

Droege, Cara; Greven, Andrea; Fischer-Kreer, Denise; Brettel, Malte

Article — Published Version

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British Journal of Management

Provided in Cooperation with:

John Wiley & Sons

Suggested Citation: Droege, Cara; Greven, Andrea; Fischer-Kreer, Denise; Brettel, Malte (2022) : Inter-Firm Coopetition and Credit Ratings: How the Debt Market Reacts to Inter-Firm Coopetition, British Journal of Management, ISSN 1467-8551, Wiley, Hoboken, NJ, Vol. 34, Iss. 4, pp. 2093-2115, <https://doi.org/10.1111/1467-8551.12689>

This Version is available at:

<https://hdl.handle.net/10419/288051>

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Inter-Firm Coopetition and Credit Ratings: How the Debt Market Reacts to Inter-Firm Coopetition

Cara Droege,¹ Andrea Greven,² Denise Fischer-Kreer¹ and Malte Brettel¹

¹Innovation and Entrepreneurship Group (WIN) – TIME Research Area, RWTH Aachen University, Kackertstr. 7, 52072, Aachen, Germany ²Chair of Entrepreneurship – WHU - Otto Beisheim School of Management, Campus Vallendar, Burgplatz 2, 56179, Vallendar, Germany
Corresponding author email: cara.droege@time.rwth-aachen.de

Due to the high importance and severe consequences of credit ratings, we investigate the effect inter-firm coopetition—simultaneous cooperation and competition—has on credit ratings. So far, coopetition research has disregarded its effect on the debt market and research on credit ratings has not considered this evermore occurring mode of alliance. Given the combination of debtholders' high risk sensitivity and coopetition's paradoxical characteristics entailing high risks and potentially high returns, we hypothesize: First, firms who engage in coopetition enjoy higher credit ratings in general. Second, nevertheless, coopetition increases the likeliness of a credit rating downgrade in the short term. Third, firms can weaken the initial, negative reaction through partner selection. Empirical testing with a large-scale, cross-industry sample containing 2569 public firms over a time span of 20 years supports our first two hypotheses. A deeper analysis also validates our third hypothesis. Our research contributes to both literature streams by building on paradox theory and thereby revealing a dark side of coopetition.

Introduction

This paper analyses if and how inter-firm coopetition—simultaneous cooperation and competition—affects a firm's credit rating. In particular, we investigate if firms that engage in coopetition benefit from higher credit ratings. The unique, paradoxical characteristics of inter-firm coopetition distinguish it from purely cooperative alliances bearing higher risks and potentially generating high returns (e.g. Bouncken *et al.*, 2015). The paradox coopetition received much attention in research and in practice in the last years (Devece, Ribeiro-Soriano and Palacios-Marqués, 2019). Research has shown that cooperating with a direct competitor leads to positive financial outcomes, such as an increase in sales, market share and profit margin (Bouncken and Fredrich, 2012), as well as return on equity (Luo, Rind-

fleisch and Tse, 2007). However, the focus of research on the outcomes of coopetition has so far mostly been on firm performance and innovation performance, finding predominantly positive results (Gernsheimer, Kanbach and Gast, 2021). When considering the effect of coopetition on the financial market, the debt market has not yet been considered. Our motivation for this research paper is to offer a holistic view of coopetition's effect on the financial market and to estimate the relevance of strategic actions, in this case engaging in coopetition, in the context of credit ratings.

Credit ratings play a decisive role for firms when accessing the debt market. As credit ratings speak to the firm's creditworthiness (Kisgen, 2006), they give an estimate on the probability of a firm's risk of financial default and thus on the probability of the firm being able to pay back their debt (Bonsall, Holzman and Miller, 2017). Other than in the

equity market, debtholders are interested in the downside or the risk of a company and its actions, leaving them more risk sensitive (Bonsall, Holzman and Miller, 2017). Thus, credit ratings determine the cost of debt a firm faces (John, Lynch and Puri, 2003), since the debtholders want to be compensated for the risk of not receiving their repayment. As a result, its credit rating is of high importance to a firm. The debt market's reaction to coopetition is especially interesting due to its unique distinctions compared to purely cooperative alliances. So far, researchers have analysed the effect strategic alliances have on the debt market. For example, Chen, King and Wen (2015) consider the bondholders' perspective and show how strategic alliance and joint venture announcements create value for them. Chou, Ou and Tsai (2014) take on the firm's perspective, proving strategic alliances to advance a firm's standing in the debt market by lowering its cost of debt.

