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Always on par? How small- and medium-sized enterprises manage coopetition strategies to innovate with large firms

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Abstract

This article explores how entrepreneurial small- and medium-sized enterprises (SMEs) manage coopetition strategies to innovate with large firms. While coopetition offers opportunities for innovation and growth, asymmetries between SMEs and large firms can provoke unilateral actions, opportunistic tactics, and knowledge theft which can undermine SME innovation power and jeopardise coopetition success. Based on a qualitative multiple-case study of 25 coopetitive innovation projects, each involving an SME and a large firm, we find that SMEs manage these risks by pursuing a synergistic mix of three distinct coopetition strategies: (1) Co-distribution, (2) Technology licensing, and (3) R&D co-development. In each strategy, SMEs navigate different coopetition intensities by dynamically combining the principles of separation, integration, co-management and co-ownership to achieve specific innovation outcomes. Our findings suggest that SMEs shift between cooperation- and competition-dominant strategies and employ a mix of management principles to offset asymmetrical risks and maximise their innovation benefits from coopetition with large firms.

Keywords

coopetition, coopetition strategies, innovation, SMEs, large firms

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Introduction

Although small- and medium-sized enterprises (SMEs) are important enablers of technological innovation and economic development, they often lack the resources, market presence and expertise to sustain independent growth (Colombo et al., 2010; Gimenez-Fernandez et al., 2020). Therefore, in fast-paced knowledge-intense sectors with short product cycles and high levels of uncertainty, SMEs increasingly collaborate with larger, more established and powerful competitors to pursue innovation (Bengtsson and Johansson, 2014; Hora et al., 2018). In these environments, SMEs can benefit from the complementary technical and financial resources, reputation, and knowledge of their rivals, allowing them to accelerate the creation of more robust and better-differentiated products (Manzhynski and Biedenbach, 2023; Ricciardi et al., 2022). The complementary knowledge and resources of SMEs and their larger competitors facilitate the creation of new technologies while reducing the costs and risks of their development (Bouncken et al., 2020; Chiambaretto et al., 2020). These advantages can be particularly relevant for SMEs given their restricted access to resources and their limitations in terms of smallness and newness (Bouncken and Kraus, 2013; Gast et al., 2019b). Large firms, for their part, can take advantage of the flexibility and entrepreneurial spirit of their smaller opponents (Klammer et al., 2023). Such relationships involving simultaneous cooperative and competitive elements are known as coopetition (Bengtsson and Kock, 2000; Gernsheimer et al., 2021).

While coopetition with larger firms offers SMEs particular opportunities for innovation and growth, it also exposes them to high levels of risk and uncertainty (Gnyawali and Park, 2009; Morris et al., 2007). Power and knowledge asymmetries between SMEs and large firms provoke unilateral actions, opportunistic tactic and knowledge theft, which can undermine SME innovation performance and compromise coopetition success (Näsholm et al., 2018). Indeed, large firms may easily copy, imitate or re-engineer key technologies from SMEs, misappropriate their knowledge and expertise and exploit their innovative capabilities to capture individual advantage (Bengtsson and Johansson, 2014; Lechner et al., 2016). SMEs have less power and influence than large established corporates and are therefore, particularly vulnerable to such risks (Chiambaretto et al., 2020; Näsholm et al., 2018). Their size and newness may prevent SMEs from recovering from knowledge theft and imitation (Baum et al., 2000; Lee et al., 2012). For these reasons, SMEs must identify approaches to managing coopetition with larger companies and reaping its benefits while avoiding its potentially damaging consequences (Le Roy and Czakon, 2016).

Scholars have recently begun investigating how firms can manage coopetition, identifying three core management principles: *organisational separation* of cooperating and competing activities (Bengtsson and Kock, 2000), *individual integration* of these activities (Gnyawali and Park, 2011), and *co-management* of joint activities (Le Roy and Fernandes, 2015). However, the effectiveness of these principles has primarily been demonstrated in coopetition between large similarly sized firms (Pellegrin-Boucher et al., 2018; Seran et al., 2016). It remains unclear whether and how smaller, less experienced firms can use these principles to manage coopetition with larger and more powerful companies. Furthermore, past research has shown that SMEs primarily engage in cooperation-dominant strategies that involve low levels of risk and hostility (Gast et al., 2019b; Kraus et al., 2019). In coopetition with larger and more dangerous competitors, however, the strategies SMEs can employ to protect their position and achieve beneficial innovation outcomes remain unclear. Additional insights into the effectiveness of coopetition principles and their links to specific strategies for coopetition with larger companies would allow SMEs to mitigate unilateral knowledge theft, better protect their competitive advantage and facilitate the creation of better,

more robust and equally balanced innovation outcomes (Le Roy and Czakon, 2016; Lechner et al., 2016). Accordingly, we ask the following research question: '*How do SMEs manage coopetition strategies to innovate with large firms?*' We address this question through an exploratory qualitative approach employing a multiple-case study design in the agrochemical industry. In this sector, pioneering SMEs collaborate with large pesticide companies to develop and market healthier, chemical-free and environmentally friendly plant protection products known as biologicals. By analysing their coopetitive innovation projects, each involving an SME and a larger firm, we find that SMEs pursue a synergistic mix of three distinct coopetition strategies: first, Co-distribution; second, Technology licensing and third, R&D co-development. In each strategy, SMEs navigate different coopetition intensities by dynamically combining the principles of separation, integration, co-management and co-ownership to achieve specific innovation outcomes.

Our study makes several contributions. Different from existing results in the small business coopetition literature, we find that SME coopetition strategies are not necessarily cooperation-dominant (Gast et al., 2019b; Kraus et al., 2019). In coopetition with large firms, SMEs shift among three strategies with different levels of coopetition intensity, ranging between cooperation- and competition-dominant approaches. In cooperation-dominant and balanced-moderate coopetitive strategies, SMEs rely on the known principles of separation and integration to achieve low and incremental innovation outcomes (Fernandez et al., 2018; Park et al., 2014). In balanced-strong coopetitive strategies, SMEs additionally apply co-management as a third, and co-ownership of joint inventions as a fourth and new principle to create radical innovation (Mariani and Belitski, 2022). Overall, we show that SMEs move among three distinct strategies and apply a mix of management principles to offset asymmetrical risks and maximise their innovation benefits from coopetition with larger firms.

Theoretical background

SME coopetition strategies for innovation

Coopetition, simultaneously occurring collaboration and competition, is a specific type of business-to-business relationship in which firms engage in both collaborative and competitive actions to create value (Bengtsson and Kock, 2000; Gernsheimer et al., 2021). The interplay of these two contradictory forces renders coopetition highly conflicting, paradoxical and challenging for the firms involved (Bengtsson and Kock, 2000; Raza-Ullah et al., 2020). Whereas cooperation allows firms to access strategic resources, knowledge and expertise to achieve collective interests, competition emphasises opportunistic behaviours to achieve private gains (Gnyawali and Ryan Charleton, 2018). The competitive element inherent in such relationships differentiates coopetition from other types of inter-firm collaboration such as strategic alliances or joint ventures (Bengtsson and Kock, 2014). Competition reduces complacency and keeps firms constantly pushing to improve their performance (Guo et al., 2023; Xie et al., 2023). This dynamic enables coopetitive relationships to deliver greater benefits than purely collaborative or purely competitive engagements (Lado et al., 1997; Peng et al., 2012). The simultaneous pursuit of collaboration and competition has recently taken shape as a critical business practice for entrepreneurial SMEs (McGrath et al., 2019; Rajala and Tidström, 2022). Pooling and combining technologies, expertise and knowledge with competitors helps SMEs overcome resource limitations that their small size and newness entail (Freeman et al., 1983; Stinchcombe, 1965). In coopetition, SMEs can exchange important assets and equipment (Kraus et al., 2019), share know-how and advice (Galloway et al., 2019), mitigate financial risk and uncertainties and defend their position against more powerful competitors (Garri,

2020). As SMEs are more vulnerable due to their size and market position, coopetition can protect them from adverse environmental impacts and help secure their long-term survival in the market (Akdoğan and Cingšz, 2012; Blackburn, 2007).

SMEs often pursue coopetition openly and with an intrinsically positive attitude to collaborate (McGrath et al., 2019). They team-up with other like-minded smaller firms in joint communication, marketing, supply chain, or production activities to create and leverage shared benefits (Lindström and Polsa, 2016). For instance, craft breweries exchange their recipes and know-how to mutually improve their performance (Kraus et al., 2019). Wineries often join forces in collective structures, establishing common brands and setting new standards to promote and defend their cluster (Granata et al., 2018). Charities connect to borrow equipment, share staff and engage in joint fundraising efforts (Crick and Crick, 2020). Even in the informal economy, small painting businesses embrace coopetition as a naturalised practice to jointly navigate adverse business events (Darbi and Knott, 2023). Coopetition between SMEs is thus typically friendly and driven to achieve common goals based on mutual assistance, sympathy and trust (Gast et al., 2019a; Kraus et al., 2019). As a result, SME coopetition strategies are often formally labelled as cooperation-dominant (Gast et al., 2019b; Kraus et al., 2019).

Although coopeting SMEs can lean towards more collaboration and less competition, there are occasions where cooperative and competitive behaviours collide. In the tourism sector, for instance, SMEs join together in local networks to design marketing campaigns, share knowledge and split the costs of collectively promoting their destinations (Cortese et al., 2018). At the same time, they compete fiercely for the limited budget of tourists (Chim-Miki and Batista-Canino, 2017). Strategies of this nature may be understood as balanced-coopetitive where neither cooperative nor competitive behaviour prevails (Mariani and Belitski, 2022). Balanced-coopetitive strategies can be strong, moderate or weak (Bengtsson et al., 2010). Balanced-strong coopetitive strategies can carry high risks of opportunism and leakage due to the simultaneously strong cooperation and competition involved (Park et al., 2014). In balanced-moderate coopetitive strategies, neither cooperation nor competition is overly strong or weak and therefore, there are moderate risks for the firms involved (Bengtsson and Raza-Ullah, 2019). Balanced-weak strategies (weak cooperation, weak competition) create low risks of knowledge theft as the intensity of both cooperation and competition is low (Luo, 2007). Innovation is a key outcome of coopetition strategies among SMEs (Bouncken and Fredrich, 2016). Sharing, integrating and recombining innovative technologies and technical know-how with smaller competitors enables SMEs to create different types of innovation, including incrementally and radically innovative products (Ritala and Hurmelinna-Laukkanen, 2013; Ritala and Sainio, 2014). In this regard, combining SME technologies may lead to incremental innovation with only minor improvements but could also result in more advanced radical innovation (Vanyushyn et al., 2018). This is particularly the case when SMEs decide to connect their resources and capabilities in the later, more advanced and less risky stages of a new venture (Bouncken et al., 2018).

Managing SME coopetition strategies for innovation

Sharing and integrating complementary resources with other small competitors can generate unparalleled knowledge and learning opportunities (Bouncken and Fredrich, 2016; Ritala and Hurmelinna-Laukkanen, 2013); however, it can also invite opportunistic tactics, learning races and knowledge theft that undermine innovation power and compromise coopetition success (Bengtsson et al., 2016). Consequently, while younger, less experienced and under-resourced firms may particularly benefit from coopetition, their smaller size and weaker structure also make them extremely vulnerable to its risks (Crick and Crick, 2021; Gnyawali and Park, 2009; Morris et al., 2007).

