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Family Firms, Alliance Governance and Mutual Knowledge Creation

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For family firms, alliances represent a form of heightened entrepreneurial risk-taking. However, a dearth of research exists on the implications of forms of alliance governance for family firms. In a study of 939 non-equity alliances of family and non-family firms, we analyse how contracts and trust influence mutual knowledge creation. Both contract completeness and trust assist non-family firms in knowledge creation. However, family firms rely on high levels of trust for the creation of knowledge. Knowledge creation suffers when family firms encounter very complete contracts tied to attempts at high levels of trust. The negative interaction effect is especially strong for non-owner-run family firms.

Introduction

Researchers increasingly discuss the differences between family firms and their non-family counterparts (Cesinger *et al*., 2016; Eddleston *et al*., 2010; Feranita, Kotlar and De Massis, 2017). The interests of the family are at the forefront when family firms make risky decisions, such as entering alliances (Gómez-Mejía *et al*., 2007). As set out by the relational view, alliances allow complementarities often based on knowledge transfers (Dyer and Hatch, 2006; Dyer and Singh, 1998; Pesch and Bouncken, 2018; Weber, Bauke and Raibulet, 2016). While family firms operate on a path-dependent knowledge stock, they especially fear the leakage of valuable knowledge about their alliance and aim to protect their knowledge (Sirmon and Hitt, 2003). Simultaneously, family firms need to access and create new knowledge through alliances. While unilateral knowledge transfers are highly risky, firms might secure value creation and capture by creating mutual knowledge with their alliance partners (Grant and Baden-Fuller, 2004). Mutual knowledge creation can stem from transferring, merging and marvelling about knowledge, creating further potential spillovers.

However, mutual knowledge creation needs coordination in the alliance. Previous (non-equity) alliance research concentrated on trust and/or contracts as coordination or governance mechanisms (Makadok and Coff, 2009; Oxley, 1997). Contracts and their enforcement may secure value creation and capture, but often alongside what has been foreseen and stated in the initial contract (Reuer and Ariño, 2007). The dynamic relational view emphasizes that trust can promote social processes and learning between firms (Dyer and Hatch, 2006; Dyer and Singh, 1998). Trust, often developed in repeated and anticipated future ties (Dyer and Hatch, 2006; Dyer and Singh, 1998), thus fosters the exchange of knowledge, might activate unforeseen value and allows more flexibility

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over the course of the alliance. Still, value creation and capture might be limited in a trust regime, by inducing partner 'blindness' and ignorance of external information, especially weak signals (Szulanski, Cappetta and Jensen, 2004).

The relationship between trust and contracts built a long-term debate in alliance research (Cao and Lumineau, 2015). Contracts and/or trust might facilitate mutual knowledge creation in alliances, but trust might increase flexibility and serendipity and thus serve better the mutual knowledge creation among firms (Larsson *et al.*, 1998; Squire, Cousins and Brown, 2009). The dilemma is that excessive trust can increase cognitive lock-ins that damage knowledge creation (Bermiss and Greenbaum, 2015). Value appropriation might become endangered when trust substitutes contracts (Oxley, 1997). Conversely, contracts can signal distrust (Bouncken *et al.*, 2020; Fredrich, Bouncken and Kraus, 2019). In sum, studies report various and conflicting findings on trust and detailed contracts, suggesting that firm characteristics and contingencies are at play (Cao and Lumineau, 2015).

Previous research has not considered trust and contracts for alliances by family firms. Family firms use fewer external relationships because they put at risk the family's resources, especially their knowledge stocks (Carney, 2005; Pittino and Visintin, 2011). Family firms emphasize trust in general (Scholes, Mustafa and Chen, 2016), which might then also stretch to their use of trust for knowledge creation with external entities (Stanley and McDowell, 2014). The question is how trust and contracts affect mutual knowledge creation in family firms compared to non-family firms.

The theoretical background of our study is the dynamic relational view, which we extend with the trust–contract discussion in alliance governance (Cao and Lumineau, 2015). Our model assumes that non-family firms can benefit from more complete contracts to safeguard value creation and value capture that allows mutual knowledge creation. Differently, very complete contracts impose expectations and restrictions that are unattractive or uncommon to family firms, which are used to acting more autonomously and allowing flexibility through intense trustful personal relationships (Carney, 2005). Trust does not dilute the family's control over their business when entering alliance relationships (Cesinger *et al.*, 2016) and is a pillar of their flexibility-oriented strategic activities (Scholes, Mustafa and Chen, 2016). Thus, our model assumes that *non-family* firms can improve knowledge creation by following a contractual logic or using the advantages of trusting relationships too. Instead, *family* firms will favour trust for mutual knowledge creation, and heavily specified contracts may be damaging their knowledge creation in alliances.

Our study of 939 firms trading in Europe from two industries (packaging and medical device manufacturing) industries on their non-equity alliances finds that family firms achieve high mutual knowledge creation when they follow trust only. In both industries, mutual knowledge creation might emerge from exchanging knowledge about technical potentials and customer demands within a regulated frame. Co-developing knowledge will help to connect technical components in a novel way, alter the design and integrate new customer demands. Considering alliance governance, non-family firms can use trust and contract completeness independently and jointly, but family firms cannot, and their deleterious effects are greater for those family firms that are non-owner-run businesses. Our results contribute to theory and research on family firm management, alliance governance and family firm alliance research specifying the conditions for family firm alliances. The boundary condition of our research is that we focus on contracts and trust (Bacharach, 1989; Bradach and Eccles, 1989; Clauss and Bouncken, 2019).

Theoretical background

Alliances refer to 'any voluntarily initiated cooperative agreements between firms' (Gulati, 1995, pp. 620–621). Following the dominant lenses in alliance research, the relational and the dynamic relational views, alliances allow complementarities that are often based on opportunities for learning in alliances (Dyer and Hatch, 2006; Dyer and Singh, 1998). Knowledge exchanges create relational rents, improve their partner-specific understanding and discover further complementarities (Weber, Bauke and Raibulet, 2016). Mutual knowledge creation among allying firms can provide far more significant complementarities and creativity than a plain transfer of knowledge among allying firms can do for both innovation and firm performance (Buckley *et al.*,

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2009). The merger, recombination and reciprocity of knowledge, especially of rich tacit knowledge (Bouncken and Barwinski, 2020), underpinning mutual knowledge creation breed creativity (Grant and Baden-Fuller, 2004). However, how can firms facilitate mutual knowledge creation in alliances?

Contracts and trust are the main governance mechanisms in alliances (Cao and Lumineau, 2015; Makadok and Coff, 2009; Oxley, 1997). Value-creating processes are regularly subject to an instrumental, calculative logic associated with contracts, but are tempered by a relational logic associated with trust (Carney, 2005), necessary to substitute for incomplete contracts or complement elements a contract cannot specify (Bouncken *et al*., 2018; Cao and Lumineau, 2015). Costs in governing the alliance then offset the extent to which alliances are successful in creating value for firms. Value creation and appropriability are a concern for firms because the output of innovation activity is novel and often knowledge-based (Bouncken *et al*., 2020). Alliance governance is necessary to demotivate and restrict excessive or harmfully opportunistic value appropriation by one party at the expense of the other (Bouncken, Pesch and Gudergan, 2015; Ireland, Hitt and Vaidyanath, 2002).

Trust is confidence between parties that none of them will engage in opportunistic behaviour that would exploit others' vulnerabilities, and thereby violate the values, principles and standards of behaviour they have internalized as part of the exchange (Xavier Molina-Morales, Teresa Martínez-Fernández and Torlò, 2011). High trust, as a key relational mechanism, reduces costs relating to search, screening, adjustment and contract enforcement (Gulati, 1998), but adds cost to do with reciprocity, unspecified obligations and the maintenance of trust over an uncertain time horizon (Carney, 2005). Trustful ties are less likely to trigger questioning, scrutiny, validation and search (Szulanski, Cappetta and Jensen, 2004), but trust between alliance partners facilitates the transfer of knowledge, especially the transfer of tacit knowledge (Meier, 2011).

Appropriability mechanisms (e.g. patents, confidentiality agreements and contracts) demotivate and restrict opportunism and excess value appropriation by one party at the expense of the other (Ireland, Hitt and Vaidyanath, 2002). Modest use of appropriability mechanisms fosters innovation among heterogeneous partners and limits knowledge leakages in innovation collaborations (Miozzo *et al*., 2016). Contracts allow formal enforcement, limit opportunistic behaviour (Gulati, 1998) and the possibility of conflicts (Miozzo *et al*., 2016). They can offer a sense of stability, normality or standardization to an alliance (Argyres and Mayer, 2007). However, contracts cannot predict all eventualities or specify all contingencies and situations precisely, thereby limiting the freedom of the parties involved in the alliance (Oxley, 1997). Raising the completeness of contracts to reduce risk from opportunistic behaviour and conflict may restrict the co-creation of knowledge because highly complete contracts may limit co-learning opportunities due to the fear of breaching contractual terms whose consequences cannot fully be anticipated. Empirical evidence in this regard is not consistent, though. Miozzo *et al*. (2016) find that heavy emphasis on formal appropriability mechanisms in innovation collaborations has adverse effects (e.g. conflicts over ownership, overly time-consuming approval for joint projects and damaging trust). Contrarily, some studies show that firms are more willing to collaborate for innovation under strong formal appropriability mechanisms (Pisano and Teece, 2007) and more complete contracts facilitate joint innovation among firms (Massini and Miozzo, 2012). But does this apply to family firms?