As coopetition's paradoxical tensions set it apart from purely cooperative alliances, combining the high risks and possibly high returns associated with and resulting from coopetition with high risk sensitivity of debtholders offers a thought-provoking scenario. This predicament urges us to differentiate between the effect of coopetition on credit ratings in general and in the short term. First, we address the following research questions: Does coopetition influence a firm's credit rating? If so, how does it influence the credit rating? Second, given the theoretical foundation of our research we go a step further and consider if this reaction to coopetition differs in the short term considering the relative values of credit ratings in prior years. Third, we ask: Can a firm influence this short-term effect through its partner selection in a cooperative alliance?

To answer these research questions, paradox theory offers a broad understanding of the potential outcome of coopetition. We consider the conceptual framework of coopetition developed by Gnyawali and Ryan Charleton (2018), highlighting the paradoxical tensions coopetition presents, which distinguish it from pure cooperation. Especially, the balance of cooperation and competition within a cooperative alliance is crucial when addressing the third research question. After underlining the critical factors for credit ratings, we de-

rive three hypotheses to answer the research questions. We empirically test the research questions using a large-scale, cross-industry panel dataset covering a time span of 20 years. Our results show that firms which engage in more coopetition, in general, enjoy higher credit ratings. Nevertheless, more coopetition is positively related to a potential initial downgrade in credit ratings. Our main results do not show that a higher share of balanced coopetition is negatively related to a potential initial downgrade in credit rating. However, after deeper analysis through various robustness checks we can find a negative relationship between the share of balanced coopetition and initial downgrade in credit ratings. While firms most likely do not choose to engage in coopetition with the intent to influence their credit rating, this so far unknown outcome has implications of high importance for the firm.

This study contributes to research in several ways. First, considering research on credit ratings our results provide evidence that credit rating agencies consider the strategic decision to engage in coopetition when evaluating a firm's creditworthiness. Additionally, our in-depth analysis of this relationship pointing out an initial negative reaction in the short term advances credit rating research by considering diverse results. Second, our insights offer a new view of coopetition's effect on the financial market since coopetition research has not yet considered the effect on the debt market. Hence, our research also contributes to coopetition research revealing a—at least in the short term—dark side of coopetition. Third, our theoretical contribution based on combining coopetition's paradoxical characteristics and paradox theory emphasizes coopetition's embeddedness in paradox theory regarding its ongoing theory development. By juxtaposing paradox theory and contingency theory relying on the former in this context we offer a new potential approach to the short-term negative reaction of credit ratings to the paradox coopetition. Additionally, coopetition research so far has been based on case studies and survey data limiting generalizability of results (Dorn, Schweiger and Albers, 2016; Ritala, 2012). We enhance research on coopetition by empirically testing our hypotheses with a large-scale, cross-industry dataset.

Theoretical background

Coopetition and Paradox Theory

Compared to its counterpart, purely cooperative alliances, coopetition combines cooperation with simultaneous competition. Here, two or more firms collaborate with a competitor with the aim to create value in form of additional benefits (Gnyawali and Ryan Charleton, 2018). The aspect of value creation intent differentiates coopetition from collusion (Gnyawali and Ryan Charleton, 2018). Given its definition, a coopetitive alliance fulfils the criteria of a paradox with its two contradictory, yet interconnecting elements (Lewis, 2000). According to paradox theory, firms can achieve long-term benefits by attending to conflicting demands at the same time (Smith and Lewis, 2011). By balancing these opposing demands, firms are able to benefit from synergies (Lewis, 2000). In the case of coopetition, this means that in the long term firms will benefit by engaging in a coopetitive alliance. While focusing on one aspect of the two, competition or cooperation, as contingency theory would suggest, might lead to short-term benefits, not attending to the paradoxical demands an organization faces could lead to corporate failure in the long run (Smith and Lewis, 2011; Lewis, 2000).