Approaches to managing the risks of coopetition have been at the forefront of scholarly attention (Le Roy and Czakon, 2016; Rajala and Tidström, 2022). However, few studies explore how SMEs can mitigate these risks to succeed in coopetition. Formal practices including contracts, procedures and good governance were found effective tools to manage opportunistic behaviours (Mariani, 2007). When linked with informal practices such as goal setting, transparent communication and continuous dialogue, formal practices reveal their full potential and allow the proactive mitigation of unilateral knowledge theft and plunder (Tidström et al., 2018). For instance, a formalised organisational structure can help micro-firms jointly defend common interests while protecting their individual competitive advantage (Dana et al., 2013; Granata et al., 2018). Being active and committed, within a particular geographical distance, and having the willingness to share personal resources, are known to be effective tactics to mitigate tensions in coopetition between innovative small-business networks (Lindström and Polsa, 2016). Thus, SMEs typically choose trusted partners to avoid conflicts, facilitate open communication and foster pragmatic problem resolution (Garri, 2020). A small set of studies primarily focused on large firms has extended these findings to explore three management principles that lower the risks in coopetition: the *separation principle* (Bengtsson and Kock, 2000), the *integration principle* (Chen, 2008; Gnyawali and Park, 2011), and the combination of these through the *co-management principle* (Le Roy and Fernandez, 2015). These principles were found effective in managing the risks of innovative coopetition projects between large similarly sized firms (Fernandez et al., 2018; Pellegrin-Boucher et al., 2018).

The *separation principle* recommends a functional, temporal or spatial separation of collaborative and competitive activities (Bengtsson and Kock, 2000). This management approach entails the division of cooperation- and competition-related tasks (Luo et al., 2006). For instance, firms cooperate in upstream activities, such as new product development, and compete in downstream activities, such as sales and marketing (Kylänen and Rusko, 2011). Separation helps managers avoid conflicts by focusing on either collaborative or competitive activities, but such emphasis can also create new risks and tensions and is therefore, not sufficient to manage the complexities of coopetition (Pellegrin-Boucher et al., 2018).

According to the *integration principle*, managers must synthesise collaborative and competitive actions at the individual level (Gnyawali and Park, 2011). The integration principles reflects the ability of individual managers to dynamically move between competitive and collaborative thinking and contextually prioritise one force without ignoring the other (Gnyawali and Park, 2009; Stadtler and van Wassenhove, 2016). Integration builds upon a coopetitive mindset, a cognitive ability to think paradoxically and dynamically balance the risks and opportunities from coopetition (Bengtsson et al., 2016; Gnyawali et al., 2016).

The *co-management principle* suggests establishing a joint project team, separated from the rest of the organisations and steered by a dual management committee, to manage complex coopetitive projects. In such structure, managers from two coopeting firms with high integration capabilities are pooled to intensively collaborate and make all critical project decisions together (Le Roy and Fernandez, 2015). Co-management builds upon the integration principle and relies on the ability of individual managers to balance and integrate conflicts to the benefits of all coopeting firms (Fernandez et al., 2018).

SME coopetition strategies with large firms for innovation

Due to growing technological challenges, regulatory hurdles and escalating costs of developing and launching radical innovation, SMEs increasingly join forces with larger and more powerful competitors (Bengtsson and Johansson, 2014; Hora et al., 2018). Strong resource complementarities render SMEs and large firms ideal collaborators since each has what the other lacks (Hora

et al., 2018; Weiblen and Chesbrough, 2015). Large firms control extensive assets and resources to engage in challenging innovation, but often lack the specific innovation capabilities to exploit and accelerate radically new technologies (Chesbrough and Brunswicker, 2014). SMEs, by contrast, possess pioneering technological know-how, flexibility and agility to speed up new product introduction but can lack access to broader resources and markets (Chiambaretto et al., 2020).

Despite these complementarities, coopetition with larger competitors can also be a source of increased risk and, as a result, be more complex and challenging than coopetition between SMEs (Lechner et al., 2016). In coopetition with large firms, SMEs must share their most valuable knowledge with a much larger and more powerful firm (Gast et al., 2019a). Whereas large corporates are experienced in protecting and defending sensitive information through formal mechanisms, routines and procedures (Chiambaretto et al., 2020; Fernandez et al., 2021), SMEs may be less familiar with or able to control such tools, leaving them exposed to greater risks of knowledge theft and plunder (Gast et al., 2019a). SMEs may also have fewer opportunities to create and capture value from coopetition (Alvarez and Barney, 2001). Large firms benefit from established practices to quickly diffuse, recombine and leverage innovative knowledge and resources (Fernandez et al., 2018). For those with networks of international subsidiaries, they are able to scale jointly developed technologies more quickly and achieve high returns faster than smaller firms (Fernandez et al., 2021; Gnyawali and Park, 2011). SMEs, by comparison, may lack the capabilities, experiences and structures to effectively absorb and leverage knowledge and technologies from larger competitors (Alvarez and Barney, 2001). These power and knowledge asymmetries are specific challenges in coopetition between SMEs and large firms (Bengtsson and Johansson, 2014; Klammer et al., 2023) that can slow the establishment of trust, delay the exchange of strategic resources and erode the unique value creation potential of coopetition (Feng et al., 2019; Ritala and Hurmelinna-Laukkanen, 2009).

Despite these challenges, to our knowledge, there is an absence of work investigating how SMEs can manage the specific risks entailed in coopetitive relationships with larger firms (Table 1). Indeed, most studies on the strategies and management of coopetition focus on SMEs or large firms separately (Fernandez et al., 2018; Granata et al., 2018). This gap is surprising, considering that coopetition between SMEs and larger firms can generate specific synergies to foster better, more creative and sustainable innovation outcomes and be particularly consequential to technological advancement, economic growth and employment (Giglio et al., 2023; Hora et al., 2018; Klammer et al., 2023). Given these opportunities, we argue there is need to study which strategies SMEs can apply to effectively manage coopetitive relationships with large firms for innovation. Accordingly, we ask the following research question: '*How do SMEs manage coopetition strategies to innovate with large firms?*'

Method

Study design, industry context and sample

We adopt an exploratory, qualitative approach with a multiple-case study design to explore our research question. This approach is recommended to analyse complex and unexplored phenomena within a specific context (Eisenhardt, 1989; Yin, 2018). A qualitative multiple-case design is appropriate for three main reasons. First, prior research on coopetition management primarily focuses on single-cases between two similarly sized firms (Fernandez et al., 2018; Le Roy and Fernandez, 2015). By using a multi-case approach to study coopetition between differently sized firms, we seek to extend theory across contexts (Bansal and Corley, 2012). Second, qualitative cross-case examination creates more robust findings which can then be tested in future quantitative

Table 1. Main studies on coopetition between SMEs and large firms.

Authors	Topics	Methods	Main findings
Bengtsson and Johansson (2014)	Alliance management capabilities	Three case studies with high-tech SMEs	SMEs need to develop legitimacy, agility and role flexibility in coopetition with large firms.
Lechner et al. (2016)	Impact of vertical coopetition on sales growth	Quantitative study of 82 start-ups in Germany	Vertical coopetition with larger firms positively affects sales growth of small firms.
Jakobsen and Steinmo (2016)	The role of proximity in coopetition between small and large firms	Multiple-case study within the Norwegian manufacturing industry	Cognitive and technological proximities are essential for the development of innovation through coopetition.
Hora et al. (2018)	Motives, nature and outcomes of coopetition between start-ups and large firms	70 interviews with start-ups and corporates in Austria	Start-ups seek to increase sales, growth and publicity opportunities while large firms seek access to technologies and innovation.
Chiambaretto et al. (2020)	Partner selection criteria	Quantitative study of 61 managers and entrepreneurs	Small firms coopete to reduce costs and learn, large firms coopete to reduce their time-to-market.
Klammer et al. (2023)	Learning and unlearning mechanisms	30 interviews with large companies	Large firms use learning and unlearning to develop a coopetitive mindset and manage asymmetries.

approaches (Eisenhardt and Graebner, 2007; Lincoln and Guba, 1985). Third, case studies facilitate an in-depth understanding of a phenomenon in a limited context (Yin, 2018). So far, coopetition between differently sized companies has received very little attention, making an exploratory qualitative study particularly appropriate.

We select the agrochemical industry as our research setting. This sector is dominated by a few large multinational corporates engaged in the discovery and development of highly innovative pesticides (Phillips, 2020; Sparks and Lorsbach, 2017). Escalating research and development (R&D) costs, stricter regulations, as well as increasing complexities in the discovery of new products have led to the recent emergence of numerous coopetitive relationships among these firms (Sparks and Lorsbach, 2017). At the same time, a strong push from consumers and policymakers for healthier and more sustainably grown food has given rise to the development of natural and more environmentally friendly products known as biologicals (CropLife, 2023). Biologicals are safer alternatives to pesticides and able to control insects and diseases without the use of chemicals (Powell and Jutsum, 1993).

Entrepreneurial SMEs with specific scientific capabilities are the primary inventors of biologicals. Whereas large pesticide firms traditionally develop large-scale pesticides for a broad range of pests and diseases, entrepreneurial SMEs focus on developing biologicals targeting specific pests and diseases. However, given the challenges in developing new pesticides and the growing demand for safer and more sustainable products, large agrochemical firms have recently started to shift their strategies and market biologicals through coopetition with their smaller peers (Shoham, 2020). This dynamic makes this sector an exciting setting in which to study coopetition between SMEs and large firms. Our sample includes large global pesticide firms and small- and mid-sized biological firms. These companies collaborate in the development and commercialisation of a specific biological product while remaining in direct competition with other products. Industry experts consider coopetition between SMEs and large firms a unique opportunity to grow the biologicals

segment and provide farmers at a more rapid pace with more and better products (AgNews, 2022). Our analysis takes place at the project level, allowing us to study how SMEs and large firms manage coopetition from a working-group perspective. As such, our sample only reflects coopetitive innovation projects involving SMEs and large firms with a clearly defined project scope and objective (Table 2).

Data collection

Qualitative data were collected through semi-structured interviews with informants participating in coopetitive innovation projects between biological SMEs and large pesticide firms. We identified these projects by accessing IHS Markit Insight, a subscription-based database for global intelligence on the agrochemical industry. The database contains records of publicly announced interfirm collaborations on agrochemicals in press releases, analyst presentations and public reports by all major firms in the industry. A dedicated team of IHS industry experts validates the content of each collaboration announcement through accredited contacts within the industry. Different to regional or firm-specific databases, IHS Markit Insight is considered the most comprehensive and reliable source with global coverage of all firm and product types. While other providers screen collaborations in the current year, IHS Markit Insight provides a full-text search over ten years, offering deep background data for a range of research, including understanding historical trends. We took advantage of these features and generated a comprehensive overview of biological collaborations between SMEs and large firms in the sector. To enable purposive sampling (Miles and Huberman, 1994; Palys, 2008; Patton, 2015), we engaged two industry consultants to help identify those coopetitive innovation projects where SMEs directly collaborated with larger competitors. We considered SMEs as companies with fewer than 250 employees and less than €50 million in annual turnover.

Between January 2022 and March 2023, we contacted the SMEs and the large firms involved in these projects via email and asked for an interview. From 59 identified projects (118 individual requests), we received responses for 32 projects (64 informants) and, following discussions about the scope of our study, received agreement to participate from 25 projects (50 informants; see Appendix 1 for a list of interviewees). At the beginning of each interview we confirmed with all informants their deep involvement in the initiation and/or management of the identified projects (Taylor and Blake, 2015). For each project, we conducted two interviews: one with a manager from the SME and one with a manager from the large company; this allowed us to draw broad and holistic insights from two perspectives to enhance the credibility of our findings (Dana and Dumez, 2015; Lincoln and Guba, 1985).