Familiness describes the uniqueness of family businesses (Hughes *et al*., 2018). It constitutes and describes the influence of the family – the familiness – of a family business (Frank *et al*., 2016). Family firms rely on trust (Cabrera-Suárez, Déniz-Déniz and Martín-Santana, 2015) and exhibit low risk propensity (Naldi *et al*., 2007) while placing significant priority on maintaining independence and family control (Gómez-Mejía *et al*., 2007). Internal ties, established patterns of interaction and involvement create shared meanings among family members (Cabrera-Suárez, Déniz-Déniz and Martín-Santana, 2015). This is why family members exchange and create knowledge efficiently and why family members also have deep levels of firm-specific knowledge (Salvato and Melin, 2008). This strong internal social capital facilitates the recognition, assimilation and use of specialized knowledge by family members (Arregle *et al*., 2007; Salvato and Melin, 2008), but it can be a substantial impediment to introducing new ideas and strategies (Herrero and Hughes, 2019). External

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relationships may solve knowledge deficits among family firms (Herrero and Hughes, 2019).

Alliances may then be powerful means for family firms, but family firms bear governance preferences that have implications for allying (Carney, 2005) and knowledge creation, which literature has not researched yet. We predict an overall theoretical framework forecasting why family firm alliance governance will likely and necessarily differ from their non-family counterparts to engender mutual knowledge creation. Processes of accessing and absorbing knowledge expose the knowledge-donating firm to dangers of opportunism and problems in learning at the same rate as its partner. Firms have to balance value creation and value capture (Ritala *et al*., 2013). This is unpalatable to a family firm due to dangers of free riding, the leakage of valuable knowledge (Nieto, Santamaria and Fernandez, 2015) and less control (Gómez-Mejía *et al*., 2007). Nevertheless, alliances can be a key source of learning and innovation for family firms (Zahra, 2010). This holds for mutual knowledge creation. As the emphasis shifts to active co-creation of new knowledge, rather than just transferring knowledge to and from one another, the knowledge-donating firm is less vulnerable to dangers of opportunism in learning. Nonetheless, coordination and protection of trust and contracts are still necessary for non-equity alliances where formal hierarchies are low or absent (Bradach and Eccles, 1989), especially when they involve uncertain innovation processes. Trust is, arguably, a vital parameter for all firms engaged in alliances, but the priority it has in contrast to contracts is sensitive to the type of firm. Family firms are more likely to draw on the rich social capital within existing ties to acquire information, regardless of their strategic value (Herrero and Hughes, 2019). Alliances provide complementary resources that the family firm might need as a trigger for innovation and firm performance (Feranita, Kotlar and De Massis, 2017). Because they are answerable to the family rather than traditional shareholders, family firms value their sovereignty over decision rights and control rights (Carney, 2005); managers of non-family firms are well versed in the expectations and diligence required by their separate owners (Jensen and Meckling, 1976). Expectations imposed by the contract then impose potentially unattractive restrictions on family firms used to acting with few constraints. Consequently, family firms will look for reciprocal exchanges in alliances that favour mutual knowledge creation, conditioned by an alliance governance framework that protects family interests.

Hypotheses

Interplay between contracts and trust

Contracts act as a basis for economic exchanges but carry high costs when possessing more detailed or context-related clauses about obligations, enforcement, controls and rights. Kale, Singh and Perlmutter (2000) assume that contracts enhance alliance partners' commitment and impede unwanted knowledge loss. Trust soothes relationships between firms, especially increasing knowledge exchanges and learning, as emphasized in the relational view (Dyer and Hatch, 2006; Dyer and Singh, 1998; Weber, Bauke and Raibulet, 2016). Yet, the relationship between trust and contracts has been subject to long-term debate in alliance research (Cao and Lumineau, 2015). The question of either trust or contracts represents a singular view of governance, while trust and contracts in a complementary relationship relates to a plural view of governance (Bouncken, Clauß and Fredrich, 2016). In the singular governance view, trust might substitute formalized contracts or otherwise (Clauss and Bouncken, 2019). In studies of plural governance, the question is how trust and contracts are combined and influenced by other factors and dynamics (e.g. power or competitive behaviour) (Bouncken *et al*., 2020; Fredrich, Bouncken and Kraus, 2019).

Completeness of contracts

Contract completeness describes how well the transaction is fully reflected in the contract (Ariño and Reuer, 2005). More complete contracts help to reduce opportunistic behaviour and task uncertainties, such that alliance partners tend to specify obligations and returns (Argyres and Mayer, 2007). More complete formal contracts enforce firms to articulate targets, tasks and safeguards to secure value creation and value capture (Vlaar, Van den Bosch and Volberda, 2006). Contracts are a framework which allow a *degree* of freedom and flexibility for knowledge creation but within *clear* boundaries.

Family members' wealth is concentrated in the firm, which increases their sensitivity to

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uncertainty and investments (Gómez-Mejía *et al*., 2007). This raises the assumption that family firms prefer complete contracts in governing alliances. However, forming more complete contracts will hinder the flexibility and openness needed for the sharing and exploration of new knowledge (Larsson *et al*., 1998). The non-overlapping nature of knowledge combination and novel creation requires unforeseeable processes of interaction, exchange and collaboration during the alliance. Because contracts are bi-directional, enforcing protections and endowing rights to the family firm's allying partner, the family firm must concede a degree of control, which is incompatible with preserving socioemotional wealth.

Family firms' long-term orientation and stewardship attitude exempts them from the pressure for short-term paybacks and allows them to invest in more radical ideas (Dunn, 1996). Although greater contract completeness brings an extensive range of conditions to account for and protect the financial and non-financial wealth of family firms, they will find highly complex contractual requirements less appealing than non-family firms. The calculative rationality (Carney, 2005) of complete contracts reduces the family's *absolute* control over the business and its activities (Anderson and Reeb, 2003) and limits creativity. Instead, calculative rationality will be the dominant logic for non-family firms because of their accountability towards shareholders (Carney, 2005). In family firms, non-owner-run and owner-run alike, the family is the critical decision-making and control authority, putting a heavy premium on trust and while not working with very complete contracts.

Compared to family firms, managers in non-family firms must justify any form of tacit, extra-contractual or relational commitments. They thus tend to limit their investment to codified knowledge (Anand and Galetovic, 2000). Legal contracts with standard boilerplate provisions are unattractive because not all exchanges are neatly rationalized (Macaulay, 1963). More complete contracts can account for many contingencies. The typical non-family firm will thus rationally define alliance terms, select partners, maintain relationships and terminate them based upon clear criteria defined through contracts. Yet, family firms with a non-family manager might prefer more complete contracts for the greater number of safeguards they provide. Owners of family firms instead might use less complete contracts because ownership and managing responsibilities are more united and there is a stronger identification with family values. We thus assume differences among family and non-family firms and between owner-run and non-owner-run family firms.

H1a: Growing levels of contract completeness are less positively associated with mutual knowledge creation in alliances of owner-run family firms than of non-family firms.

H1b: Growing levels of contract completeness are less positively associated with mutual knowledge creation in alliances of non-owner-run family firms than of non-family firms.

Trust

The relational view stresses the importance of repeated ties and trust among allying firms (e.g. Dyer and Hatch, 2006). Greater trust among partners decreases dysfunctional conflicts and lowers the need for contractual safeguards (Greve, Mitsuhashi and Baum, 2013). Trust can also stimulate greater closeness, dialogue, flexibility and open information and knowledge exchange (Krishnan, Martin and Noorderhaven, 2006), couched in the assumption that partners will neither misuse nor misappropriate the knowledge. This improves the transformation of shared information into new and mutual knowledge (Bigley and Pearce, 1998). Still, trustful interactions can induce partner blindness and ignorance of external information, especially weak signals (Szulanski, Cappetta and Jensen, 2004).