To understand the coopetitive tensions and dynamics, the theoretical background needs to be considered. However, potentially due to these distinctive characteristics, no cohesive theoretical coopetition model yet exists (Bengtsson and Raza-Ullah, 2016). So far, previous research in this field has built on a combination of game theory, resource-based theory and various other theories. The conceptional framework by Gnyawali and Ryan Charleton (2018) best consolidates preceding theoretical approaches and integrates empirical insights. They do so by analysing each component of coopetition and its implications separately to then derive resulting mechanisms. Therefore, we follow their approach to underline coopetition's distinction from purely cooperative alliances.

Strategic alliances are voluntary partnerships between two or more firms (Gulati, 1998). On the one hand, coopetitive and purely cooperative strategic alliances share the component of cooperation. By cooperating within a strategic alliance, firms aim to reduce their risks and project costs, share means and knowledge and possibly gain market access (Hitt *et al.*, 2000).

Hence, like purely cooperative alliances, coopetition yields two implications of cooperation: *mutuality* and *resource commitments* (Gnyawali and Ryan Charleton, 2018). Mutuality refers to firms' reciprocal behaviour within an alliance. Firms join forces to advance their competitive position in the market conjointly (Gulati, 1998). This enables them to generate a new competitive advantage over the rest of the industry together. While the extant of commitments might differ, every strategic alliance builds on resource commitments. To pursue the goal of the alliance, partners choose to share 'knowledge, skills, capabilities, and assets' (Gnyawali and Ryan Charleton, 2018, p. 2517).

On the other hand, coopetition consists of competition, which is defined as 'pursuing one's own interest at the expense of others' (Das and Teng, 2000, p. 85). Implications of competition, namely *rivalrous spirit* and *resource relevance*, set coopetition apart from purely cooperative strategic alliances (Gnyawali and Ryan Charleton, 2018). In the nature of competitors, they constantly aim to generate a competitive advantage over each other to better their positioning in the market (Barney, 1991). When choosing a competitor as alliance partner, this constant fight transfers to the coopetitive agreement. While this rivalrous spirit can sabotage the participants and completely destabilize the cooperative aspects of the alliance (Das and Teng, 2000), it also promotes efficiency and boots outcomes (Gnyawali and Ryan Charleton, 2018). By definition, a firm's competitor holds complementary resources (Yu, Subramaniam and Cannella Jr, 2013). Hence, when entering into coopetition participants gain access to the complementary resources, which are of high relevance to them, leading to coopetition yielding high returns for the participants (Gnyawali and Park, 2011; Bouncken *et al.*, 2015).

Following recent insights from coopetition theory development, the combination of cooperation and competition results in four coopetition mechanisms: (1) *mutual pursuit*, participants collectively and relentlessly strive for competitive superiority, which unifies them; (2) *resource leverage*, the optimal use of combined resources; (3) *safe-guarded resources*, protection of firm-specific internal knowledge while sharing resources with competitors and (4) *relevant commitments*, sharing of relevant, complementary resources (Gnyawali and Ryan Charleton, 2018). These mechanisms offer great opportunities for each coopetitor. Neverthe-

less, coopetition presents various risks. Das and Teng (1998) point out that every strategic alliance poses performance and relational risk. The mechanisms of coopetition intensify the relational risks, for example, due to opportunism of coopetitive partners, knowledge leakage, learning races, misallocation of resources, conflicting strategic goals, misunderstandings, and wrong partner selection (Bouncken and Fredrich, 2012; Hitt *et al.*, 2000; Inkpen, 2000; Khanna, Gulati and Nohria, 1998; Sarkar, Echambadi and Harrison, 2001). These high relational risks in turn then escalate the performance risk. In sum, coopetition presents a mode of alliances with higher risks, but also potentially higher returns compared to purely cooperative alliances. Coopetitive tensions and the resulting high risks could explain the extraordinary high failure rate of coopetitive alliances (Bengtsson, Raza-Ullah and Vanyushyn, 2016; Park and Ungson, 2001).