Thirty-two interviews were completed via Microsoft Teams and eighteen in person. Each interview was conducted in English and lasted between 30 and 104 min, with an average duration of 66 min. With the interviewee's consent, we audio-recorded and then transcribed the interviews immediately verbatim to preserve the quality of the data and avoid interpretation biases (Gibbert et al., 2008). The transcripts for all interviews comprise of approximately 1,250 pages of evidence; we also recorded 75 pages of handwritten notes taken during the interviews. An interview guide was developed and pre-tested with three retired managers previously involved in similar coopetitive innovation projects. We used this guide consistently for all interviews to ensure a shared understanding of the phenomenon and the purpose of the questions (Appendix 2, Interview guide).

We complemented and contextualised the data from our interviews by screening for secondary data on websites and in annual reports (mostly of large firms), analyst presentations and public information. Public information included collaboration announcements, economic and financial

Table 2. Sample overview.

	Small- and mid-sized enterprise			Large firm			Coopetition project
No.	Revenue in 2021	No. of employees	Headquarters	Revenue in 2021	No. of employees	Headquarters	Description
P1	<€5 million	45	Europe	€400 million	900	Europe	Collaboration for the technical development, registration and commercialisation of multiple biological products primarily for fruits.
P2	<€5 million	35	Europe	€160 million	100	North America	Marketing collaboration for a biological focused on improved crop quality.
P3	<€5 million	30	Europe	>€15 billion	20,000	Europe	Collaboration to improve plant growth and plant's natural resistance.
P4	<€5 million	<25	Europe	>€15 billion	20,000	Europe	Collaboration to commercialise an innovative biological with a unique mode of action for use across several fruits and vegetables.
P5	€5 million	25–30	Europe	>€15 billion	20,000	North America	Global collaboration to develop a portfolio of biological products.
P6	€7 million	50	Europe	>€15 billion	20,000	North America	Collaboration to develop novel microbial-based biological solutions.
P7	€45 million	100	Europe	€10–15 billion	20,000	Europe	Collaboration to commercialise a wide range of biologicals.
P8	€40 million	100	North America	€5–10 billion	10,000	Middle East	Collaboration to accelerate the discovery of radically new biologicals.
P9	<€5 million	20–25	Europe	€5–10 billion	10,000	Middle East	Innovative biological product to enhance plant stress tolerance.
P10	€5 million	50	Europe	€10–15 billion	20,000	North America	Global collaboration for the discovery, development and marketing of biologicals products with joint technologies from both companies.
P11	15 million	100	North America	€5–10 billion	10,000	Europe	Strategic collaboration for the development of an innovative biological.
P12	€15 million	60	North America	>€15 billion	20,000	Europe	Collaboration for access to early-stage biological innovation.
P13	n/a	n/a	Asia Pacific	€5–10 billion	6000	North America	Long-term collaboration for the discovery and development of next-generation biological products and combinations.
P14	<€5 million	<25	South America	>€15 billion	20,000	North America	Collaboration for the development and commercialisation of differentiated biological solutions to improve nutrient uptake and plant health.
P15	<€5 million	40–50	Europe	>€15 billion	20,000	North America	Multi-year collaboration to commercialise new biological products that accelerate nutrient efficiency and plant metabolism.
P16	€5 million	20	North America	>€15 billion	20,000	North America	Collaboration to discover new biological products that enhance plant resilience and growth under challenging environmental conditions.
P17	<€5 million	<25	South America	>€15 billion	20,000	North America	Global collaboration to sell new biologicals that maximise yield potential.
P18	<€5 million	60	North America	€5–10 billion	10,000	Asia Pacific	Commercial collaboration to market new biological technologies to achieve better crop nutrition and improved soil health.
P19	€45 million	150–170	North America	>€15 billion	20,000	Europe	Collaboration for biological technologies to lowering pesticide residues.
P20	n/a	n/a	North America	>€15 billion	20,000	Europe	Long-term collaboration for the development and commercialisation of biologicals that are complementary/ synergistic to conventional pesticides.
P21	€15 million	~100	North America	<€5 billion	n/a	Asia Pacific	Collaboration for the commercialisation of new biological solution based on an earlier collaboration for the joint development of the product.
P22	€5 million	<25	North America	>€100 million	200	North America	Collaboration for the development of new biological products complementary to existing crop protection products to achieve better nutrient use efficiency.
P23	<€5 million	20–25	North America	>€500 million	180	North America	Collaboration for the commercialisation of biological products to make plants stronger, more resilient and tolerant to abiotic stress.
P24	€5 million	22	Europe	€5–10 billion	10,000	Asia Pacific	Collaboration for the commercialisation of a new biological technology.
P25	€20 million	70	Middle East	€5–10 billion	10,000	Middle East	Collaboration to commercialise a biological and a crop protection product.

information and marketing materials for their biological products. One respondent shared a 459-pages biologicals report, including company profiles, descriptions of the R&D process, regulatory approval procedures and market-size projections. This information was useful in building our knowledge of the industry and coopetition in this context. It also helped us to validate insights and clarify contradictions in the interview data. Some secondary data were particularly rich, especially in terms of technical and scientific information, which was helpful as a complement to verify accuracy or to support the management of our interviews. Finally, one author joined a leading worldwide biologicals conference. We observed presentations and panel discussions and engaged in informal conversations with managers from biological SMEs and large pesticide firms to discuss our preliminary findings. Although we were in this context prohibited from recording due to confidentiality concerns, we collected evidence to validate and triangulate our results by taking extensive field notes (Eisenhardt, 1989).

Data analysis

We coded all our data in Lumivero's NVivo 12 software using systematic procedures based on recommendations from Miles and Huberman (1994) and Gioia et al. (2013), following a recursive three-step approach of open, axial and selective coding (Corbin and Strauss, 2015). In the first step, we used open coding to identify the attributes of each coopetition project in a within-case analysis (Eisenhardt, 1989). These initial concepts were mostly descriptive and derived from informant portrayals of collaborative and competitive behaviours, actions, or decisions during the projects.

In the second step, we moved from open to axial coding and clustered open codes into more abstract and theoretical categories (Corbin and Strauss, 2015). We drew known management principles (e.g. separation, integration and co-management) and features of coopetition projects (e.g. project costs, project risks, project innovativeness) from the literature and used these to develop our themes and identify nascent concepts (Fernandez et al., 2018; Le Roy and Fernandez, 2015). For example, we clustered statements as relating to the 'separation principle' if they were related to 'limiting large competitors to only sell to specific customers', 'using differentiated brands' and 'engaging through separate teams' based on their common properties.

In the third step, we searched for the aggregated dimensions underlying our themes by exploring how the axial codes fit together (Thornberg and Charmaz, 2014). In this step, we moved to a cross-case analysis to compare, contrast and search for common themes among the projects (Eisenhardt, 1989). For example, in projects characterised by the 'separation principle', with 'low costs and risks' and 'low innovation', SMEs and large firms collaborated by jointly distributing an existing product. Thus, we combined these themes into the aggregated dimension of 'co-distribution strategy'. In projects involving the 'separation principle', the 'integration principle', the 'co-management principle' and the 'co-ownership principle' with 'high costs and risks' and 'high innovation', SMEs and large firms co-created radically new products. We subsequently aggregated these themes into the aggregated dimension 'R&D co-development strategy'.

Although presented in a linear fashion, our analysis was dynamic and iterative; all data were continuously compared and discussed among the authors to decrease the subjective nature of the process (Eisenhardt, 1989). This approach also helped to refine the coding process, eliminate competing explanations and allow reflection about the boundary conditions of our data. As a result, we identified 39 first-order codes that we consolidated into 13 themes, finally arriving at three aggregated dimensions, reflecting the three strategies for coopetition between SMEs and large firms to create innovation. Table 3 summarises our data structure, illustrating how we first summarised concepts from informant reflections into first-order codes and subsequently assembled them into themes and dimensions.

Table 3. Overview of first-order codes, themes and dimensions.

First-order codes	Themes	Dimensions
Limiting large competitors to only sell to specific customers.	Separation principle	Co-distribution strategy
Using differentiated brands and packaging to approach specific customers.		
Engaging through separate sales teams to commercialise the product.		
Not investing in development and manufacturing activities.	Low costs and risks	
Not investing in sales and marketing teams/own R&D resources.		
Relying on existing distribution network from large competitors.		
Exchanging non-critical technical information to support sales activities.		
Interacting on different org. levels based on mutual appreciation and trust.		
Not engaging in joint new product development activities.	Low innovation	
Selling an existing undifferentiated product developed by an SME.		
Dealing with potential frustration and lack of attention.		
Restricting technology licenses to specific uses and geographies.	Separation principle	Technology licensing strategy
Splitting a technology license for specific uses to multiple competitors.		
Retaining exclusive rights to strategically important markets.		
Balancing between short- and long-term aspirations when negotiating royalties.	Integration principle	
Assigning revenue targets to licenses to push performance.		
Reducing uncertainty of acquisitions through change of control clause.		
Carrying development costs for better differentiated products.	Medium costs and risks	
Facing the risk of development or approval uncertainties and potential failure.		
Facing the risk of not being able to commercialise the product.		
Recombining SMEs' technologies with in-house solutions from large firms.	Medium innovation	
Creating new, better differentiated and higher performing products.		
Negotiating exclusive commercialisation rights to specific geographies.	Separation principle	R&D co-development strategy
Commercialising the jointly developed product in separate territories.		
Commercialising the jointly developed product for separate uses.		
Separating decision making in joint project teams (lead and support roles).		
Embracing different approaches to solve issues and avoiding second-guessing.	Integration principle	
Choosing individuals with similar experience and expertise for joint teams.		
Accepting different speed and approaches to make critical decisions.		
Ensuring level playing field with equal opportunities to create and capture value.		
Project teams are governed by joint steering committee.	Co-management principle	
Jointly coordinating development activities across project subteams.		
Agreeing on joint ownership to new and jointly developed inventions.	Co-ownership principle	
Being able to use joint patents in future projects with different competitors.		
Avoiding the risk of being blocked by new patents from large competitors.		
Facing the risk of product cancellation mid-way through development process.	High costs and risks	
Carrying high costs for developing and registering a biological product.		
Collaborating at very early stage in the product discovery process.	High innovation	
Developing radically new products that potentially replace existing offers.		

Results

Our data reveals that SMEs pursue three distinct coopetition strategies with larger firms: (1) Co-distribution, (2) Technology licensing and (3) R&D co-development strategies. To understand how SMEs manage these strategies, first we explain the objectives in coopetition between SMEs

Table 4. Coopetition intensities, asymmetrical risks, firm roles and management principles in coopetition strategies between SMEs and large firms.

Coopetition strategy	Coopetition intensity	Asymmetrical risks	Role of SME	Role of large firm	Management principles
Co-distribution	Cooperation-dominant	Low	Supplier and distributor	Distributor	Separation
Technology licensing	Balanced-moderate coopetitive	Medium	Licensor/ Technology provider	Licensee, product developer and distributor	Separation and integration
R&D co-development	Balanced-strong coopetitive	High	Development partner and distributor	Development partner and distributor	Separation, integration, co-management and co-ownership

Table 5. Management principles in coopetition strategies between SMEs and large firms.