Family firms especially tend to rely significantly on trust to coordinate relationships and alliances, and that might be significantly more important than in non-family firms (Eddleston *et al*., 2010; Scholes, Mustafa and Chen, 2016; Steier, 2001). This is especially strong for owner-run family firms compared to non-owner-run family firms. Family members act as stewards of the family business (Le Breton-Miller and Miller, 2009), potentially enabling family leaders to build an enduring reputation and strong and trustful relations with external stakeholders (i.e. *external social capital)* (Herrero and Hughes, 2019). Non-owner managers of family firms might also act as stewards

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of the family business, but do not share entirely the family's identity and they are less integrated in the family (Miller, Breton-Miller and Lester, 2011). Thus, the influence of trust on the alliance, especially on mutual knowledge creation, might be less in non-owner-run than owner-run family firms. Trust requires no dilution of the family's control at the hands of another party and does not require legal commitment. We expect that family firms (especially owner-run ones) will prioritize trust as an alliance coordination mechanism because it favours a situation where authority, control and monitoring are centralized into the business and not into a mechanism, which enables contractual oversight by third parties. Specialized knowledge held by family members makes family firms vulnerable in alliances but under higher levels of trust, the family's direct control and ownership rights over its assets, resources and knowledge are protected, incentivizing it towards mutual knowledge creation with alliance partners. Rather, non-family firms will take advantage of managerial governance under normal conditions and prioritize rational economic decisions that emphasize contracts because of their fiduciary responsibility to shareholders. Thus:

H2a: Growing levels of trust are more positively associated with mutual knowledge creation in alliances of owner-run family firms than of non-family firms.

H2b: Growing levels of trust are more positively associated with mutual knowledge creation in alliances of non-owner-run family firms than of non-family firms.

Following the plural governance view, firms use some mix of trust and contracts in alliances. However, the alliance governance literature disagrees on whether their effects are substitutive or complementary (Cao and Lumineau, 2015). Deferral to the contract may not be seen as particularly destructive or obstructive for non-family firms (Khanna, Gulati and Nohria, 1998). Non-family firms can use the advantages of trust when specific tasks cannot be integrated into contracts without high costs, or in cases where social dynamics are necessary. The non-family firm can concurrently use contract completeness for those remaining alliance tasks that can only be performed efficiently or reliably through carefully defined terms. Thus, the combination of trust and contracts can be advantageous for mutual knowledge creation among non-family firms.

For family firms, specified regulations in contracts can impede the trustful sharing of knowledge (Larsson *et al*., 1998) and its upscaling into mutual knowledge creation. Family members will intervene in the affairs of the business and substitute rational economic criteria with particularistic criteria (Carney, 2005), in large part to protect the family's control, influence, wealth and identity (Gómez-Mejía *et al*., 2007). If partners demand the full gamut of clauses within contracts to occur when trust is in place, we expect it to limit the flow of knowledge and constrain mutual knowledge creation for these firms. The prescriptive nature of complete contracts risks over-specifying responsibilities and outcomes, leaving less room for synergy more likely under conditions of trust. When contracts are heavily specified, a partner is more likely to rely too much on the procedures set out in the contract, and any openness through greater trust may not come to pass. Partners may not find it necessary to do more or to contribute more, even if they would or could do due to increased trust. While the non-family firm will more likely discern such behaviour as rational and economic (Carney, 2005), the socio-economic mindset of family owners and managers and family involvement (Hughes *et al*., 2018) and ownership (Carney, 2005) suggests inwardly oriented behaviour to protect and preserve family wealth and control rights.

The importance of trust to family firms and the desire to minimize dilution of family ownership and control rights creates an incompatibility between high trust and high contract completeness, building a fuzzy environment for mutual knowledge creation. Contracts create the need for costly monitoring and incentive arrangements. Since the family's wealth is tied to the wealth of the business, there is an incentive to minimize cost. Even in non-owner-run family firms, the family identifies the business as an extension of the family (Demsetz and Lehn, 1985). The family, as the critical decision-making and control authority, renders family firms unwilling to abide by practices that challenge or inhibit their ownership privileges (Carney, 2005). Family firms will unlikely operate in alliances that threaten family control over the firm (Gómez-Mejía *et al*., 2007), family values, family resources (Miller and Le Breton-Miller,

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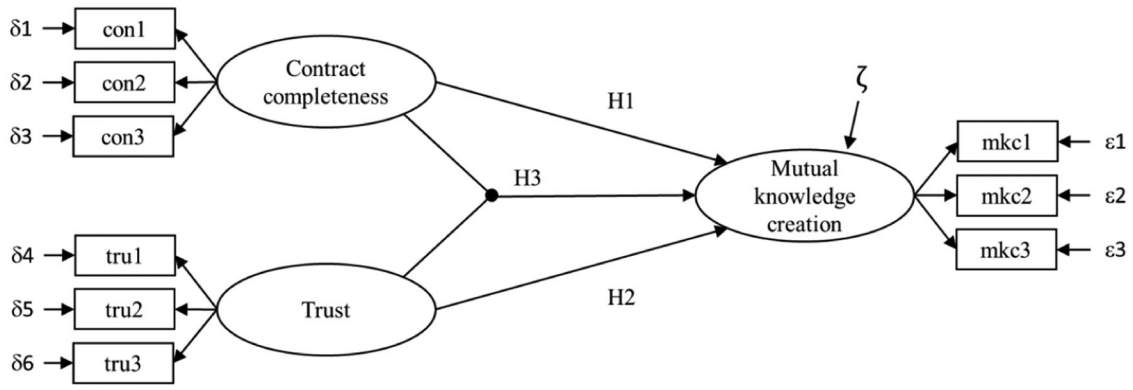


Figure 1. Framework and hypotheses

2005) or family knowledge (Pittino and Visintin, 2011). Contracts allowing control and sanctions might signal distrust to this end, which recursively lowers trust and openness to mutual knowledge creation (Connelly, Miller and Devers, 2012). The management of non-owner-run family firms might follow greater calculative rationality with similarities to the management of non-family firms (Carney, 2005), whereas owner-managers frequently rely extensively on arm's-length contractual transactions but maintain close relations with a subset of trusted partners (Uzzi, 1997).

Non-family managers have a very different agency relationship. Their scrutiny at the hands of family members is more intense. Compared with owner-run family firms, the family firm with external management may experience fewer disadvantages for mutual knowledge creation from complementing trust logic with contractual completeness that defines tasks and monitoring for the alliance and some terms of the knowledge exchanges and creation. Contract completeness allied with high trust is then likely to be a strategy by non-owner managers to protect the family's control rights and their own positions to work towards mutual knowledge creation with alliance partners. Thus:

H3a: Trust and contract completeness negatively interact with each other on mutual knowledge creation in family firms.

H3b: Trust and contract completeness have lesser negative interaction effects on mutual knowledge creation in non-owner-run than owner-run family firms.

Figure 1 illustrates our theoretical framework.

Methodology

Sample

We drew on a sample of firms trading in Europe from medical technology device developers and the packaging industry. We selected these two industries because both represent knowledge-intensive and innovative industries. Medical devices are strongly regulated, and a product needs to pass extensive approval. Instead, packaging is a fast-moving industry due to changing consumer preferences (e.g. more personalization, convenience or sustainability) and dynamic behaviour among competitors (Feber, Nordigården and Varanasi, 2019), while also facing safety regulations (Fang *et al*., 2017). Packaging firms must innovate (e.g. intelligent packaging, new sustainable materials, radio-frequency identification (RFID) technology) to secure competitive advantage (Fang *et al*., 2017). Feber, Nordigården and Varanasi (2019) show that industry trends in the packaging sector call for intensified collaboration with suppliers, retailers and technology providers. Similarly, medical technology device developers must innovate because healthcare budgets in developed countries are falling, resulting in cost pressure and the need for highly efficient R&D. Regulatory regimes are becoming more complex and new players with technological and data analytics capabilities enter the market (Stirling and Shehata, 2016). Collaboration rather than in-house efforts increasingly drive innovation and accelerate speed to market in the industry (Chatterji and Fabrizio, 2016).

Following previous research (Filser *et al*., 2018), we define the family firm (FF) as a firm where the majority of company shares (more than 50%)

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Table 1. Descriptive statistics for the sample (N = 938) and for the subsamples of non-family-firms (NFF), non-owner-run family-firms (NRFF) and owner-run family firms (ORFF) with the non-parametric test statistic

	Overall (N = 938)	NFF (N = 307)	NRFF (N = 442)	ORFF (N = 189)	Comparing NFF, NRFF and ORFF
		Mean (SD)			**Kruskal–Wallis test H(df); p-value**
Firm size	836 (9,991)	2,346 (17,044)	64 (62)	38 (44)	102.68 (2); 0.00
Firm age	31.4 (28.0)	32.3 (32.7)	33.7 (26.4)	24.5 (21.8)	28.69 (2); 0.00
R&D intensity	17.2 (18.0)	18.5 (20.4)	15.6 (14.5)	18.2 (20.1)	0.21 (2); 0.90
ROI	25.3 (20.7)	26.7 (21.7)	24.7 (19.5)	24.1 (21.5)	0.93 (2); 0.63
		Frequencies (%)			**Chi^2(df); p-value**
OEM	81.2	79.8	83.0	79.4	1.78 (2); 0.41
First tier	20.5	23.1	19.5	18.5	2.05 (2); 0.36
Second tier	6.7	7.5	6.6	5.8	0.55 (2); 0.76
Trade	12.2	8.5	13.3	15.3	6.30 (2); 0.04
Service	10.4	11.7	9.5	10.6	0.96 (2); 0.62
Medical	75.9	83.4	71.9	73.0	14.05 (2); 0.00
Packing	24.1	16.6	28.1	27.0	14.05 (2); 0.00

are in the hands of one or two families. We first collected contact information from the Amadeus database and then gathered lists from industry trade fairs and company homepages for more direct access to senior managers. In total, we sent out our paper-and-pencil questionnaire with a cover letter to 8,000 firms. Following previous alliance research (Pesch and Bouncken, 2018), we asked the respondents at the beginning of the survey to base their responses on one alliance they had significant knowledge about and were responsible for. If the contacted senior manager was not knowledgeable about and actively involved in any of her/his firm's alliances, we asked the senior manager to forward the survey to another senior manager who fulfils this criterion. The participating senior manager answered the questions regarding our dependent variable mutual knowledge creation. A second manager in each firm answered the questions regarding the independent variables. To contact this second informant, we asked the senior manager to provide us with contact information of a further manager who was knowledgeable and involved in the selected alliance.