Thus, in the coopetition paradox, cooperation and competition can coexist within the alliance. Hence, by considering coopetition as an orthogonal construct, cooperation and competition can both vary in degree (Ricciardi *et al.*, 2022). The degree of cooperation depends on the equity investment of the firms in the alliance (Gulati, 1995). Hence, a high degree of cooperation takes place when the alliance partners choose to form a joint venture (Clarke-Hill *et al.*, 1998). The degree of competition within coopetition depends on how strong competitors the alliance partners are. In line with other researchers (e.g. Hoffmann *et al.*, 2018), Park, Srivastava and Gnyawali (2014) establish the overlap of markets to determine the degree of competition between firms. When a firm chooses to cooperate with a fierce competitor, competition within the alliance is strong. When competition and cooperation are either both strong or both weak at the same time, the coopetitive alliance classifies as balanced (Bengtsson, Raza-Ullah and Vanyushyn, 2016). Paradox theory captures the concept of balance (Schad *et al.*, 2016).

According to Gnyawali and Ryan Charleton (2018), the outcome of coopetition to a great extent hinges on the balance and degree of cooperation and competition within the coopetitive alliance. For example, in the case of innovation balance within a coopetitive alliance positively affects the outcome of the alliance (Park, Srivastava and Gnyawali, 2014). Furthermore, Bengtsson, Eriksson and Wincent (2010) find that imbal-

ance within coopetitive alliances disfavours beneficial outcomes. In a balanced coopetition, cooperation or competition do not overpower the other. Therefore, following coopetition's conceptual framework a comparable degree of cooperation and competition generates favourable consequences (Gnyawali and Ryan Charleton, 2018).

Credit Ratings

Credit rating agencies evaluate the firm's risk of financial default, or firm's creditworthiness (Kisgen, 2006), and thereby the probability for debtholders to receive their periodic interest and payment at the end of the lending period. They aim to ease the well-established information asymmetry problem between debtholders and a firm or, more specifically, a firm's management (Ashbaugh-Skaife, Collins and LaFond, 2006; Jensen and Meckling, 1976). Therefore, these agencies are described as "debt market information intermediaries" (Bonsall, Holzman and Miller, 2017, p. 1427). They scrutinize information or signals that may affect a firm's creditworthiness to offer debtors an informative credit rating. Other than equity holders, debtholders do not benefit from the financial growth of a firm (Bonsall, Holzman and Miller, 2017). Debtholders are solely interested in the probability of debt repayment. Hence, an increase in the variance or decrease in the mean of future cash flow worries debtholders (Ashbaugh-Skaife, Collins and LaFond, 2006). Credit ratings speak to the firm's credit risk, meaning the risk of the credit and interest not being repaid, for example, due to default (Bonsall, Holzman and Miller, 2017).

Credit rating agencies determine credit ratings based on factors influencing said probability of repayment. Standard and Poor's Financial Services LLC (2019) officially state that they include such factors as financial and accounting information, risks associated with a firm's country and industry, as well as competitive stance and management or governance, among others. Aside from accounting figures, research underlines that factors such as managerial ability, corporate governance, the CEO's risk-taking incentives or even their political preferences play a role in a firm's credit rating (Ashbaugh-Skaife, Collins and LaFond, 2006; Bhandari and Golden, 2021; Bonsall, Holzman and Miller, 2017; Horrigan, 1966; Kuang and Qin, 2013; Lee, 2008).