Management principles	Co-distribution	Technology licensing	R&D co-development
Separation	Separating customers Separating products	IPR restrictions • Geographic separation • Product use separation	IPR restrictions • Geographic separation • Product use separation Project management • Separating decision-making authority
Integration	Not relevant	• Capability to balance short-term financial and long-term strategic objectives • Capability to align expectations and regulate desired performance outcomes • Capability to reduce ambiguity and uncertainty	• Capability to foster confidence, respect and trust • Capability to embrace different approaches to speed and decision making • Capability to ensure equal opportunities to create and capture value
Co-management	Not relevant	Not relevant	• Joint steering committee coordinating development activities across subteams
Co-ownership	Not relevant	Not relevant	• Equal access and ownership to new patents

and large firms. We then analyse each coopetition strategy with respect to the intensity of collaboration and competition, the roles performed by SMEs and large firms and the levels of asymmetrical risk (Table 4). Next, we explore the coopetition management principles that SMEs apply to navigate these risks and create products with different levels of costs and innovativeness (Tables 5 and 6).

The emergence of coopetition between SMEs and large firms

Our results show that SMEs and large firms pursue different objectives as they engage in coopetition. SMEs possess specific scientific capabilities to discover innovative biological products, but

Table 6. Coopetition project characteristics and respective coopetition strategies between SMEs and large firms.

Coopetition strategies	Co-distribution	Technology Licensing	R&D co-development
Project characteristics			
Timeframe	Short-term	Mid-term	Long-term
Costs	Low	Medium	High
Risks	Low	Medium	High
Innovativeness	Low	Incremental innovation	Radical innovation

lack the necessary financial resources, commercial expertise and structures to effectively scale and commercialise their products within and beyond domestic markets. As one SME respondent explains,

> As a 35-person company, how are we supposed to have a national footprint? It's hard to be a company that has only two products . . . So we [SME] realised that and decided that we should stick with the R&D and the product development and the things that we know we have expertise in, but then really rely on partners for getting things all the way out the door. (P2-S)

Large pesticide firms, however, lack the scientific expertise to develop innovative biologicals in-house, but own complex large commercial structures to bring these technologies to market. In coopetition, their goal is to access and scale SMEs' innovative technologies through their commercial networks:

> We [large firm] work with these smaller companies because our pipeline for biologicals is very dry and at the moment almost non-existent because we decided not to prioritise R&D for biologicals. So our strategy is to go and access products from these smaller companies. They have technologies that are very close to market or already in the market that will generate returns for us quicker with a lower investment. (P12-L)

Co-distribution strategy

In co-distribution strategies, an SME appoints a larger firm as the distributor for a specific biological product while remaining in fierce competition with other products (Figure 1). SMEs act as suppliers, manufacturing the product while large firms act as distributors, selling the product. In terms of this strategy, SMEs and large companies assume complementary and mutually dependent roles that are fully focused on cooperation. While the SME continues to sell its product to its existing customers under the original brand and in the original packaging, the large firm sells the same product under a different brand and distinct packaging to a separate group of customers. By separating their customer base and differentiating their product offerings to the end customer, SMEs can protect their existing position and reduce the risk of their larger peers engaging in opportunistic tactics:

> In co-distribution, we are competitors, but we are also collaborators. We [SME] sell our own branded product and that very same product is sold by our bigger competitor or slash collaborator with a different label, a different name on, but it's exactly the same product. (P4-S)

Separating customers also eliminates the SME's risk of being replaced or out-competed by their larger rivals. Different customer groups apply biologicals for different uses and some

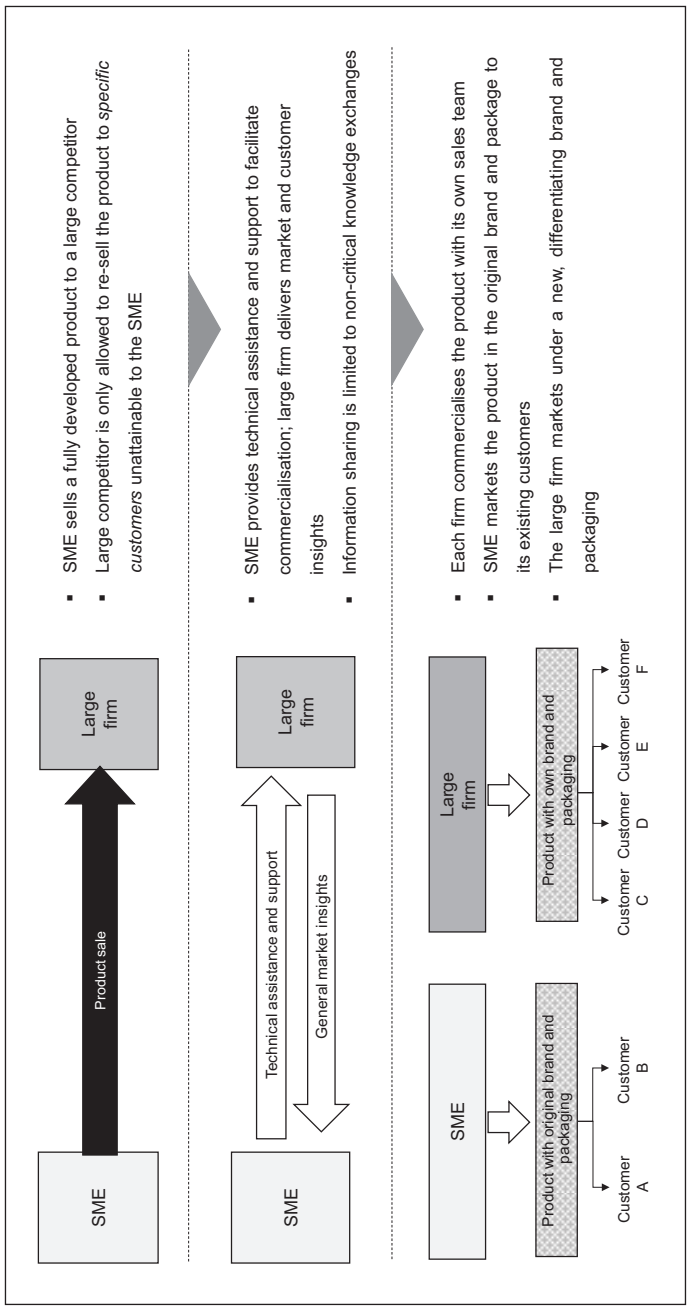

Figure 1. Co-distribution strategy between small- and medium-sized enterprises and large firms.

specific customers are not accessible to SMEs. For instance, some biologicals customers demand high liability protection and service levels that SMEs are unable to provide. By restricting larger competitors to only sell to such customers (separation), SMEs can expand into new and otherwise unattainable segments, gain market share and simultaneously maintain their existing customer base accessible and protected:

> We together define where we [SME] are going to play and where they [large firm] are going to play. We [SME] are parsing the market and give them [large firm] positioning in those markets where we aren't going to compete. (P18-S)

The key benefit of co-distribution strategies is the option to rapidly accelerate the market penetration of biological products at low costs. As our respondents explain, SMEs are able to promote and scale their product through the existing distribution network, sales teams and customer relations of large firms without having to invest in a full-fledged commercial infrastructure (high cooperation). Large firms, by contrast, are able to immediately sell a fully developed and proven biological product without the financial and organisational burden of having to establish their own R&D programme and invest in manufacturing assets (low competition).

> Their [SME] technology is already developed . . . We [large firm] have access to the market. . . . So, there is a natural fit . . . where we both depend and rely on each other. . . . It's kind of a symbiotic relationship. (P19-L)

In co-distribution strategies, the risks of asymmetrical knowledge theft and plunder are low. By providing a large competitor with a fully developed, patent protected and commercially available product, SMEs maintain full control and ownership of their technologies, reduce the risk of imitation and eliminate the need to reveal sensitive information about their discovery, development and production processes (separation). As our SME respondents explain, in co-distribution, they only provide large firms with non-critical technical data and assistance to help position and market their product (high cooperation). In return, large firms provide SMEs with insights into their customers and knowledge about those segments in which they are actively participating (high cooperation). These balanced knowledge exchanges reduce SME fears of exploitation and foster frequent interactions (low competition):

> We [SME] offer technical support, training of their [large firm] sales teams, helping them with their tech sheets and sales decks and positioning. . . . So, it's a lot of information going back and forth, a lot of training, a lot of teaching. (P23-S)

In co-distribution, the SME and the large firm engage their own sales teams to commercialise the product through existing channels (separation). By doing so, SMEs benefit from the reputation and trustworthiness of a respected competitor promoting their product on a large scale (high cooperation). Legitimacy and commercial support from large competitors are important to increase trust among customers regarding the value and benefit of new biological technologies. Likewise, by collaborating with SMEs on environmentally friendly products, large pesticide firms demonstrate their commitment to sustainability, improving their credibility and public reputation (high cooperation). The key disadvantage of co-distribution strategies lies in the low level of innovation involved. SMEs and large firms do not engage in joint development activities but commercialise a product fully and solely developed by the SME. Such products are often simple, undifferentiated biologicals that can be easily copied by followers. This makes large firms vulnerable to more innovative offers from better performing rivals. Consequently, large firms may dedicate little time, effort and

resources to promote biologicals, which can lead to frustration and eventually jeopardise the success of co-distribution strategies.

Technology licensing strategy

As farmers become increasingly aware of the benefits of biologicals, the demand for better and more innovative biological products steadily rises. Large firms have a toolbox of in-house solutions that allow them to connect with technologies from SMEs to enhance the performance of biologicals. In technology licensing strategies, SMEs license their intellectual property rights (IPRs) to larger competitors, allowing them to use and recombine their biologicals to develop better, higher performing and more innovative products (Figure 2). By licensing and supplying their existing product instead of sharing resources to develop new products, SMEs protect their unique discovery platforms from imitation, reduce the need to disclose core knowledge and thus, eliminate the risk of asymmetrical leakage.

> The discovery platform is my [SME] golden goose, it's the one that produces all the eggs. So, I am giving them [large firm] a licence to one egg, but I'll keep the goose producing the eggs. (P6-S)

Technology licensing strategies are characterised by a balance between cooperative and competitive actions. SMEs are able to restrict the licence to particular uses and geographies (separation) and thus, specifically determine where, when and for how long large firms can commercialise their technologies (moderate collaboration and moderate competition). This tactic allows SMEs to more easily balance the levels of collaboration and competition. SMEs act as licensors and technology providers and large firms act as licensees, product developers and distributors. These complementary roles largely involve collaboration. At the same time, however, SMEs compete with large firms by licensing their product to multiple large pesticide companies for different uses and geographies. These partly complementary and partly incompatible roles result in medium levels of asymmetrical risk.

> Assume our [SME] product works in fruits and vegetables, then we can give them [large firm] a global licence for fruits, but keep all our rights for vegetables. Or we say we give a license for fruits only for Spain and retain all other fruit rights in all other countries for ourselves. (P9-S)

Restricting licences to specific uses and geographies enables SMEs to protect their competitive advantage in strategic countries while expanding into geographies where they have no interest or limited ability to compete (separation). As our SME respondents report, they often provide several larger rivals with separate licences to differing countries and uses, enabling them to collaborate with multiple large competitors in various geographies simultaneously (separation). This tactic allows SMEs to leverage the different geographical strengths of their large rivals to maximise the full commercial potential of their products (moderate collaboration/moderate competition):

> We [SME] are very strong here in the US, so we keep all our rights exclusively here. But for Europe and Latin America, we don't have our own sales teams. There we look for partners, which can be bigger competitors who want to licence. (P21-S)

In technology licensing, however, SMEs are exposed to medium levels of asymmetrical risk due to the simultaneous occurrence of both collaboration and competition. SMEs typically seek to licence their technologies to multiple large competitors. This approach can increase the pressure and tension for larger firms to commit and engage in coopetition ahead of other larger competitors.