All firms are trading in Europe, whereas 63.3% come from Europe (40.3% from Germany, 13.2% from Italy, 7.1% from Great Britain), 16.4% from Asia (52.4% from China) and 20.6% from other countries worldwide (40.9% from the USA). The final sample of 938 alliances consists of 307 non-family firms (NFF) and 631 family firms. For the analysis, the family firms were split into 442 non-owner-run family firms (NRFF) and 189 owner-run family firms (ORFF). Contrary to non-owner-run family firms, owner-run family firms are firms in which family members are a member of the executive board. We searched databases and companies' homepages to establish whether family firm members belong to the executive board. Only 32.0% of the non-family firms allied with family firms, but 56.5% of the family firms allied with other family firms, and this value is much higher for owner-run family firms (71.4%). The mean of firms' size differs significantly: 836 employees in the total sample, 64 in non-owner-run family firms, 2,346 in non-family firms and 38 in owner-run family firms (Table 1). The firms' average age was 31.4 years in the total sample. Owner-run family firms are significantly younger (24.5 years). R&D intensity (R&D investments/sales) of 17.2% and return on investment (ROI) of 25.3% in the total sample do not differ significantly. The family firms in our sample are more often a distributor, less represented in medical technology but more in the packaging industry (see Table 1).

Measures

Our study operationalizes mutual knowledge creation, contract completeness and trust in the alliance as latent variables each with three reflective indicators measured on five-point Likert-type scales. The heart of mutual knowledge creation is the merger of knowledge between alliance partners to develop novel ideas and products (Postrel, 2002). For contract completeness, we used the

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Table 2. Results of CFA and chi^2-difference test between configural and factor-loading invariant models

Construct	Indicators	FL	CR	AVE	FLR
Trust	Our cooperation partner has always been even-handed in its negotiations with us.	0.81	0.88	0.70	0.16
	Our cooperation partner is always trustworthy.	0.91			
	Our cooperation partner keeps promises made to our firm.	0.79			
Contract completeness	Our collaboration is regulated through a comprehensive and clearly worded contract.	0.89	0.93	0.82	0.13
	The contract with this partner describes in detail every aspect that we think is of interest.	0.94			
	We and our partner secured all the collaboration-concerning details in a contract.	0.89			
Mutual knowledge creation	We mutually develop novel ideas/insights/products, etc. with our collaboration partner.	0.81	0.85	0.65	0.18
	We mutually find novel solutions by sharing knowledge with our partner.	0.87			
	We share and merge knowledge to accomplish new projects successfully.	0.74			

	Chi^2(df)	RMSEA	CFI	SRMR	Delta chi^2(df)	p-Value
Configural (baseline) model	140.75 (90)	0.05	0.98	0.05	11.7 (15)	0.70
Factor-loading invariant model	152.43 (105)	0.04	0.98	0.06		

Notes: Rows shows standardized factor loadings (FL), composite reliability (CR), average variance extracted (AVE) and Fornell–Larcker ratio (FLR) for the factor-loading invariant model as root mean square error of approximation (RMSEA), comparative fit index (CFI) and standardized root mean square residual (SRMR) for both models.

items of Liu, Li and Zhang (2010). Inter-firm trust was measured with the items of Zaheer, McEvily and Perrone (1998).

With a multi-group confirmatory factor analysis (CFA) we confirm the relations between the latent variables and their indicators, and we compare the measurement model invariance across groups (non-family firms, non-owner-run family firms and owner-run family firms). The factor-loading invariant model does not fit the data quite as well as it did with no factor-loading constraints imposed. Because the chi^2-difference test gives a non-significant result, we consider the confirmatory model with factor-loading invariance between groups in the following analyses. The results of the CFA support construct reliability and discriminant validity for all latent variables (see Table 2).

To avoid omitted variables bias, we include control variables in the analysis. Firm size, measured by calculating the logarithm of the number of employees in each firm, can influence the need to form alliances and the capabilities of alliance governance. Firm age might bring rigidities that impact knowledge creation. The supply chain position shapes a firm's knowledge stocks and demands for knowledge. We considered the firm's supply chain position as dummy variables. We controlled for research intensity of the firm because it has a strong relationship with technology and innovation behaviour. Industry was controlled for because appropriability regimes differ across technologies and sectors (Hall *et al*., 2014)

Table 3 shows the correlations of the model variables and other variables of interest in the sample. Non-owner-run family firms and owner-run family firms show a significant positive relationship and both family-firm types show a significant negative relation with firm size. Furthermore, non-owner-run family firms are positively related to trading activities. Owner-run family firms show a significant negative correlation with firm age, which does not apply to non-owner-run family firms. Non-owner-run family firms show a significant positive relationship with trust and a significant negative relationship with contract completeness.

Tables 6 and 7 provide further information about the sample of non-owner-run and

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Table 3. Means (M), standard deviations (SD) and correlations among variables and the latent constructs (N = 938)

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. NRFF	0.67	0.47	1													
2. ORFF	0.20	0.40	0.35**	1												
3. Firm size	4.04	1.69	−0.34**	−0.22**	1											
4. Firm age	31.80	30.81	−0.01	−0.12**	0.33**	1										
5. OEM	0.81	0.39	0.02	−0.03	−0.00	0.00	1									
6. First tier	0.21	0.40	−0.04	−0.02	0.02	0.03	−0.34**	1								
7. Second tier	0.07	0.24	−0.02	−0.02	0.08*	0.02	−0.21**	0.27**	1							
8. Trade	0.12	0.33	0.08**	0.05	−0.09**	−0.03	−0.23**	0.03	0.07†	1						
9. Service	0.10	0.30	−0.03	0.00	0.03	−0.09**	−0.21**	0.10*	0.08†	0.19**	1					
10. R&D intensity	17.00	17.99	−0.05	0.06	−0.18**	−0.23**	−0.03	−0.08*	−0.09**	−0.03	0.13*	1				
11. ROI	22.84	18.20	−0.03	0.01	−0.08	−0.00	0.10	0.00	−0.14†	−0.01	0.06	0.10	1			
12. TRU	0.03	0.79	0.12**	0.03	−0.04	0.04	−0.09*	0.04	−0.02	0.04	0.08*	−0.08	0.02	1		
13. CON	0.03	1.12	−0.07*	−0.03	0.02	−0.05	0.00	−0.02	−0.03	0.11**	0.03	0.17**	0.15	0.26**	1	
14. MKC	0.04	0.91	−0.03	−0.01	0.08†	0.03	−0.02	0.08*	0.02	0.01	0.11*	0.12†	0.11	0.31**	0.23**	1

Notes: Correlations are significant with p-values ≤0.001***, ≤0.01**, ≤0.05* and ≤0.10† (two-tailed).
Non-owner-run family firm (NRFF) and owner-run family firm (ORFF) are dummy coded with non-family firm as reference.
Firm size measured by the logarithm of employees.
Firms age measured in years.
R&D intensity is the ratio of firm's R&D investments to its revenue (%).
Return on investment (ROI) is measured as a percentage.
Trust (TRU), contract completeness (CON) and mutual knowledge creation (MKC) are latent variables with a latent mean of zero.