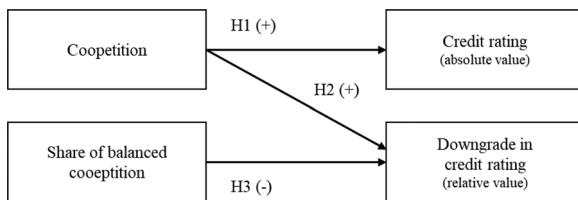


Figure 1. Research model

Firms try to prevent credit rating downgrades and secure upgrades, as the credit rating has substantial implications and therefore is of high importance for the firm (Alissa *et al.*, 2013). First, a high credit rating signals a firm's quality (Kisgen, 2006). This signal can trickle down and trigger an effect on contracts with, for example, suppliers or consumers (Kuang and Qin, 2013). Second, the cost of debt is directly tied to a firm's default risk and thus its credit rating. Debtholders are reimbursed for the risk they take when investing in a firm. A higher credit rating speaks to a lower default risk and therefore a lower predefined interest rate (John, Lynch and Puri, 2003). Hence, a higher credit rating warrants a lower cost of debt. Third, the access to capital of a firm depends on its level of credit rating due to self-imposed or regulation-based investment guidelines (Alissa *et al.*, 2013). Banks or pension funds, for example, are not allowed to invest in firms with a certain credit rating (Kisgen, 2006).

In sum, the combination of the high importance of credit ratings to a firm, the risk sensitivity of debtholders and coopetition's distinctive, paradoxical and thus riskier characteristics urges us to fill the current research gap in this strand of research. Hence, we investigate the effect coopetition has on credit ratings in general, if coopetition more likely leads to an up- or downgrade in credit ratings in the short term, and if the share of balanced cooperative agreements alters this effect of coopetition on credit ratings in the short term. Figure 1 summarizes the complete research model.

Hypothesis Development

As stated in the previous section, credit ratings reflect the default risk of a firm. Firm performance, for example, measured by the return on assets, directly influences default risk and thus the credit rating (Ashbaugh-Skaife, Collins and LaFond, 2006). Research on the outcomes of coop-

etition so far has mostly focused on innovation and firm performance, finding predominantly positive results (Gernsheimer, Kanbach and Gast, 2021). Moreover, in the context of cost of debt, Chou, Ou and Tsai (2014) argue that firms can lower their default risk by engaging in a strategic alliance. Therefore, we propose that coopetition lead to a lower default risk and hypothesize that firms who engage in coopetition enjoy higher credit ratings.

Strategic alliances enable firms to take on challenging, risky, and cost-intensive projects (Gnyawali and Park, 2011). Following paradox theory, attending to cooperation and competition simultaneously leads to sustainability of positive outcome, meaning long-term benefits (Smith and Lewis, 2011). In the context of credit ratings, paradox theory therefore would predict long-term higher credit ratings when engaging in coopetition. Here, considering the four coopetition mechanisms resulting from the interplay of cooperation and competition, coopetitors profit especially from relevant commitments. Since competitors are active in the same market and offer similar products, they possess similar knowledge and capabilities (Ritala and Hurmelinna-Laukkanen, 2013). Combined with access to complementary resources from the competitor, this knowledge overlap enables them to integrate these more easily and quickly than non-competitors. While nevertheless safeguarding their critical internal knowledge and jointly pursuing the goal of a positive coopetition outcome, coopetitors benefit from this form of strategic alliance financially.

This positive effect of coopetition on firm performance has also been proven empirically. Peng *et al.* (2012) show in their case study that coopetition leads to firms attaining higher performance faster. Ritala (2012) proves that coopetition positively influences the innovation and market performance of a firm. In the survey of their study, they measure market performance based on growth in sales, profitability, market share and market growth. Furthermore, besides other outcomes, Bouncken and Fredrich (2012) investigate coopetition's effect on competitive success. They again find a positive relationship while defining competitive success by an increase in sales, market shares and profit margin. Hence, based on these results we can conclude that coopetition increases firm performance and profitability by sales growth and cost reduction due to cost sharing and an increase in efficiency. As these positive accounting ratios

indicate a firm's lower financial risk, they then reflect in credit ratings (e.g. Bhandari and Golden, 2021).