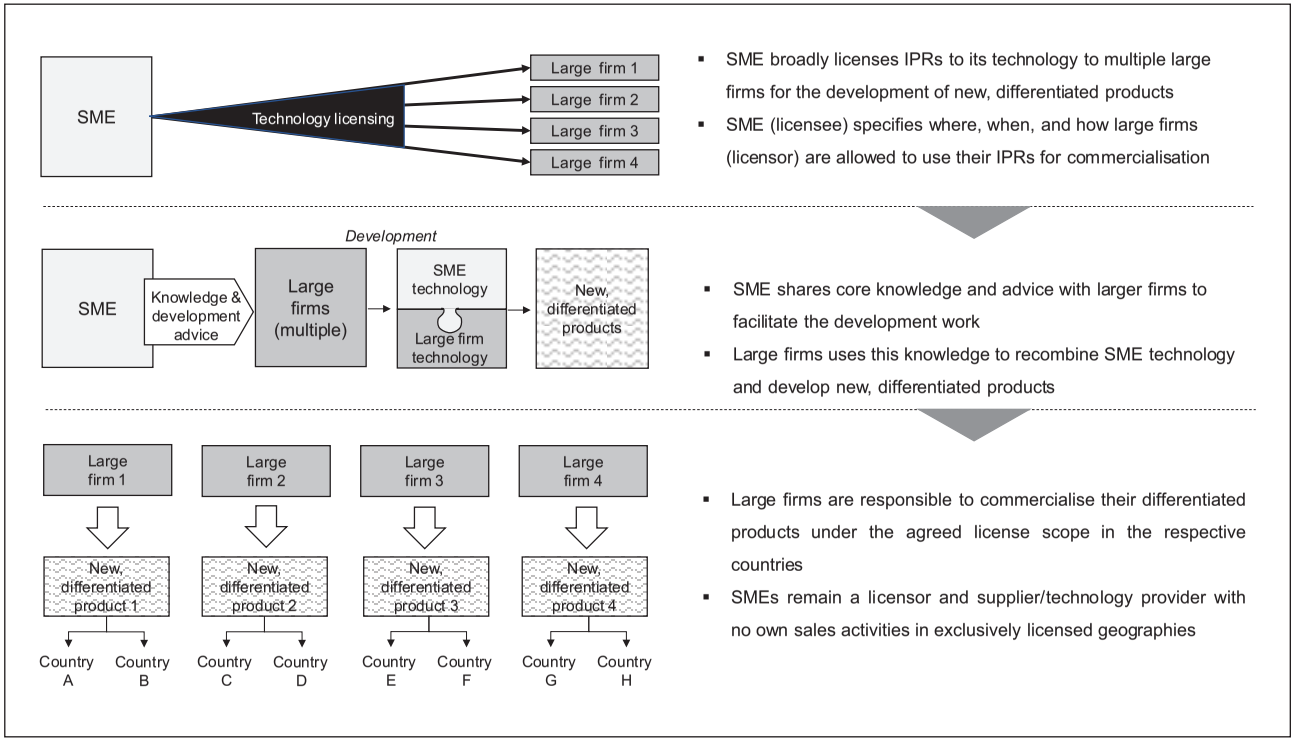

Figure 2. Technology licensing strategy between small- and medium-sized enterprises and large firms.

Indeed, the fear of losing a licensing opportunity to another competitor often pushes large firms into coopetition with SMEs. Consequently, since SMEs generally wish to advance quickly, slow and bureaucratic decision-making can prevent large firms from making timely decisions, leading to frustration and missed opportunities for coopetition, as explained by one small-firm respondent:

> They [large firm] were a little frustrated when they saw we had a deal with their direct competitor, because they were, you know, finding out we [SME] were married to somebody else. I mean, they [large firm] were kind of angry about it. But you have be confident enough to say, 'look, you could have made a deal. You guys just decided to drag it out and couldn't make a decision'. (P14-S)

Another source of asymmetrical risks comes from the negotiation of royalty rates. Due to their smaller size and market position and the early stage of their technologies, SMEs may struggle to negotiate high royalties. As such, SMEs need to balance their short- and long-term aspirations and carefully evaluate the risks and opportunities of coopetition. Striving for high royalties may increase profits in the short-term, but can also put coopetition with large competitors at risk. Lower royalty rates may lead to smaller profits and threaten the short-term survival of SMEs, but pave the way for more coopetitive projects with potentially greater, longer-term returns in the future (integration).

> Just making a deal with [a large-firm] is valued and it'll encourage others to sort of enter into agreements with us [SMEs]. So it's almost like your first success is really setting you up for future successes. So we might compromise and agree to something less profitable with [a large-firm] in order to get the greater value long term. (P3-S)

Asymmetrical risks may also arise as a result of SMEs fear of a larger firm's lack of commitment and poor resource allocation to develop their product. As large firms usually have a dominant focus on chemicals, they may prioritise pesticides over biologicals when deciding on funding for new products. Therefore, SMEs design specific mechanisms to implement and capture the full benefits of coopetition. As reported by our respondents, SMEs tend to grant larger firms technology licences contingent upon the achievement of certain performance goals (integration). If such targets are not met, SMEs reserve the right to revoke the licence, take their product back and approach another competitor to become a partner (moderate cooperation and moderate competition).

> We [SME] set targets for growth as a condition of the license. Say it may be a three-year license, then they [the large firm] have to demonstrate X performance at these values over that course of that time. And if it doesn't happen, then we get the license back and give it to another competitor. (P7-S)

A final source of asymmetrical risks comes from the threat of potential acquisitions of the SME by another large competitor. In such cases, large firms may be forced to collaborate with a large direct competitor or lose their licensing rights and be blocked from commercialisation. From a large firm's perspective, such risk can lead to high levels of scepticism and hesitance to licence with SMEs. As one large-firm respondent explained, SMEs are aware of these risks and must be prepared to proactively suggest remedies to reassure large firms about the potential longevity of their partnership.

> One of the big fears we [large firm] have is that we develop this biological product for many years and then our partner is sold to a competitor and the product gets out of our hand. . . . For that case, we have a very specific change of control clause in the agreement. Let's say they [SME] get acquired by this, this, or this company, then this, this, and that happens. (P5-L)

The main benefit of technology licensing strategies lies in incremental innovation. Licensing and combining biologicals from SMEs with their own complementary in-house technologies allow large firms to develop more powerful and better differentiated biological products. SMEs typically facilitate the development work by providing technical assistance without disclosing critical knowledge that would allow large firms to copy or re-engineer their technologies. These incrementally innovative products can boost the enthusiasm within large firms to support biologicals and increase their openness and commitment to collaborating with SMEs.

> We [large firm] learned that it's not about replacing a chemical with a biological, but to bring them together. So right now we develop this new mixture between one of our [large firm] chemical products and one of their [SME] biological products. We are blending the two together because they complement each other. This creates much more value for our customers than each one of our products alone. (P14-L)

However, recombining SME technologies takes time and exposes large firms to higher development risks. Developing a differentiated biological 'mixture product' can take several years. Also, technical risks and the uncertainty of the regulatory approval processes can compromise the success of a new mixture project mid-way through the development process. Therefore, SMEs need to recalibrate their expectations and accept that the opportunity to capture value from the technology they possess rests on the abilities of larger competitors to successfully develop and launch such products (integration).

Co-development strategy

SMEs and large firms also work together at a very early stage in the development process to create radically new biological products. These broad-spectrum technologies can potentially replace large-scale pesticides and deliver higher profits. To develop such specific and costly products, SMEs and large firms must work together intensively and share their most sensitive knowledge (Figure 3):

> Licensing or co-distribution very often applies to technologies which are more or less already developed . . . and where the spending is done. Co-developments are for earlier technologies discovered by the small firms which still need significant investment. And with that shared investment comes also shared risk and shared opportunities where we [large firm] and they [SME] invest and then we both need to find somehow a way how to deal with the business at the end. (P13-L)

Co-development strategies are characterised by strong cooperative and competitive actions. SMEs seek resources and funding to further develop and bring their technologies to market (high collaboration) but want to limit the risk of exploitation and asymmetrical leakage (high competition). Large firms, by contrast, seek to access new and unique technologies to build their portfolio of biological products (high collaboration) but want to limit their exposure to technical and commercial risks (high competition). Both firms are product developers and future distributors. These overlapping roles focus on strong cooperation and competition and therefore, lead to high levels of risk:

> There is pressure on both sides. As a small company, we are giving more than others would do because we often have no choice but to work with them [large firm]. And the larger ones are also pressured because they want our technology and they can't do these types of complex development deals with twenty other small firms. (P22-S)

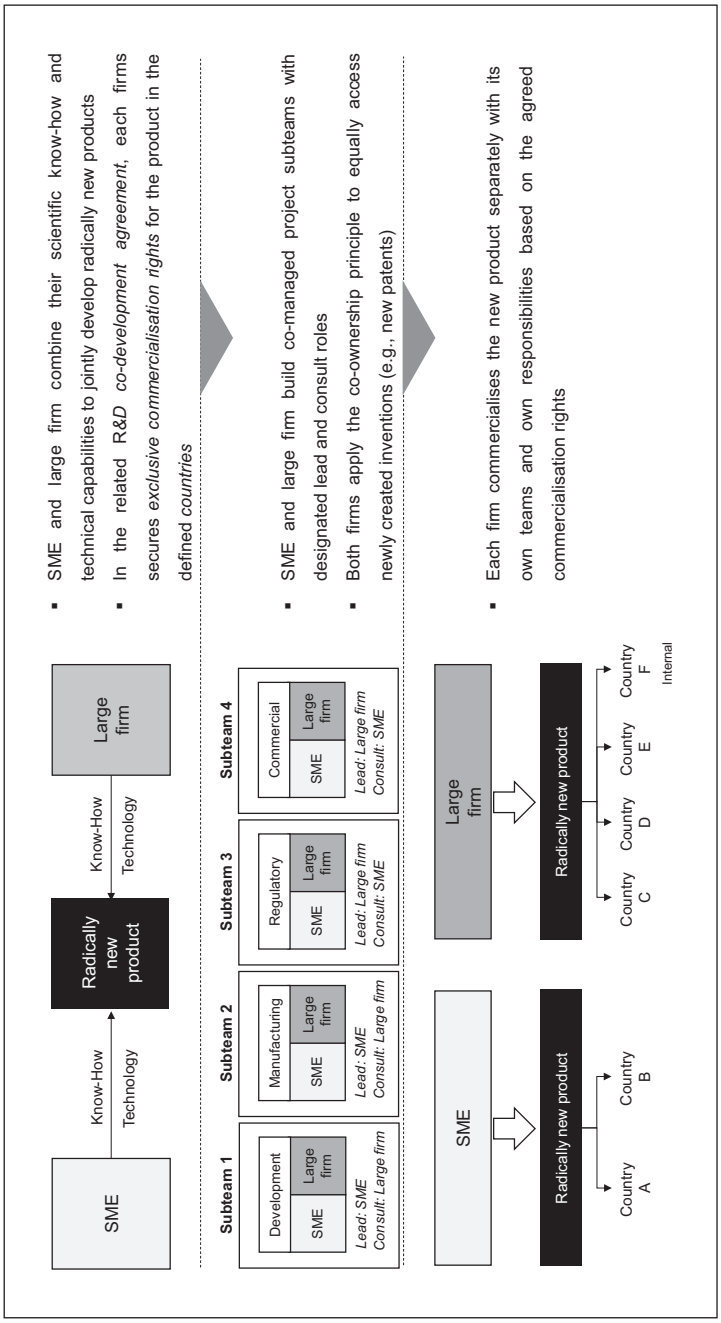

Figure 3. Research and development co-development strategy between small- and medium-sized enterprises and large firms.