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Table 4. Stepwise analysis of controls (Model 1), contract completeness and trust (Model 2) and their interaction (Model 3) on mutual knowledge creation for non-family firms (NFF; N = 307), non-owner-run family firms (NRFF; N = 442) and owner-run family firms (ORFF; N = 189)

	NFF			NRFF			ORFF		
	Est.	z	p	Est.	z	p	Est.	z	p
Model 1									
Log(firm size)	0.160†	1.827	0.068	0.025	0.375	0.708	0.081	0.799	0.424
Firm age	−0.010	−0.130	0.896	−0.007	−0.104	0.917	0.177†	1.848	0.065
OEM	0.009	0.100	0.920	0.007	0.113	0.910	0.093	0.802	0.423
First tier	−0.006	−0.077	0.938	0.186***	3.277	0.001	0.017	0.167	0.867
Second tier	0.022	0.322	0.747	−0.044	−0.781	0.435	0.009	0.075	0.940
Trade	0.060	0.675	0.500	−0.027	−0.428	0.669	−0.009	−0.082	0.935
Service	0.088	1.060	0.289	0.071	1.311	0.190	0.151†	1.710	0.087
R&D intensity	0.102	0.971	0.332	−0.060	−0.493	0.622	0.336**	2.632	0.008
R^2	0.039	1.208	0.227	0.043†	1.768	0.077	0.143†	1.761	0.078
Model 2									
Log(firm size)	0.134	1.535	0.125	0.050	0.770	0.441	0.065	0.634	0.526
Firm age	−0.013	−0.177	0.859	0.012	0.180	0.857	0.131	1.328	0.184
OEM	0.024	0.311	0.756	0.017	0.282	0.778	0.088	0.779	0.436
First tier	0.024	0.325	0.745	0.172***	3.203	0.001	−0.006	−0.061	0.951
Second tier	0.019	0.342	0.732	−0.012	−0.213	0.831	0.020	0.183	0.855
Trade	0.084	1.054	0.292	−0.049	−0.751	0.453	−0.067	−0.637	0.524
Service	0.060	0.752	0.452	0.061	1.186	0.235	0.141†	1.676	0.094
R&D intensity	0.056	0.580	0.562	0.087	0.723	0.470	0.214	1.396	0.163
Contract completeness	0.310***	3.890	0.000	0.053	0.824	0.410	0.118	1.133	0.257
Trust	0.267***	3.258	0.001	0.349***	4.689	0.000	0.127	1.252	0.211
R^2	0.237***	3.729	0.000	0.162***	3.397	0.001	0.148*	1.973	0.049
Model 3									
Log(firm size)	0.101	1.601	0.109	0.093	1.100	0.271	0.072	0.652	0.514
Firm age	−0.004	−0.055	0.956	−0.004	−0.062	0.950	0.192	1.449	0.147
OEM	0.031	0.408	0.683	0.018	0.307	0.759	0.084	0.744	0.457
First tier	0.024	0.331	0.741	0.178***	3.311	0.001	−0.004	−0.043	0.966
Second tier	0.022	0.413	0.679	−0.014	−0.253	0.800	0.018	0.162	0.871
Trade	0.081	1.069	0.285	−0.045	−0.699	0.485	−0.056	−0.540	0.589
Service	0.063	0.829	0.407	0.066	1.282	0.200	0.133	1.572	0.116
R&D intensity	0.057	0.731	0.465	0.091	0.375	0.707	0.267*	2.098	0.036
Contract completeness	0.289***	3.741	0.000	0.071	1.010	0.313	0.083	0.938	0.348
Trust	0.287***	3.810	0.000	0.349***	4.154	0.000	0.187†	1.768	0.077
Contract completeness × trust	0.023	0.278	0.781	−0.165*	−2.459	0.014	−0.033	−0.332	0.740
R^2	0.236***	4.294	0.000	0.213***	3.648	0.000	0.167*	2.453	0.014

Notes: Fit indices for Model 2 are $chi^2(df) = 453.21$ (315), RMSEA = 0.04; CFI = 0.96, SRMR = 0.05. Rows show estimated standardized structural coefficients (Est.) and robust standard errors in parentheses (S.E.) from the multi-group model with N = 938. Coefficients are significant with p-values ≤0.001***, ≤0.01**, ≤0.05* and ≤0.10†.

owner-run family firms (e.g. the phases of the alliance lifecycle in which family firms rely on high trust in their partners).

Analysis methods

To test our hypotheses, we use structural equation modelling (SEM) with Mplus (version 8). To check path differences for non-family firms, non-owner-run family firms and owner-run family firms, we use a multi-group approach with non-family firms, non-owner-run family firms and owner-run family firms as the grouping variable. For the interaction of contract completeness and trust, we apply the latent moderated structural equations approach (LMS) (Klein and Moosbrugger, 2000).

Table 4 shows the estimated path coefficients, z-values and p-values for non-family firms, non-owner-run family firms and owner-run family firms. The estimations are stepwise reported for

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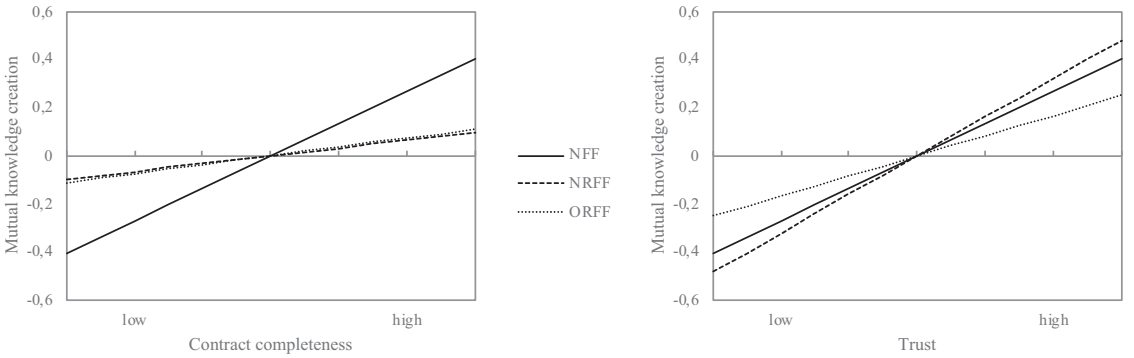


Figure 2. Influence of contract completeness (left) and trust (right) on mutual knowledge creation in non-family firms (NFF), non-owner-run family firms (NRFF) and owner-run family firms (ORFF)

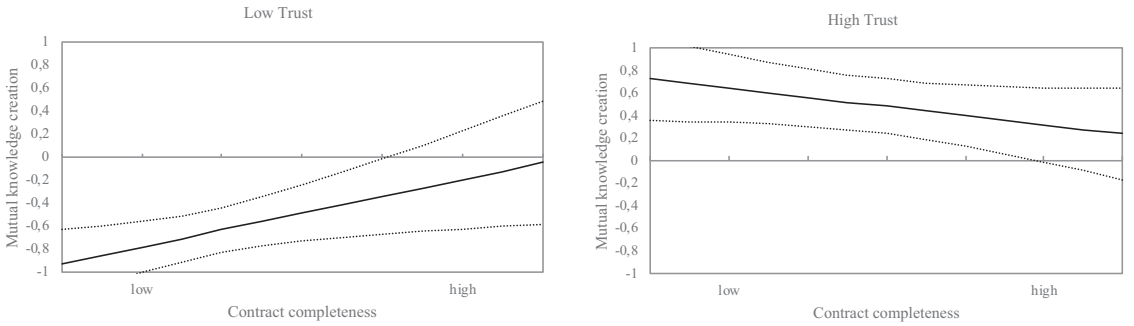


Figure 3. Interaction of contract completeness and trust on mutual knowledge creation in NRFF. Figures show the predicted mutual knowledge creation with 95% confidence interval (dotted lines) for low trust (left) and high trust (right). With high trust (right) and up to high contract completeness, mutual knowledge creation decreases with increasing contract completeness. With further increasing of contract completeness, the lower confidence bound is below zero, which means no substantive deviation from average mutual knowledge creation

the control variables (Model 1), adding contract completeness and trust (Model 2) and adding the latent interaction of contract completeness with trust (Model 3) on mutual knowledge creation.

To examine the hypotheses, we use a path-difference test to compare the estimated structural coefficients for non-owner-run family firms with non-family firms, and non-owner-run family firms with owner-run family firms for Hypothesis 3b. We denote coefficients and differences with p-values lower than 0.10 as significant by tendency. We provide typical plots of the effects of trust

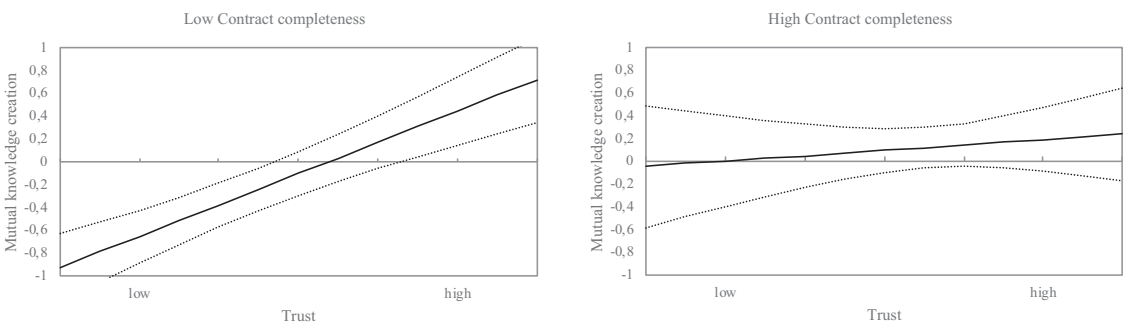


Figure 4. Interaction of trust and contract completeness on mutual knowledge creation in NRFF. Figures show the predicted mutual knowledge creation with 95% confidence interval (dotted lines) for low contract completeness (left) and high contract completeness (right). With high contract completeness (right), increasing trust cannot substantively promote mutual knowledge creation