Chou, Ou and Tsai (2014) find that strategic alliances decrease cost of debt based on at-issue yield spread. They argue from two lines of reasoning. First, by engaging in strategic alliances firms are able to lower cost and access needed resources. As derived before, this is also the case for coopetitive strategic alliances. Therefore, coopetition decreases variance and increases mean of future cash flow. Second, by cooperating with a different company firms signal their value to debtholders, thereby reducing the information asymmetry in the debt market (Chou, Ou and Tsai, 2014). Engaging in a strategic alliance, regardless of being purely cooperative or coopetitive, leads to more information being available to credit rating agencies. As the other alliance participants choose to form an alliance with the focal firm, this functions as a positive signal of firm value. Hence, a strategic alliance signals approval from an independent party, in this case the coopetitive alliance partner. Therefore, we hypothesize:

H1: Firms engaging in one or more coopetition enjoy higher credit ratings than firms engaging in no coopetition.

In the context of credit ratings, paradox theory hints at long-term higher credit ratings due to the focal firm engaging in coopetition. In contrast, meeting contradictory demands by choosing either competition or cooperation once at a time as suggested by contingency theory might lead to short-term achievements (Smith and Lewis, 2011). We hypothesize the backward conclusion, namely that due to the high risks associated with coopetition and debtholders' risk sensitivity coopetition leads to an initial negative reaction in the debt market. Therefore, engaging in coopetition increases the probability of a short-term downgrade in credit rating.

The high relational risk and in turn growing performance risk associated with coopetition should alarm debtholders as they are mainly interested in the probability of their investment repayment. The high failure rate of coopetition adds to this negative reaction. Investing in riskier projects is not in the interest of debtholders due to the potential failure of such projects and subsequent danger to the firm's financial stability (Kuang and Qin,

2013). Engaging in coopetition signals risk-taking propensity to debtholders and credit rating agencies. Kuang and Qin (2013) prove that credit rating agencies include risk-taking incentives of management in their credit rating. They show when management is motivated by their payment structure to take more risk, credit ratings reflect a higher default risk and are therefore lower. As coopetition classifies as a risky management decision, we propose the same effect of coopetition on credit ratings in the short term.

Furthermore, Griffin, Hong and Ryou (2018) show that credit rating agencies initially recognize information on innovation from a firm inadequately. At the beginning, credit ratings do not acknowledge the positive effect of innovation on the future outcome to the correct extent. Griffin, Hong and Ryou (2018) find that lower credit ratings increase the cost of debt for firms investing in innovation in the short term. Hence, in the case of coopetition this means credit rating agencies do not value the potential financial benefits of engaging in coopetition in the short term, increasing the probability of an initial downgrade in credit rating. Finally, coopetition already entails high risks. If firms engage in multiple coopetitive alliances at the same time, the risk of each coopetition deal accumulates. Thus, more coopetition implies even more risk which debtholders aim to avoid. Hence, we propose the following hypothesis:

H2: Initially, firms engaging in one or more coopetition are more likely to experience a downgrade in their credit rating in the short term than firms engaging in no coopetition.

Are firms able to prevent this initial downgrade in credit rating after announcing their coopetitive alliance? The conceptual framework of coopetition underlines how the outcome of coopetition varies depending on the 'navigation of simultaneity' (Gnyawali and Ryan Charleton, 2018, p. 2514). Here, a balance of the opposing forces—cooperation and competition—favours positive consequences of coopetition (Gnyawali and Park, 2011). Therefore, we hypothesize that in the debt market firms can influence the signal they send from engaging in coopetition through their coopetitive partner selection. We propose a higher share of balanced coopetitive alliances decreases the probability of an initial downgrade in credit rating.

The debt market initially reacts negatively to cooperative alliances due to the high associated risks. Hence, in order to prevent this initial downgrade after entering into cooperation the firm should aim to signal a lower risk associated with the chosen form of cooperation. Das and Teng (2000) argue that a balance of cooperation and competition within a strategic alliance ensures successful performance and decreases failure risk. Therefore, considering partner selection two options prevail: The firm chooses a cooperation with either weak cooperation and weak competition or strong cooperation and strong competition. Both options are classified as balanced cooperation (Bengtsson, Raza-Ullah and Vanyushyn, 2016).