Based on their existing IPRs, SMEs assign exclusive commercialisation rights for specific geographies and uses with their larger peer already before the development work starts (separation). This provides certainty about future commercial opportunities and motivates both sides to dedicate sufficient resources to the project's success. As our respondents explain, SMEs typically try to retain exclusive commercialisation rights in their home market while large multinational firms try to secure geographies where they have already established a major commercial presence (separation). In so doing, SMEs avoid opportunistic tactics and direct competition for the same product in the same territories:

> Very early on we [large firm] negotiate exclusivity for those countries and regions where we have a strategic interest to grow with this product. . . . It's like cherry picking. We [large firm] pick the most interesting countries for us and thereby balance the costs and risks that we have versus the potential turnover and margin. (P13-L)

Once separation has been secured, the two firms can connect and develop the product. In joint hybrid mini subteams, SMEs and large firms pool employees to work on specific development activities. These teams are coordinated by a joint steering committee with representing managers from the SME and the large firm (co-management). They collaborate intensively to develop the product and create performance data to address the increasing regulation of biologicals. Lack of proper technical data can delay or even prevent market entry. Efficiency, fast decision-making and scale are therefore, critical. For these reasons, SMEs and large firms set up small and agile joint teams with only a few members from each side.

> We have joint teams set up. So, there's a regulatory team with their [SME] people and our [large firm] people. We have a biology taskforce and we have a patent taskforce. And we have a steering committee that reports every three months back what's going on. . . . In there, we have four people totally, two from them [SME] and two from us [large firm], that have regular meetings to review the progress, budgets and try to solve problems. It's actually working really well. (P11-L)

However, R&D co-developments with large firms are filled with the potential for conflict and disagreement due to their sometimes differing approaches to resolving technical and commercial issues. As our results reveal, SMEs have unique technical capabilities and work with novel approaches. Large firms, on the other hand, benefit from extensive commercial experience and expertise, but lack scientific biological know-how. Both competencies must be merged such that one is not dominating over the other. Decisions about the course of development should not be based purely on either scientific or economic considerations, as explained by one of our SME respondents:

> You need to define after each stage whether you want to commit to the next stage. And that typically becomes a steering committee decision. But, you know, if the guys don't want to work together, it's a pain in the neck. You need to have a good mechanism to avoid getting into unsolvable conflicts. Because then you get stalled, nothing gets done, because you can't agree. (P12-S)

In effect, SMEs determine lead and consult roles for each subteam (separation). For instance, due to their specific scientific capabilities, subteams working on development or manufacturing activities are typically led by SMEs with final decision-making authority in case of disagreements. Large firms, on the other hand, typically take the lead on regulatory and commercial activities while SMEs are only consulted when decisions need to be made. Designated lead and consult roles for each subteam activity reduces the risk of disagreement and opportunism and clarifies on who makes the final decision in case of conflict (separation):

> Everything related to the development and manufacturing of the product is decided by us [SME]. They [large firm] consult and may disagree, but we have the lead and the final say. Everything related to registration is decided by them [large firm]. (P20-S)

Working in joint teams requires individuals with high cognitive abilities who can synthesise the conflicting logics of collaboration and competition and accept the viewpoints of others without second-guessing their choices (integration). As our interviewees mention, a manager from a large firm may struggle to accept decisions made by individual experts from an SME. Managers from SMEs, for their part, may feel strong-armed by their larger, more influential peers when a controversial decision must be made. So, SMEs and large firms seek to pair individuals with similar experience and expertise that are able to relate eye-to-eye and mutually balance the sometimes conflicting views (integration):

> There needs to be matching experience and expertise between the people working together on both sides. Similar professional careers, similar educational background. Something that bonds together, something that makes them respect and trust each other . . . And there must be the willingness to work with the counterpart and appreciate the experience and expertise of what is brought to the table by both sides. (P13-S)

In R&D co-developments, SMEs and large firms must also balance their different approaches to decision making (integration). SMEs tend to be quick decision-makers whereas large firms often need to seek approvals at a higher level in the hierarchy which can slow the innovation process and jeopardise coopetition success. Thus, both firms need to find a balance between slowness and thoroughness and at the same time provide equal opportunities to create and capture value from coopetition.

> We have the common goal to bring a product to the market. I think they [SME] are feeling that we [large firm] are doing our best. They understand the difficulties . . . So, I think there's a mutual tolerance for slowness and mutual appreciation for thoroughness. We are giving and taking. I think that's also from their [SME] perspective important, that we don't want to have everything. That it's not all for us [large firm] and nothing for them [SME]. I think we have a balance in that. (P11-L)

The main advantage of R&D co-development is the possibility of developing radically new biological innovation. To achieve this, SMEs must exchange highly sensitive core know-how and therefore, the risks of asymmetrical knowledge theft and plunder are high. During the development stage, large firms may combine the SME product with solutions from their in-house toolbox and identify synergistic effects, leading to new and patentable inventions (high competition and high collaboration). As our respondents report, patenting such inventions could block SMEs from commercialising their product(s) in the future. As such, SMEs apply co-ownership to new and jointly created inventions. Co-ownership assigns both firms the rights to new inventions, ensuring a reciprocal exchange of patents registered by either firm during development. Under co-ownership, both firms are free to use and exploit such patents even in future projects with other competitors.

> If we find out that there's a synergistic interaction between their [large firm] technology and our [SME] technology, then we make sure that both parties benefit from it equally by giving each other access to new patents. (P2-S)

> For anything we co-develop, as a general rule, we agree to share the IP. Of course, you can't always anticipate what that's going to look like. But at least you agree that anything that comes out of this will be a joint property that both partners have the opportunity to access and exploit. (P8-S)

As noted by our respondents, co-ownership is a critical element in reducing the use of opportunistic tactics, encouraging knowledge flows and protecting the SME's competitive advantage during the joint development of radical innovation with larger firms. The co-ownership principle ensures that knowledge is shared and protected for both sides and it also reduces ambiguity, stress and tension during the collaboration. As such, it can be considered a key enabler of R&D co-development strategies between SMEs and large firms.

Discussion

This study explores how entrepreneurial SMEs manage coopetition strategies to innovate with large firms. Our results show two distinct motives for coopetition between SMEs and large firms: Market access for SMEs and technology access for large firms. We also find that SMEs pursue a synergistic mix of three distinct coopetition strategies: (1) Co-distribution, (2) Technology licensing and (3) R&D Co-development. In each of these strategies, SMEs navigate different coopetition intensities by dynamically combining the principles of separation, integration, co-management and co-ownership to achieve specific innovation outcomes (Figure 4).

Separation as a key principle in co-distribution strategies

In co-distribution strategies, SMEs and large firms join forces to commercialise an established product developed by the SME. SMEs act as suppliers, manufacturing the product while the large firms act as distributors, selling the product. Under this strategy, SMEs and large firms assume complementary and mutually dependent roles that are fully focused on cooperation. Small firms benefit from immediate, short-term access to the existing distribution networks, reputation and market insights of their larger peers. Large firms, in turn, gain short-term access to innovative SME technologies and can market these without investing in discovery and development. Therefore, co-distribution is a cooperation-dominant strategy (Bengtsson et al., 2010; Park et al., 2014), providing immediate commercial benefits for both firms.

Separation is the sole management principle in this strategy. Separating collaborative and competitive activities is known to reduce the risks of opportunism and knowledge theft in coopetition (Bengtsson et al., 2016). According to existing studies, separation can be temporal (Bengtsson and Kock, 2000), functional (Seran et al., 2016), or spatial (Tippmann et al., 2018). Our study advances these insights by uncovering a new and previously unknown separation mode: the separation of customers and products. In co-distribution, the SME continues to sell its product to its existing customers under the original brand and in the original packaging whereas the large firm sells the same product under a different brand and distinct packaging to a separate group of customers. By separating their customer base and differentiating their product offerings to end customers, SMEs can protect their existing position and reduce the risk of their larger peers engaging in opportunistic tactics. Splitting customers and products reduces competitive behaviours, facilitates open and efficient knowledge exchanges and stimulates high levels of collaboration (Bengtsson et al., 2010).

Despite these benefits, prior studies have emphasised the limitations of separation for the effective management of coopetition (Le Roy et al., 2021; Pellegrin-Boucher et al., 2018). Isolating collaborating and competing activities can create tension and erode the synergistic potential of coopetition (Bengtsson and Raza-Ullah, 2019). Therefore, scholars have previously suggested separation is insufficient in managing coopetition (Pellegrin-Boucher et al., 2018). By contrast, our results indicate that in cooperation-dominant strategies, separation alone may be sufficient. In co-distribution, the complementary and mutually dependent roles of SMEs (acting

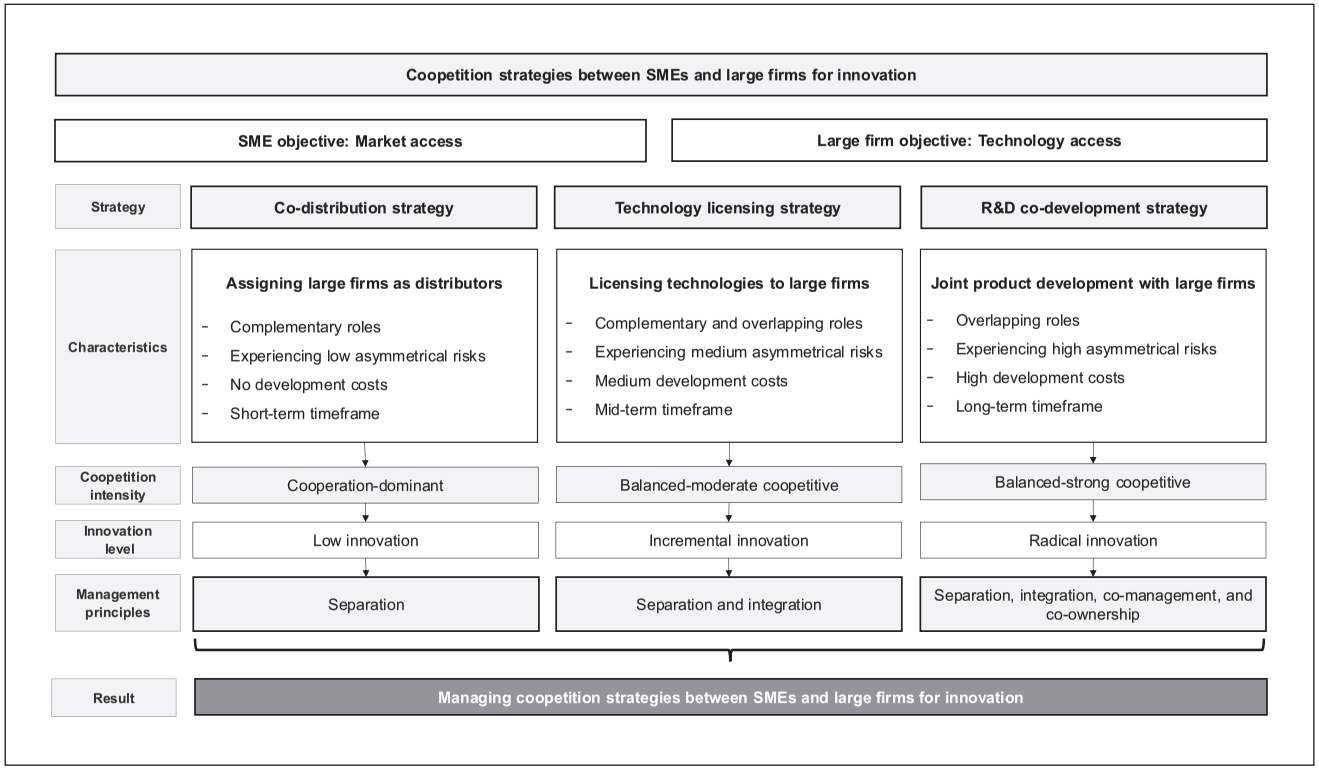

Figure 4. Integrated framework for small- and medium-sized enterprise coopetition strategies to create innovation with large firms.

as suppliers) and large firms (acting as distributors) reduce the asymmetrical risks of unilateral actions and opportunistic behaviours. The separation of customers and products reduces the competitive pressure and allows both firms to entirely focus on collaboration. In this case, separation becomes the enabler of collaboration.