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Table 5. Results of regression models with MIIV-2SLS and specification tests for the model-implied instrumental variables

	NFF			NRFF			ORFF		
	Est.	S.E.	p	Est.	S.E.	p	Est.	S.E.	P
Model 2a									
Trust's indicator 1	0.34	(0.13)	**	0.38	(0.13)	**	0.53	(0.16)	**
Contract's indicator 1	0.31	(0.10)	**	0.07	(0.08)		0.07	(0.09)	
Weak instruments test	df_1 (df_2)	F-val.	p-val.	df_1 (df_2)	F-val.	p-val.	df_1 (df_2)	F-val.	p-val.
Trust's indicator 1	10 (95)	10.75	0.00	10 (129)	15.14	0.00	10 (61)	6.50	0.00
Contract's indicator 1	10 (95)	16.79	0.00	10 (129)	37.32	0.00	10 (61)	11.25	0.00
Wu–Hausman test	2 (101)	2.15	0.12	2 (135)	4.31	0.02	2 (67)	1.25	0.29
Sargan test	df	chi^2-val.	p-val.	df	chi^2-val.	p-val.	df	chi^2-val.	p-val.
	8	7.50	0.48	8	9.64	0.29	8	2.35	0.97
Model 3a									
Trust's indicator 1	0.34	(0.13)	*	0.44	(0.15)	**	0.53	(0.16)	**
Contract's indicator 1	0.31	(0.14)	**	0.04	(0.08)		0.05	(0.10)	
Interaction 1	0.01	(0.13)		0.14	(0.11)		0.06	(0.14)	
Weak instruments test	df_1 (df_2)	F-val.	p-val.	df_1 (df_2)	F-val.	p-val.	df_1 (df_2)	F-val.	p-val.
Trust's indicator 1	11 (94)	10.03	0.00	11 (128)	14.08	0.00	11 (60)	5.82	0.00
Contract's indicator 1	11 (94)	16.25	0.00	11 (128)	34.11	0.00	11 (60)	10.18	0.00
Interaction 1	11 (94)	6.96	0.00	11 (128)	11.16	0.00	11 (60)	4.44	0.00
Wu–Hausman test	3 (99)	1.40	0.25	3 (133)	5.54	0.00	3 (65)	0.78	0.51
Sargan test	df	chi^2-val.	p-val.	df	chi^2-val.	p-val.	df	chi^2-val.	p-val.
	8	7.69	0.47	8	8.27	0.41	8	2.26	0.97

Notes: Rows show standardized regression coefficients (Est.) and standard errors (S.E.) for the group specific sample.
Regression coefficients are significant with p-values $\leq 0.01^{**}$ and $\leq 0.05^{*}$.
Instruments are: log(firm size), firm age, OEM, first-tier supplier, second-tier supplier, trade, service, research intensity, trust indicator 2, contract indicator 2 and interaction 2.
(a) The weak instrument test checks for the null hypothesis that all instruments are weak.
(b) The Wu–Hausman test of endogeneity checks whether the variables are indeed endogenous. The rejection of the null hypothesis indicates the existence of endogeneity and the need for instrumental variables.
(c) The Sargan test checks the validity of instruments (i.e. whether the instruments are correlated with the error term). The rejection of the null hypothesis indicates that at least one of the instruments is not valid.

and contract completeness (see Figure 2) and their interaction in the 95% percentile interval (see Figures 3 and 4) following Brambor, Clark and Golder (2006).

Endogeneity tests

Endogeneity biases might affect relationships in non-experimental designs (Antonakis *et al.*, 2014; Cameron and Trivedi, 2005). We undertook several tests to guard for endogeneity and compare models with a robust maximum-likelihood (MLR) estimator and two-stage least-squares (2SLS) estimator. We use the statistical environment *R* (R Core Team, 2016) with the packages 'lavaan' (Rosseel, 2012), 'MIIVsem' (Fisher *et al.*, 2016) and 'AER' (Kleiber and Zeileis, 2008). The coefficients of 2SLS estimations are less efficient, but more robust against endogeneity biases (Antonakis *et al.*, 2010).

Table 5 shows the results of the specification tests for the MIIVs and the 2SLS estimations. The weak instrument test shows that the instruments are suitable for determining the scaling variables of trust and contract completeness for non-family firms, non-owner-run family firms and owner-run family firms (see Models 2a and 3a in Table 5). The Wu–Hausman test of endogeneity supports the null in Models 2a and 3a for non-family firms and owner-run family firms but rejects the null for non-owner-run family firms. This indicates that trust or contract are not exogenous in the subsample of non-owner-run family firms. Accordingly, the model estimation that includes the interaction of trust and contract completeness provides results that are more accurate for these family firms. The Sargan test for over-identification does not reject

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Table 6. Regression of family firm (FF) on different possible explanatory variables for the relationship of FF with trust, respectively contract completeness

	FF classification on:				Explanatory variables on:					
	Explanatory variables[a]				Contract completeness			Trust		
Explanatory variable	Est.	z	p	Odds ratio	Est.	z	p	Est.	z	p
Family firm	→				−0.235	−2.643	**	0.204	3.051	**
Focal firm is:										
OEM	0.098	0.555		1.103	0.140	1.050		−0.047	−0.558	
First tier	−0.184	−1.079		0.832	−0.009	−0.073		0.116	1.498	
Second tier	−0.190	−0.700		0.827	−0.126	−0.648		−0.117	−0.925	
Trading company	0.550	2.339	*	1.733	0.432	2.832	**	−0.016	−0.178	
Service firm	−0.209	−0.942		0.811	0.099	0.571		0.191	1.932	†
Partnering firm is:										
OEM	0.052	0.337		1.053	0.004	0.040		−0.203	−2.383	*
First tier	−0.159	−0.996		0.853	−0.151	−1.334		−0.045	−0.518	
Second tier	−0.348	−1.575		0.706	0.098	0.643		−0.183	−1.554	
Trading company	0.255	1.298		1.291	−0.054	−0.419		−0.019	−0.204	
Service firm	−0.105	−0.515		0.900	−0.097	−0.619		−0.088	−0.835	
Phase of the collaboration										
Beginning	0.138	0.641		1.148	−0.029	−0.204		0.395	3.947	***
Middle	0.051	0.365		1.052	−0.152	−1.539		0.524	6.632	***
End	0.075	0.221		1.078	0.151	0.776		0.513	3.564	***
Innovation stage										
Concept development	−0.125	−0.620		0.883	−0.108	−0.835		0.183	1.798	†
Concept evaluation	−0.258	−1.199		0.772	0.108	0.803		0.112	1.004	
Planning and specification	−0.541	−2.732	**	0.582	−0.162	−1.350		−0.071	−0.694	
Product development	−0.532	−2.655	**	0.588	−0.028	−0.258		0.025	0.280	
Testing and evaluation	−0.116	−0.587		0.890	0.222	1.987	*	0.058	0.631	
Product launch	0.357	1.826	†	1.429	0.134	1.305		0.053	0.658	
Log(collaboration duration)	0.297	3.380	***	n/a[b]	0.011	0.195		−0.018	−0.449	

Notes: Rows show estimated standardized structural coefficients (Est.) and z-values.
Coefficients are significant with p-values ≤0.001***, ≤0.010**, ≤0.050* and ≤0.100†.
[a]Logistic regression.
[b]No odds ratio available for log(collaboration duration) because this measure is metric.

the null: the MIIVs are uncorrelated with the error term and thus are valid instruments.

To check for potential endogeneity bias from omitted variables (Ratzmann, Gudergan and Bouncken, 2016), we investigate relations of exogenous alliance characteristics (firm's and partnering firm's position in the supply chain, collaboration stage, innovation stage, duration of the collaboration and family firm classification) on trust and contract completeness.

Tables 6 and 7 show that the family firm classification (not for owner-run family firms) might influence trust and contract completeness, and alliance- and firm-level characteristics influence trust and contract completeness.

Results

Mutual knowledge creation[1] is positively associated with growing levels of contract completeness

[1]We included several control variables and find that they do not predict mutual knowledge creation in non-family firms (see R^2 in Table 4, Model 1 for NFF). In non-owner-run and owner-run family firms, the controls predict a small amount of the variance on mutual knowledge creation. In non-owner-run family firms, the position of the firm as first-tier supplier indicates higher mutual knowledge creation. In owner-run family firms, higher R&D intensity, firm age and being a service firm predicts higher mutual knowledge creation. Model 3 (adding contract completeness and trust) explains significantly more variance of mutual knowledge creation for all firm types.