In an unbalanced cooperation agreement, cooperation can overpower competition or vice versa. If cooperation is stronger than competition, the firms share their resources irresponsibly, leaving the direct competitor with sensitive internal resources and know-how (Das and Teng, 2000). These newly gained, complementary resources and knowledge generate a new competitive advantage for the competitor and leaves the focal firm at a disadvantage. If in turn competition outweighs cooperation, the cooperative partners act opportunistically (Das and Teng, 2000). Here, competitors do not benefit from cooperation's unique advantages due to a lack in willingness to cooperate (Das and Teng, 1999). In both cases, cooperation agreements are more likely to fail. Thus, by choosing a balanced cooperation the relational risk and risk of failure lessen. Therefore, entering into a balanced cooperation signals less risk to debtholders. Following the conceptual framework of cooperation, a balance of cooperation and competition amplifies the resulting cooperation mechanism (Gnyawali and Ryan Charleton, 2018). Since firms can engage in multiple cooperative alliances at the same time, we consider the number of balanced cooperation compared to the total number of cooperation at an aggregated level and therefore hypothesize:

H3: A higher share of balanced cooperation decreases the probability of an initial downgrade in credit rating.

Data & Methodology

Sample & Data Sources

Our large-scale, cross-industry dataset over a time span of 20 years builds on three separate data

sources. First, the Thompson's Securities Data Corporation (SDC) database offers all alliances and joint ventures formed between 1997 and 2017. Second, the Compustat Rating database includes the credit ratings in question. Third, the Compustat North America database contains annual firm characteristics and accounting data. Because of the construction of certain variables addressing temporal changes the final dataset spans from 1998 to 2017. Analogous to Chou, Ou and Tsai (2014), we exclude financial institutions and regulated utility companies due to high regulations in the industries (SIC codes 6000-6999 and 4900-4999). When accounting for missing variables, we arrive at an initial, unbalanced panel dataset containing 2569 public firms in North America active in 340 different industries.

Dependent Variables

Credit Rating. The dependent variable to test hypothesis one is a numerical value for the credit rating of the firm in each year, which in turn reflects the firm's default risk. The Standard & Poor's Long-Term Domestic Issuer Credit Rating ranges from AAA to D and SD. Following Kuang and Qin (2013), we dedicate a number to each credit rating to generate an ordinal variable (see Table 1). This variable ranges from 1 to 20, where the value 1 corresponds to the highest credit rating (AAA) and 20 to the lowest credit rating (D and SD, respectively). Hence, higher numerical scores of the credit rating depict higher default risk.

Downgrade in Credit Rating. To test hypotheses two and three, we consider a downgrade in the firm's credit rating in the short term after announcing a cooperative alliance. We follow Griffin, Hong and Ryou (2018) in their definition of the short-term time span covering $t + 1$ and $t + 2$. Hence, we arrive at a binary dependent variable indicating one if the credit rating in $t + 2$ is lower than the credit rating in $t + 1$ considering the baseline t when the firm decides to enter into one, more or no cooperative alliances. The dependent variable for a downgrade in credit rating takes on zero if the credit rating in $t + 2$ is higher or equal to the credit rating in $t + 1$.

Independent Variables

Number of Cooperative Alliances. Cooperation between one or more firms takes place when they enter into an alliances or found a joint venture—

Table 1. Credit rating classifications

Standard & Poor's Long-Term Domestic Issuer Credit Rating	Assigned credit rating score
AAA	1
AA+	2
AA	3
AA-	4
A+	5
A	6
A-	7
BBB+	8
BBB	9
BBB-	10
BB+	11
BB	12
BB-	13
B+	14
B	15
B-	16
CCC+	17
CCC	18
CC	18
C	19
D	20
SD	20

Analogous to Kuang and Qin (2013)

a stronger form or higher degree of cooperation due to equity involvement (Gulati, 1995). We use the North American Industry Classification System (NAICS) code to measure competition. Other than the SIC code, the NAICS code offers more detailed information on the competition level between firms as it considers the production process and covers new industries more precisely. If firms with the same first four digits of the NAICS code cooperate, they are also competing simultaneously due to their strong industry similarity and resource complement (Wang and Zajac, 2007). In the case of hypotheses one and two, the independent variable represents the number of cooperative deals the focal firm announces per year.