However, the strong pull for collaboration and the absence of competitive pressure may create complacency and frustration and erode coopetition over time (Bengtsson et al., 2010). Indeed, in co-distribution, SMEs and large firms engage in commercial cooperation but do not engage in technological cooperation to jointly innovate, advance technological development and share innovation investments (Burström et al., 2022). Co-distributed products will reach the end of their life cycle and decline in popularity over time. Therefore, co-distribution can only serve as a bridge towards balanced-coopetitive strategies with greater intensity of competition to create incremental or radical innovations.

Separation and integration as key principles in technology licensing strategies

In technology licensing strategies, SMEs out-license IPRs for their technologies to several larger competitors, enabling them to develop new, better-differentiated and more powerful products. Although technology licensing can reduce the time to create and market new products with relatively low coordination and commitment requirements, it has remained a largely unexplored form of coopetition (Holgersson et al., 2018; Lee et al., 2023). Our results suggest that licensing between SMEs and large competitors can provide several benefits. On the one hand, SMEs can facilitate incremental innovation and expand into international markets through the commercial footprint of their larger peers within a medium timeframe. Large firms, on the other hand, can recombine their in-house products with innovative SME technologies to create uniquely differentiated and more marketable products (Bouncken et al., 2018; Ritala and Hurmelinna-Laukkanen, 2013). Technology licensing is a balanced-moderate coopetitive strategy; that is, the degree of cooperation and competition is neither too high nor too low (Mariani and Belitski, 2022). SMEs act as licensees whilst large firms act as licensors. SMEs, however, also assume the role of indirect competitors by licensing their technologies to multiple bigger rivals while remaining in fierce competition with others. Simultaneously performing these complementary and overlapping roles creates a medium level of asymmetrical risk (Lindström and Polsa, 2016; Mariani and Belitski, 2022). Therefore, compared to co-distribution, the risks in licensing are higher, but the potential benefits are also greater.

Separation and integration are the two management principles in this strategy. In licensing, SMEs seek to protect their technologies while large firms seek as much information as possible to ensure their own success employing the licensed technology (Lee et al., 2023). At the same time, SMEs must be careful not to jeopardise their position by granting large firms overly broad access to their IPRs. SMEs can navigate this risk by restricting licences to specific geographies and uses. This appealing separation tactic has remained largely unremarked in extant coopetition literature (Holgersson et al., 2018). Indeed, while IPRs are mostly seen as a feature for competing and protecting a competitive advantage (Holgersson and Granstrand, 2017), our data shows that in coopetition, IPRs enable firms to collaborate and share their knowledge. By dynamically restricting or expanding licenses, SMEs are able to regulate the intensity of collaboration and competition over time. Letcher et al. (2022) emphasise that smaller, less experienced and resourceful firms often struggle to manage changes in the intensity of cooperative and competitive behaviours. Our results show that smart license restrictions can protect the competitive advantage of SMEs, advance their position and secure the likelihood of maintaining a balance between cooperation and competition with larger companies over time (Bengtsson et al., 2010).

In addition to separation, SMEs also rely on integration as the second principle to manage licensing strategies with large firms. Integration has already been identified as a key principle in coopetition between large, similarly sized firms (Pellegrin-Boucher et al., 2018) and among micro-firms (Granata et al., 2018). Our research advances these insights by highlighting the relevance of integration in situations of coopetition between SMEs and large firms. At the individual level, SME managers must balance their short- and long-term aspirations, align the expectations and outcomes of the SMEs with those of their larger peers and help them overcome the perceived uncertainties around licensing technologies of less established firms (Raza-Ullah et al., 2023).

Prior research points to specific analytical (Raza-Ullah et al., 2018) and executional capabilities (Gnyawali et al., 2016; Rai et al., 2022) that assist in integrating the conflicting logics of coopetition. Our results confirm the critical importance of these capabilities for managers of SMEs in coopetition with larger firms. SME managers must develop analytical capabilities to understand how and whether technology licensing can broaden their firms' market footprint or hurt their competitive position. They must weigh the risks and benefits and decide whether to license to one or multiple large competitors (Raza-Ullah et al., 2018). At the same time, they must develop executional capabilities and be able to negotiate specific licensing clauses in the collaboration agreement to protect their firm's flexibility and competitive advantage (Raza-Ullah et al., 2023). Our results indicate that developing these capabilities can be challenging for SMEs and even the process of approaching large competitors to license technologies can prove difficult. SMEs may therefore need to build these capabilities in-house or recruit experienced coopetition managers from their larger peers (Raza-Ullah et al., 2023).

Separation, integration, co-management and co-ownership as key principles in R&D co-development strategies

In R&D co-development strategies, SMEs and large firms establish joint project subteams to develop radical innovation. Although this strategy has already been highlighted in coopetition between large firms (Gnyawali and Park, 2011; Le Roy and Fernandez, 2015), scholars have suggested it may be too costly, risky and complex for smaller firms to manage (Chiambaretto et al., 2020). We find, however, that SMEs are well able to pursue R&D co-development strategies. In fact, given the high costs and risks, our results suggest that joint long-term R&D co-developments with a larger, more resourceful competitor may be the only way for SMEs to compete and bring radical technologies to market. R&D co-developments are an example of a balanced-strong coopetitive approach due to the simultaneous presence of strong cooperative and strong competitive forces (Bengtsson et al., 2010; Mariani and Belitski, 2022). The benefits of strong competition stimulate the parties to compete, which improves efficiencies and increases the potential for radical innovation (Bengtsson et al., 2010). High levels of interaction and collaboration foster the exchange of sensitive knowledge for radical innovation (Bacon et al., 2020; Hong and Snell, 2015). However, as the roles of SMEs and the firms overlap (i.e. both are development partners and distributors), the asymmetrical threats of knowledge theft and opportunism are high. Therefore, balanced-strong coopetitive strategies require four management principles to be employed together: the separation, integration, co-management and co-ownership principles.

Separation is the foundational principle in R&D co-development strategies. Before the development work starts, SMEs assign to their larger peer exclusive commercialisation rights for specific geographies and product uses. This creates high levels of transparency about the future opportunities for value appropriation, reduces opportunistic tactics and motivates the collaborators to contribute with proper resources to enable radical innovation (Bouncken et al., 2020). Our data suggest

that once this separation is achieved, SMEs and large firms form separate project teams to coordinate the joint development in-line with the co-management principle identified in coopetition between large firms (Le Roy and Fernandez, 2015; Le Roy et al., 2021). However, in coopetition between SMEs and large firms, the co-management principle is implemented differently. Whereas joint project teams from large similarly sized firms have been found to resolve conflicts and make critical decisions together (Le Roy and Fernandez, 2015), our data suggest that SMEs and large firms assign the decision-making power in each project subteam to one or the other firm depending on their areas of expertise. Our data indicate that this clear separation is necessary to facilitate smooth progress in case of disagreement. Indeed, prior research suggests that SMEs and large firms have different approaches to resolving problems (Klammer et al., 2023). Large firms may have rigid and entrenched ways of thinking whereas smaller firms are agile and flexible enough to find creative solutions (Klammer et al., 2023). Assigning clear decision-making authority resolves such conflicts a priori without the need of escalation.

Integration is the third principle in R&D co-development strategies. As in technology licensing strategies, SME managers must develop analytical and executional capabilities to synthesise conflicts with their larger peers. In addition, SME managers involved in R&D co-developments must build balancing and emotional integration (Raza-Ullah et al., 2018). Prior research suggests that balancing capabilities are important to implement routines and practices that facilitate cooperation while preserving competition (Gnyawali and Ryan Charleton, 2018; Raza-Ullah et al., 2018). In our study, SME managers had to accept their dependency on large firms and had to be able to resolve conflicts eye-to-eye by connecting with peers with similar knowledge, experience, or organisational standing. Further, we found that SME managers must develop the ability to deal with mixed emotions and overcome potential biases against large firms (Raza-Ullah et al., 2020). Large firms may demand access to sensitive knowledge that SMEs are reluctant to share, but more sharing may increase SMEs' chances of competing more effectively in the market.

Co-ownership emerged as a fourth and new principle in R&D co-development strategies (Le Roy and Fernandez, 2015). As our results show, continuously sharing sensitive knowledge with a large competitor when innovating can lead to new and patentable inventions in the process. The co-ownership principle provides for equal access and joint ownership of these newly created patents. By enacting co-ownership, SMEs reduce the risk of asymmetric knowledge theft and facilitate the flow of knowledge with their larger counterpart. Co-ownership protects the flexibility and freedom of SMEs to operate by providing them with the ability to commercialise the jointly developed product without infringing valid IPRs held by their larger competitors. Indeed, in the fuzzy context of innovation, disagreements about IPRs can be costly and difficult to resolve. Co-ownership of patents is a mutual and proactive resolution to potential conflicts before they arise and preserves the competitiveness of smaller firms. Taken together, separation, integration, co-management and co-ownership are the four principles used by SMEs to manage balanced-strong coopetitive strategies for radical innovation with larger firms. Based on these findings (depicted in Figure 4), we move on to describe the implications and limitations of our study before concluding.

Implications for research and practice

SMEs are the cornerstone of technological advancement and growth in economies around the globe (Henriques et al., 2022; OECD, 2023). However, they often struggle to access resources, capture value and reach scale, limiting their entrepreneurial and innovating capacities (Gnyawali and Park, 2009; Morris et al., 2007). Selective entrepreneurship policies have been implemented to address these challenges, but more action is needed to protect and support SMEs growth and their

impact on innovation (Audretsch et al., 2020; Foreman-Peck, 2013). Coopetition with large firms can accelerate innovation by SMEs, but also expose them to risks that can destroy their competitive advantage (Näsholm et al., 2018). In this study, we therefore explore how SMEs can manage coopetition to innovate with larger firms.