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Table 7. Regression of ORFF on different possible explanatory variables for the relationship of ORFF with trust, respectively contract completeness

	ORFF classification on:				Explanatory variables on:					
	Explanatory variables[a]				Contract completeness			Trust		
Explanatory variable	Est.	z	p	Odds ratio	Est.	z	p	Est.	z	p
Owner-run family firm	→				−0.093	−0.807		0.092	1.225	
Focal firm										
OEM	−0.168	−0.820		0.846	0.073	0.519		−0.071	−0.787	
First tier	−0.100	−0.480		0.905	−0.016	−0.124		0.142	1.672	†
Second tier	−0.202	−0.584		0.817	−0.139	−0.684		−0.170	−1.317	
Trading company	0.446	1.865	†	1.562	0.355	2.183	*	0.023	0.229	
Service firm	0.053	0.196		1.054	0.142	0.768		0.206	1.986	*
Partnering firm										
OEM	0.050	0.272		1.051	−0.023	−0.206		−0.179	−2.000	*
First tier	−0.330	−1.676	†	0.719	−0.175	−1.481		−0.008	−0.083	
Second tier	−0.128	−0.455		0.880	0.068	0.428		−0.265	−2.100	*
Trading company	0.156	0.700		1.169	−0.055	−0.410		−0.013	−0.134	
Service firm	0.039	0.163		1.040	−0.088	−0.539		−0.030	−0.282	
Phase of the collaboration										
Beginning	0.093	0.384		1.097	−0.018	−0.121		0.462	4.526	***
Middle	0.105	0.637		1.111	−0.145	−1.416		0.538	6.336	***
End	−0.049	−0.119		0.953	0.094	0.460		0.455	2.962	**
Innovation stage										
Concept development	−0.317	−1.371		0.728	−0.126	−0.921		0.231	2.113	*
Concept evaluation	−0.481	−1.864	†	0.618	0.097	0.663		0.086	0.710	
Planning and specification	−0.400	−1.744	†	0.670	−0.053	−0.430		−0.090	−0.844	
Product development	−0.086	−0.397		0.917	0.005	0.045		0.033	0.354	
Testing and evaluation	−0.105	−0.473		0.901	0.130	1.103		0.028	0.281	
Product launch	0.100	0.460		1.105	0.091	0.852		0.061	0.717	
Log(collaboration duration)	0.070	0.659		n/a[b]	−0.020	−0.352		−0.008	−0.194	

Notes: Rows show estimated standardized structural coefficients (Est.) and z-values.
Coefficients are significant with p-values ≤0.001***, ≤0.01**, ≤0.05* and ≤0.10†.
[a]Logistic regression.
[b]No odds ratio available for log(collaboration duration) because this measure is metric.

only in non-family firms ($\gamma = 0.31$, p = 0.00, Model 2 in Table 4), not for non-owner-run family firms or owner-run family firms. These findings are replicated in the 2SLS estimations (Model 2 in Table 5). The path difference of contract completeness on mutual knowledge creation is significant and negative for the multi-group comparison of non-owner-run family firms versus non-family firms ($\gamma_{\text{NRFF-NFF}} = -0.21$, p = 0.04; Table 8), which supports Hypothesis 1a (see left in Figure 2). Similar effects relate to the comparison of owner-run family firms versus non-family firms ($\gamma_{\text{ORFF-NFF}} = -0.20$, p = 0.08; Table 8), supporting Hypothesis 1b.

Although trust increases mutual knowledge creation for non-family firms ($\gamma = 0.27$, p = 0.00) and for non-owner-run family firms ($\gamma = 0.35$, p = 0.00), the multi-group comparison of non-owner-run family firms versus non-family firms is non-significant ($\gamma_{\text{FF-NFF}} = 0.05$, p = 0.62). The multi-group comparison indicates no support for Hypotheses 2a or 2b.

Hypothesis 3 predicts the interaction of contract completeness with trust. Model 3 in Table 4 shows non-significance for the interaction path for non-family firms ($\gamma = 0.02$, p = 0.78), a significant negative interaction path for non-owner-run family firms ($\gamma = -0.17$, p = 0.01) and

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Table 8. Multi-group comparison between non-owner-run family firms (NRFF) (respectively owner-run family firms (ORFF)) and non-family firms (NFF)

	NRFF vs. NFF				ORFF vs. NFF			
Path on MKC	Path difference	z-Value	p-Value	Hypothesis	Path difference	z-Value	p-Value	Hypothesis
Log(firm size)	−0.006	−0.092	0.927		−0.019	−0.262	0.793	
Firm age	0.000	−0.007	0.995		0.041	0.650	0.516	
OEM	−0.028	−0.122	0.903		0.112	0.366	0.714	
First tier	0.361†	1.771	0.077		−0.062	−0.224	0.823	
Second tier	−0.132	−0.468	0.640		−0.012	−0.025	0.980	
Trading company	−0.396	−1.279	0.201		−0.412	−1.136	0.256	
Service firm	0.025	0.092	0.927		0.202	0.610	0.542	
R&D intensity	0.002	0.133	0.894		0.010	1.364	0.173	
Contract completeness (CON)	−0.205*	−2.049	0.040	H1a	−0.196†	−1.776	0.076	H1b
Trust (TRU)	0.053	0.493	0.622	H2a	−0.101	−0.840	0.401	H2b
CON × TRU	−0.173†	−1.765	0.078	H3a	−0.051	−0.434	0.665	

Note: Path differences are significant with p-values ≤0.05* and †≤0.10.

Table 9. Multi-group comparison between non-owner-run family firms (NRFF) and owner-run family firms (ORFF)

Path on MKC	Path difference	z-Value	p-Value	Hypothesis
Log(firm size)	0.013	0.167	0.867	
Firm age	−0.006	−1.298	0.194	
OEM	−0.140	−0.485	0.627	
First tier	0.423	1.608	0.108	
Second tier	−0.121	−0.258	0.797	
Trading company	0.016	0.052	0.959	
Service firm	−0.177	−0.602	0.547	
R&D intensity	−0.009	−0.622	0.534	
Contract completeness (CON)	−0.009	−0.084	0.933	
Trust (TRU)	0.154	1.235	0.217	
CON × TRU	−0.122	−1.118	0.264	H3b

non-significance interaction for owner-run family firms ($\gamma = -0.03$, $p = 0.74$). The multi-group comparison supports Hypothesis 3a partially for non-owner-run family firms ($\gamma = -0.17$, $p = 0.08$; Table 8), indicating supporting a more negative interaction of contract completeness with trust for family firms versus non-family firms.

Table 9 shows the multi-group comparison of non-owner-run versus owner-run family firms. The results do not support Hypothesis 3b, which expected a stronger negative interaction among contract completeness and trust for owner-run than for non-owner-run family firms ($\gamma = -0.12$, $p = 0.26$; Table 9). We find a strong negative interaction only for non-owner-run family firms (Model 3 in Table 4).

To interpret the difference of the interaction effect between non-owner-run and owner-run family firms, we draw the marginal effects for the different groups in Figures 3 and 4. Figure 4 shows that when non-owner-run family firms trust their partners, they can achieve above-average gains on mutual knowledge creation, but only when contracts are not overly complete, which spoil those advantages (see right side of Figure 3).

However, contract completeness does not have the assumed overall negative effect. When trust is very low (left side of Figure 3), contract completeness has a preventive effect. When non-owner-run family firms do not trust their alliance partner, more complete contracts achieve at least average gains of mutual knowledge creation. Under low contract completeness, the influence of trust increases mutual knowledge creation (left-side chart in Figure 4). Once trust is present, contracts that are more complete damage this positive impact of trust on mutual knowledge creation (right-side chart in Figure 4). The plot of upper and lower confidence intervals above and below the zero line indicates that the influence of trust on mutual

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knowledge creation at high contract completeness is without substance.

Discussion

Contribution to the literature

Our study examined differences between family and non-family firms in how trust and contract completeness influence mutual knowledge creation in alliances. In specifying family firms, we considered if those relationships change among owner-run and non-owner-run family firms. Our results extend and specify previous family firm research. Existing studies report that family firms rely on trustful relations to acquire knowledge (Herrero and Hughes, 2019). Our study finds that for the mutual creation of knowledge, family firms (non-owner-run and owner-run) draw sucessfully on trust solely, while non-family firms can either benefit from trust or from contract completeness. As a theory extension and specification, findings bring the dynamic relational view towards family firms. We extend family firm research, which has emphasized that family firms favour stable and trustful relationships for the long-term viability of their enterprise (Arregle *et al*., 2007; Miller and Le Breton-Miller, 2005).

