sinequanone conditions for the implementation and success of a coopetition strategy is the establishment of a climate of trust between the partners (Morris et al., 2007; Padula & Dagnino, 2007). Trust is essential to exploit synergies between competitors. However, they must also remain wary because cooperation is transitory while competition is not (Jarillo, 1988).

We reveal the co-existence of opposing strategic visions and objectives in coopetiton between SMEs and LFs, i.e short-term collaborative and long-term competitive visions. fear that the competitive positioning of the SME will improve in the long term through the collaborative relationship. It has been shown that the search for power and the notion of dependence in coopetition is an important source of conflict (Zineldin, 2004). Indeed, we observe that the tension created by the LF's distrust of the SME partner is a function of the power balance in the relationship. As long as the small partner has low bargaining power in the market, tensions remain low. They increase as the SME gains influence.

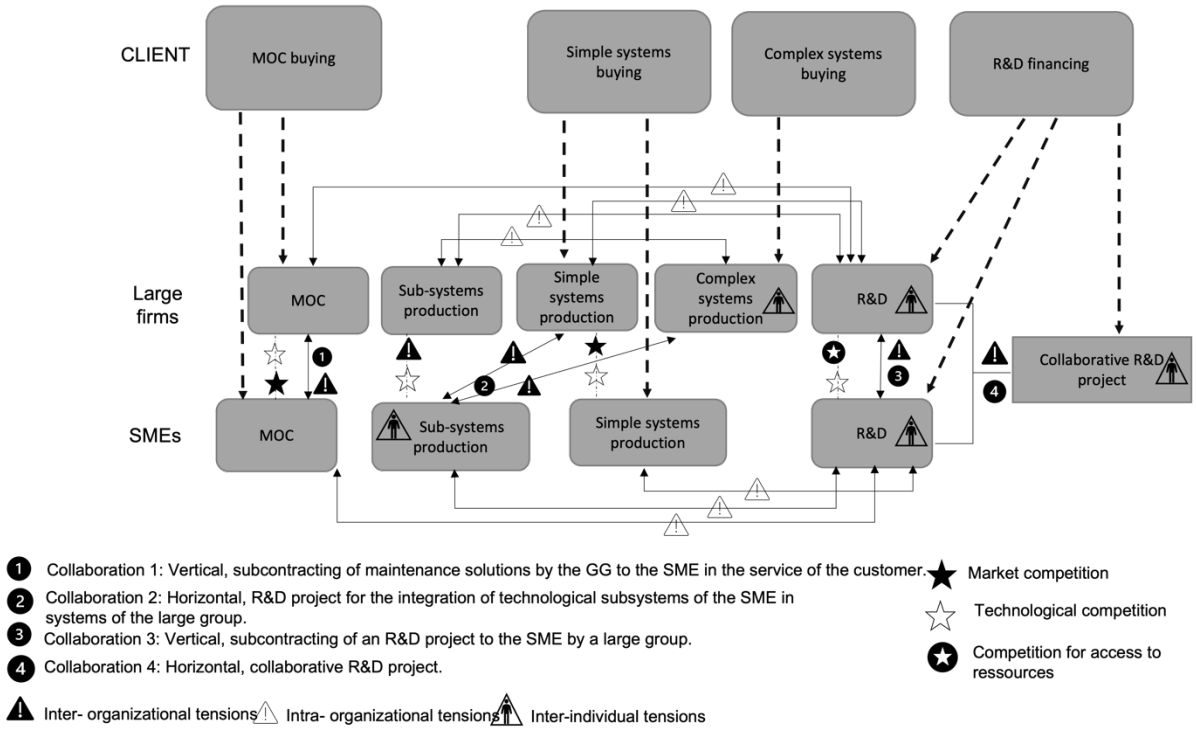
The LF is also suspicious and monitors its level of dependence on the SME's technology. It fears that the SME will "die" with a key technology for the large group, which would cause the end of the partnership that the large group cannot afford in a global innovation race. This mistrust pushes the large group to opportunistic behavior towards the SME in the collaboration. The SMEs are thus wary of the LF, which would risk at any moment, as soon as the technology becomes interesting for the customer, to push them aside from the collaboration. This observation in the case of asymmetrical coopetition refutes the generalist thesis of interdependence that reduces the risks of opportunistic behavior (Ferrary, 2003) and confirms

that access to key information and strong negotiating power on the part of one of the two partners can reinforce the tensions in coopetition (Lecocq, 2004).

The dilemma between the feeling of belonging to its original structure and the commitment to collaboration with the competitor.

Cooperative tensions have mainly been studied at the inter-organizational and internal project level (e.g. Gnyawali & Park, 2011; le Roy & Fernandez, 2015) between R&D teams. In coopetition, employees of project teams may not perceive the challenge of collaborating with a competitor and may be reluctant (Fernandez and Le Roy, 2015). Our study has shown the existence of such reluctance, especially on the side of large firms. We report tension created by an internal superiority effect in large groups, despite the opinion of the management teams, who do not perceive the contribution of SME in innovation. They thus slow down collaboration by believing they can innovate alone. This misunderstanding generates strong tensions. Finally, we show the appearance of tensions between the SBU of the LF and the cooperative SBU. Both develop the same systems, one autonomous internally, the other in partnership with the small company. Tensions are perceptible when the SBUs enter into competition in response to a call for tender on the market.

Chart 2. Summary of cooperative, competitive dynamics, and tensions between SMEs and LFs to address the French Ministry of Defense.



6. Conclusion

Our research makes several contributions to the literature. First, we show the existence of strong coopetitive tensions between asymmetric partners, i.e., SMEs and LFs. Coopetition between a SME and a LF has been shown in the literature to be a counter-intuitive and undesirable strategy, thus excluding a whole field of research on asymmetric coopetition. Our study opens up many new research perspectives on coopetition between SMEs and LFs. Indeed, we identify tensions of a cooperative/competitive, trusting/distrusting, exploratory/exploitative, and sharing/appropriation nature, which are characteristic of a coopetitive relationship. This research is generalizable to other industries. We show that SMEs have inherent characteristics that allow them to efficiently address markets historically dominated by large firms undergoing technological discontinuity. Thus, we open the door to research perspectives on cooperative tensions, for example, in biotechnology. The COVID crisis illustrates the value of the coopetition phenomena between small and large companies to quickly address a need in the biotechnology market historically dominated by large pharmaceutical groups.

Our research also opens up research perspectives on the nature of coopetitive tensions. Indeed, we note that the coopetitive tensions studied between SMEs and LFs present characteristics that distinguish them from cooperative tensions between GGs and between SMEs. They are modified and amplified by the two partners' asymmetries of size and power. Thus, the coopetition management methods proposed in the literature on coopetition between firms of similar size and characteristics appear to be unsuited to the management of asymmetric coopetition. Our research thus calls on authors in management sciences to ask themselves the question of asymmetric coopetition.

The empirical implications of this research are numerous. Collaborations between large and small firms have long been seen as non-competitive but only cooperative. We show the existence of underlying competitive tensions in the collaboration. We also show that this relationship is precarious for the smaller partner, who must protect itself in the partnership. This research highlights key points for managers of large groups and SMEs to identify irritants in the collaboration and implement appropriate managerial solutions. Moreover, this research provides to public policies, particularly the French Ministry of Army with the identification of irritants in the industry. It might help to take appropriate managerial measures to facilitate the collaboration between firms.

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