Our results show that SMEs rely on three distinct strategies to manage coopetition for innovation with large firms. While prior research argues that SME coopetition strategies are primarily cooperation-dominant (Gast et al., 2019b; Granata et al., 2018), we find that in coopetition with large firms, SMEs switch among cooperation-dominant, balanced-moderate and balanced-strong coopetitive strategies (Bengtsson et al., 2010; Park et al., 2014). Each delivers products with different levels of innovation, depending on the roles, costs and risks incurred by the respective firms. These findings add to the small business coopetition literature, demonstrating that SMEs flexibly move among multiple strategies to maximise their innovation benefits in coopetition with larger firms. Our study further suggests a direct link between coopetition strategies, management principles and innovation outcomes. When SMEs' aim is a rapid low-cost and low-risk expansion of existing innovation, they should consider a cooperation-dominant co-distribution strategy (Bengtsson et al., 2010; Park et al., 2014). In such a strategy, there is a sufficient separation between the customers and products of SMEs and large firms to manage the low risks of opportunism and knowledge theft. SMEs seeking incremental innovation and technology expansion at medium costs and risks within a medium timeframe should consider a balanced-moderate coopetitive licensing strategy. In this approach, the risks of plunder are moderate and to protect their smaller position, SME managers must combine separation and integration to reap sufficient benefits from their larger peers. When SMEs seek to create radical innovation at high costs and risks longer term, they should consider a balanced-strong coopetitive R&D co-development strategy (Mariani and Belitski, 2022). This strategy is particularly difficult to manage but provides the highest innovation reward. Therefore, SMEs need to dynamically combine the four principles of separation, integration, co-management and co-ownership. This is, to our knowledge, the first study to draw attention to these strategies and principles for coopetition between SMEs and large firms.

We also observe that coopetition between SMEs and large firms is managed differently than coopetition between firms of the same size. While some principles of large-firm coopetition are similar, others are applied differently in coopetition between SMEs and large firms. For instance, existing studies on large-firm coopetition suggest the need for co-management with joint decision-making to overcome conflicts in R&D co-development strategies (Le Roy and Fernandez, 2015). In coopetition between SMEs and large firms, however, we find that co-management is implemented differently: the decision- making authority is assigned to one or the other firm depending on their areas of expertise. This configuration preserves the agility and flexibility of SMEs, allowing them to resolve conflicts quickly and independently. These findings not only contribute to research on coopetition, but also provide new insights for the management of open-innovation between competitors involving collaborative and knowledge co-creation relationships (Bez and Le Roy, 2023; Rouyre and Fernandez, 2019). Similar to coopetition between large firms, the integration of conflicting goals is also necessary for coopetition between firms of different sizes. More specifically, our results show that SME managers must employ a mix of analytical, executional, balancing and emotional capabilities to seize the opportunities of coopetition with large firms while avoiding exploitation (Rai et al., 2022). SMEs may thus need to reskill their employees to align their capabilities with their firms' coopetition goals.

From a policy perspective, coopetition between SMEs and large firms should be encouraged. Support initiatives could include less restrictive regulations allowing open sharing of market-related and customer knowledge, tax credits to work on joint innovation projects and training

programmes supporting employees to develop the necessary capabilities for managing coopetitive innovation projects on both sides.

Limitations

Our findings have some limitations which provide several opportunities for future research. We examine a highly technological, knowledge-intense and innovation-driven industry. SMEs operating in slower-paced and less technology-intense sectors may pursue different strategies with other characteristics and management principles. The agrochemical industry studied here is an exemplary case of coopetition between SMEs and large firms, creating different levels of innovation. A study that takes a longitudinal approach in a different sector could supplement our efforts and determine how the characteristics of coopetition strategies and innovation outcomes may change over time. Finally, our results suggest that each of the three coopetition strategies is pursued for projects with specific configurations in terms of their costs, risks, innovativeness and timing. Other configurations may exist and should be further investigated.

Conclusion

Coopetition between SMEs and large firms can provide innovation outcomes that are unique and more powerful than those generated by SMEs and large firms separately (Hora et al., 2018). However, the risks for SMEs involved in this specific type of coopetitive engagement are also greater than engaging in coopetition with smaller and less established firms (Chiambaretto et al., 2020; Lechner et al., 2016). Accordingly, in this article, we explore how SMEs can manage coopetition with larger companies.

We select the innovation-driven agrochemical industry as our research setting. The growing demand for safer and more sustainable products has driven coopetition between numerous entrepreneurial SMEs and large established pesticide firms. In coopetition, SMEs seek market access to scale their products, while the goal of large firms is to access and scale the innovative technologies of SMEs at limited costs and risks. We find SMEs pursue a synergistic mix of three distinct strategies to reach their innovation goals. Contrary to results in the existing small business coopetition literature, we show that these strategies are not necessarily cooperation-dominant. In coopetition with large firms, SMEs shift among three strategies with different coopetition intensities, ranging between cooperation- and competition-dominant approaches. For low-cost, low-risk and low-innovation projects, SMEs and large firms engage in co-distribution strategies based on the separation principle. In projects with medium levels of cost, risk and innovativeness, SMEs and large firms engage in technology licensing based on the principles of separation and integration. For high-cost, high-risk and high-innovation projects, SMEs coopete with large firms in R&D co-development strategies based on the principles of separation, integration, co-management and co-ownership. While some principles (such as the integration principle) are similar to those identified in coopetition between larger firms, we find that others (such as the separation and the co-management principles) are applied differently by SMEs in coopetition with larger firms. We also identified co-ownership as a new management principle, reducing the risk of asymmetric knowledge theft by ensuring equal access to and joint ownership of newly created knowledge, such as new patents.

From a practical and small business policy viewpoint, we show that coopetition with large firms can offer SMEs a powerful approach to overcome their resource limitations and accelerate innovation. Our results illustrate that first, coopetition between SMEs and large firms can take different shapes with varying levels of cooperation and competition; second, a mix of management

principles is needed depending on each project's costs, risks, innovativeness and timeframe; third, some management principles are similar to those in large-firm coopetition while others are specifically designed to address the asymmetrical risks between SMEs and large firms; and fourth, policies should encourage SME-large-firm coopetition and simultaneously protect smaller firms against the particular risks such engagements entail.

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Appendix 1. List of interviewees.

No	Sub No	Firm type	Interview partner	Management Level	Interview length	Coopetition strategy
P1	P1-S	SME	Product Manager	Mid-Level	55 min	R&D co-development
P1	P1-L	Large firm	Head of Alliance Management	Top-Level	1 h 02 min	R&D co-development
P2	P2-S	SME	Marketing Head	Mid-Level	1 h 11 min	Co-distribution
P2	P2-L	Large firm	Global Marketing Manager	Mid-Level	1 h 41 min	Co-distribution
P3	P3-S	SME	Head of R&D	Top-Level	1 h 39 min	Technology licensing
P3	P3-L	Large firm	Head, Business Dev. & Licensing	Top-Level	46 min	Technology licensing
P4	P4-S	SME	Chief Operating Officer (COO)	Top-Level	1 h 25 min	Co-distribution
P4	P4-L	Large firm	Regional Marketing Head F & V	Top-Level	1 h 13 min	Co-distribution
P5	P5-S	SME	Chief Executive Officer (CEO)	Top-Level	45 min	Technology licensing
P5	P5-L	Large firm	Head, Business Development	Top-Level	48 min	Technology licensing
P6	P6-S	SME	CEO and Co-Founder	Top-Level	1 h 04 min	Technology licensing
P6	P6-L	Large firm	Director of Marketing	Top-Level	1 h 25 min	Technology licensing
P7	P7-S	SME	Product Manager	Mid-Level	1 h 10 min	Technology licensing
P7	P7-L	Large firm	Business Development Biologicals	Mid-Level	1 h 54 min	Technology licensing
P8	P8-S	SME	CEO and Founder	Top-Level	54 min	R&D co-development
P8	P8-L	Large firm	Head, Product Development	Mid-Level	58 min	R&D co-development
P9	P9-S	SME	Chief Executive Officer (CEO)	Top-Level	58 min	Technology licensing
P9	P9-L	Large firm	Head of Marketing	Mid-Level	1 h 35 min	Technology licensing
P10	P10-S	SME	Head of Business Development	Mid-Level	35 min	R&D co-development
P10	P10-L	Large firm	Head of Marketing	Mid-Level	1 h 06 min	R&D co-development
P11	P11-S	SME	Head of Strategy and Marketing	Mid-Level	1 h 25 min	R&D co-development
P11	P11-L	Large firm	Product Manager	Mid-Level	1 h	R&D co-development
P12	P12-S	SME	Chief Executive Officer (CEO)	Top-Level	1 h 38 min	R&D co-development
P12	P12-L	Large firm	Vice President Marketing	Top-Level	1 h 44 min	R&D co-development
P13	P13-S	SME	Head of Alliances with 3rd Parties	Mid-Level	1 h 35 min	R&D co-development
P13	P13-L	Large firm	Head of Strategy	Mid-Level	1 h 15 min	R&D co-development
P14	P14-S	SME	Chief Operating Officer (COO)	Top-Level	52 min	Technology licensing

(Continued)

Appendix 1. (Continued)

No	Sub No	Firm type	Interview partner	Management Level	Interview length	Coopetition strategy
P14	P14-L	Large firm	Head of Marketing	Mid-Level	1 h 02 min	Technology licensing
P15	P15-S	SME	Head of Alliances	Top-Level	1 h	Co-distribution
P15	P15-L	Large firm	Global Marketing Manager	Mid-Level	35 min	Co-distribution
P16	P16-S	SME	Head of R&D	Top-Level	1 h 20 min	R&D co-development
P16	P16-L	Large firm	Head of Strategy and Portfolio Mgmt.	Mid-level	55 min	R&D co-development
P17	P17-S	SME	Chief Executive Officer & Founder	Top-Level	1 h 15 min	Co-distribution
P17	P17-L	Large firm	Global Business Development Mgr.	Mid-Level	45 min	Co-distribution
P18	P18-S	SME	Marketing Manager	Mid-Level	1 h 05 min	Co-distribution
P18	P18-L	Large firm	Head, Product Development	Mid-Level	40 min	Co-distribution
P19	P19-S	SME	Chief Executive Officer (CEO)	Top-Level	1 h 35 min	Co-distribution
P19	P19-L	Large firm	Head of R&D Biologicals	Top-Level	1 h 02 min	Co-distribution
P20	P20-S	SME	Head of Development	Mid-Level	1 h	R&D co-development
P20	P20-L	Large firm	Global Marketing Manager	Mid-Level	30 min	R&D co-development
P21	P21-S	SME	Field Development Manager	Mid-Level	1 h 18 min	Technology licensing
P21	P21-L	Large firm	Head of Marketing & Product Strategy	Mid-Level	45 min	Technology licensing
P22	P22-S	SME	Alliance Manager	Mid-Level	30 min	R&D co-development
P22	P22-L	Large firm	Head, Strategy Fruits & Vegetables	Mid-Level	45 min	R&D co-development
P23	P23-S	SME	Sales Manager	Top-Level	1 h	Co-distribution
P23	P23-L	Large firm	Global Product Development	Mid-Level	1 h 22 min	Co-distribution
P24	P24-S	SME	R&D Manager	Mid-Level	38 min	Co-distribution
P24	P24-L	Large firm	Director, Product Development	Mid-Level	1 h 05 min	Co-distribution
P25	P25-S	SME	Head of Business Development	Top-Level	45 min	Technology licensing
P25	P25-L	Large firm	Marketing Lead, Biologicals	Mid-Level	1 h 30 min	Technology licensing

Appendix 2. Interview guide.

Opening	• Presentation of the scope and objective of the research project • Presentation of the interview partner (current role in the company, role in the coopetition project) • Presentation of the company (number of employees, turnover, headquarters)
Coopetition management between SMEs and large firms	• Can you describe the project you are collaborating on with the SME (large competitor) • Why did your firm decide to collaborate with the SME (large competitor) for this project? • What are your main goals and objectives in this project? • What are some of the shared interests between you and your collaborator in this project? • What do you see as benefits when collaborating with the SME (large competitor)? • What do you see as specific risks when collaborating with the SME (large competitor)? • How do you manage these risks? • Where did you in the past experience conflicts in the project with the SME (large competitor)? • How did you manage these conflicts?
Conclusion	• Is there anything you would like to add? • Acknowledgement and greetings