Specifically, we first reveal that neither substitutive nor complementary logics apply to how *family firms* benefit from specific alliance governance mechanisms. Family firms (non-owner-run and owner-run) benefit the most by forging trust in their alliances as a means of social enforcement. When operating on trust, family firms enact expectations and agreements based on bond or word over and above contract completeness. Thus, family firms benefit from trustful ties, which promote social processes, partner-specific absorptive capacity and learning as set out in the dynamic relational view (Dyer and Hatch, 2006; Dyer and Singh, 1998). Trusting reduces search, screening, evaluation, enforcement and formal oversight costs, and, per our results, prompts an increase in mutual knowledge creation. Trust is neither substitutive nor complementary to contracting but neither is contracting destructive on its own to family firms. Their reliance on trust indicates that contracts are not a meaningful solution to their alliance governance needs. Rather, the free flow of information depends on an atmosphere of trust, particularly when partners create resources cooperatively. As set out in the dynamic relational view, trustful ties create relational rents and can help firms improve their partner-specific understanding and discover further complementarities in mutual knowledge creation (Weber, Bauke and Raibulet, 2016). Trust then creates an atmosphere in which mutual knowledge creation can flourish and foster innovation. Trust relates to a normative logic of collaborative behaviour (Täuscher, Bouncken, and Pesch, 2020). The emphasis of trust rather than contract completeness relates to the view that family firm managers substitute rational calculations with relational logic to maintain family sovereignty. The family firm will straddle the alliance work with the family management mode of the unification of ownership and control, placing a high premium on protecting its decision rights, maintaining and protecting the family interest and protecting against unwarranted access to the family firm's assets by external parties. In this situation, trust has a greater role in informing alliance decision-making than contracts, and these results coincide with previous research on trust and its importance for family firms (Eddleston *et al*., 2010). By using trust, family firms can extend their preference for trust-based coordination to alliances.

Second, and in contrast to family firms, *non-family firms* can benefit from either contracts or trust, indicating substitutability for these types of firms as expected (Bouncken, Clauß and Fredrich, 2016). The alliance governance literature disagrees on substitution versus complementary effects (Cao and Lumineau, 2015). However, theorizing about alliance governance frequently starts from the assumption that firms freely display and use both mechanisms, even going so far as to suggest that firms (family or non-family) can benefit from the advantages of both (Carney, 2005). Our results indicate that only non-family firms can substitute formal and informal governance mechanisms in alliances. Compared to family firms, non-family firms can apply their managerial mode based on the separation of ownership and control to an alliance mode typically based on contracts (Carney, 2005). Contracts may act as safeguards for managers and positive signalling towards stakeholders, but non-family firms may also change to more trust-based logics in uncertain situations and when dynamic and open social relationships are necessary, as for mutual knowledge creation. Our results thus explain some of the heterogeneity of

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previous alliance results (Cao and Lumineau, 2015), especially the disagreement over the substitutive or complementary effects of trust and contracts (Hoetker and Mellewigt, 2009).

The negative interaction of trust and contract completeness applies for non-owner-run family firms only. Non-owner managers seem to find it especially difficult to merge a calculative logic towards contracts with the relational trust logic of the family (firm). Ambiguities that non-owner managers experience, and their situation sandwiched between governance optimization and family influence, interfere in their strategic management.

Owner-managers are imbued with an understanding of their business and the need for innovation for longer-term survival and prosperity, but they also have an intuitive understanding of how much risk they can take to ensure survival and how they operate with other firms (Miller *et al*., 2015). The concentration of ownership and control on the owner-manager reduces opportunism (Anderson and Reeb, 2003), and owner-managers can act with considerable latitude and power in the best interests of the family and the firm simultaneously. Their freedom to commit firm assets into alliances based on trust is also far greater. Carney (2005) observed that 'uniting ownership and control mitigates the classic agency problems inherent in… alliance governance because owner-managers' interests in growth opportunities and risk-bearing are one and the same' (p. 254). The non-owner manager of a family firm is in a far more complicated agency relationship. The non-owner manager faces considerable oversight and scrutiny as family members are incentivized to monitor its managerial agents closely to ensure that non-owner managers do not divert resources into value-destroying activities or take actions that might harm their wealth (Anderson and Reeb, 2003). This view of the non-owner manager assumes that he/she is likely to act outside the interests of the family. Our results paint a different picture. Trust is even more important for non-owner-run family firms, demonstrating strong preferences for trust-based allying. For family-controlled but non-owner-run firms, the contract logic gives way to an internal agency logic informing the best predictions about alliance governance and its outcomes. For owner-run family firms, committing firm assets 'on a handshake' (Blyler and Coff, 2003) and 'axes of solidarity' are far more important, emphasizing the relational view. Still, family firms—non-owner-run and owner-run alike—need preventive measures to not lose control: either trust or a well thought through contract that allows freedom and creativity for mutual knowledge creation.

Third, we reveal that the benefit of trust is negatively moderated by contract completeness only for non-owner-run family firms. The highly interdependent influence of trust and contract completeness on mutual knowledge creation in non-owner family firms suggests that the behaviour of managers and their decisions about trust and contracts with the alliance partner are different from owner-run family firms. The tension suggests the primacy of stewardship theory to agency theory to explain behaviour, supporting the trust and learning arguments in the dynamic relational view.

While non-family managers might be expected to act with greater self-interest (Jensen and Meckling, 1976), stewardship theory (Davis, Schoorman and Donaldson, 1997) does not foresee an inherent conflict of interest and assumes that non-family managers are copacetic to the needs of owners. Non-owner managers' interests are aligned with the family to protect the family's wealth, and non-owner managers act even more carefully than might be expected, even by comparison to owner-run family firms, evidenced by non-owner-run family firms placing an even greater premium on trust (over and above contracts) as expected of an owner-run family firm. The family owner has an intuitive understanding of the risk they can bear, whereas the non-family owner must serve to protect it carefully. The non-owner manager is then conditioned by the family firm to appreciate the vital importance of trust. Consistent with the relational view, mutual knowledge creation demands openness and brings risks of knowledge leakage. Conflict may cause failure of the alliance and family firm owners will hold the manager accountable for leakage and failure. Non-owner managers are at greater risk of being held accountable when contracts are excessively well-defined, because they may restrict the family's autonomy and introduce external monitoring and oversight, contrary to a family's desire to protect self-control (Carney, 2005).

Our findings on non-family firms show that contract completeness – and not only trust – is a mechanism to mutually create knowledge. Non-family firms appear to need the converging force of contracts to articulate conflicting opinions and to

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merge them into a new mutual knowledge creation process. Contracts deliver rules and resources that guide the interaction and creation of the couplings, exchanges and creative processes among firms. The confidence given by the contract can secure shared meaning among alliance partners, which demands to refine, draw on or modify previous information and the meaning ascribed to it by asking questions, requiring feedback, experimenting and discussing failures within the alliance (Edmondson *et al*., 2003). Hence, for alliances, family firms and non-family firms follow different somehow institutionalized logics.

Limitations and recommendations for future research

Our research faces some boundary conditions and limitations. Theories are based on assumptions that contain embedded, sometimes tacit, values related to the theory (Bacharach, 1989; Kuhn, 1962, 1977). The more socially oriented relational view departs from the classic homo-economicus assumption (Fehr and Schmidt, 1999), which has driven research on the use of contracts (e.g. transaction cost theory). Research on coordination in alliances has combined arguments on contracts and trust, releasing the traditional homo-economicus assumption. We study alliance coordination from a relational view that aims to combine formerly incommensurable logics. A key boundary condition is that we considered only contracts and trust as coordination mechanisms and not power and dependency (Bacharach, 1989). Alliances bear heterogeneity in terms of contracts, trust, hierarchical control, power and dependency, or to which degree other safeguards and appropriability mechanisms are present (Bradach and Eccles, 1989; Miozzo *et al*., 2016). Considering the heterogeneity of alliances and family firms, we might not be able to explain how trust and contracts underlie mutual knowledge creation when alliances are strongly coordinated by powerful firms. Trust and contracts might have little impact for the dependent firm. Moreover, our findings might not transfer to industries different to those we study, such as industries that require formal safeguards, rely strongly on interpersonal relationships or flexible alliance coordination (Bouncken, 2011; Schreyögg and Sydow, 2010).

Our study focused on one firm in the alliance only. Alliance governance may be a result of negotiation between the parties involved. Accordingly, future research should examine alliance dyads. Understanding the detailed instruments that may help (or hinder) the development of mutual knowledge creation (e.g. joint meetings, control or joint creativity sessions), and differences in domestic and international alliances, are also of value for future studies.

The threat of misappropriation or inappropriate behaviour triggers a demand for control. Family firms have a wider number of governance tools at their disposal, including family trust, councils and boards that extend the direct control that a family firm can apply to an alliance. We expect that family firms would favour greater predictability but would seek it by allying with like-minded firms and creating or seeking trust. Non-family firms would seek control by way of regulatory processes. Our findings offer evidence that contract completeness had no effect on mutual knowledge creation for family firms but did in their non-family counterparts. Trust was vital for family firms instead. Future research examining specific control mechanisms and antecedents that make the attainment of desirable goals more predictable would help advance our contribution. Firms develop contracts during the formation of the alliance, but trust and power differentials develop and change during the evolvement of the alliance. This evolution could influence knowledge creation, especially among owner-run and non-owner-run family firms.

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