Share of Balanced Cooperation. For the third hypothesis, we consider the share of balanced cooperation. A cooperative alliance is classified as balanced when the degree of cooperation and the degree of competition are simultaneously high (Bengtsson, Raza-Ullah and Vanyushyn, 2016). If the degree of cooperation is low while the degree of competition is high, the cooperative alliance will

be unbalanced. The share of balanced cooperation is calculated by the number of balanced cooperation divided by the total number of cooperation within the year: $Share\ of\ balanced\ cooperation = \frac{Number\ of\ balanced\ cooperation}{Number\ of\ cooperation\ in\ total}$. As this independent variable indicates a share, it ranges between 0 and 1.

Control Variables

Based on previous literature on credit ratings, various firm-specific control variables affecting a firm's credit rating are included (e.g. Ashbaugh-Skaife, Collins and LaFond, 2006; Kuang and Qin, 2013; Bhandari and Golden, 2021). Considering firm characteristics and accounting-based indicators, we control for the firm's leverage ratio, or debt-to-assets ratio (*leverage*), *return on assets*, and *interest coverage*. We expect a higher leverage ratio, lower return on assets, and lower interest coverage to positively relate to financial risk and therefore negatively to credit ratings. Furthermore, the binary variable *loss*, revealing if the firm made negative earnings within the current and prior fiscal year, presumably leads to a lower credit rating. Regarding the debt structure of the firm, the binary measure if a firm has subordinated debt, which would make investments riskier for debtors, is included. Additionally, we control for asset structure via capital intensity, property, plant, and equipment over total assets and expect it to lead to a higher credit rating. A logarithmic function of the number of employees indicates the size of the firm (Wu, 2012; Tether, 2002). Larger firms tend to have a lower default risk and therefore should enjoy a higher credit rating. We also include market-based control variables accessing the financial risk of a firm: the *stock return* over the previous 12 months, the *book-to-market* value of equity ratio, the investment in *intangible assets*, and a dummy variable showing if new equity capital was raised during the previous year (Kuang and Qin, 2013). No predictions can be made concerning the effect of the market-based control variables on the credit rating as the variables can potentially translate to an increase in financial risk or growth opportunities and future profitability of the firm (Kuang and Qin, 2013). Lastly, in order to control for *industry effects* and *year effects* a dummy for each year, 1998 to 2017, and industry dummies are included.

Estimation Method

The regression model for each hypothesis testing takes on a hierarchical structure. Thus, the third regressions represent the full models and include the current independent variable and all control variables. Guided by previous research on factors affecting a firm's credit rating, for testing H1 we choose an ordered logit regression model due to the ordinal nature of the dependent variable. In the case of hypotheses two and three, a logit regression model fits given the binary dependent variable. Overall, all regression models take into account the panel data structure of our dataset. After testing all three hypotheses, we conduct multiple robustness checks. All non-binary, continuous control variables are standardized and winsorized at a one-percent level. To constrain heteroscedasticity and thus offer dependable results, we adapt robust standard errors.

RESULTS

Descriptive Statistics

The average credit rating is 10.71, which approximately translates to a BBB- credit rating. This average value is in accordance with previous research (e.g. Bonsall, Holzman and Miller, 2017). Table 2 gives the correlation matrix, the number of observations, mean and standard deviation before standardizing and winsorizing and the variance inflation factor of each variable.

Due to the partially high pairwise correlations, we test for multicollinearity in our data. The variance inflation factor of each variable (see Table 2) and the condition number of 12.27 are considerably below the cutoffs. Additionally, we adhere to the procedure suggested by Kalnins (2018) to expose potential multicollinearity. Table 3 shows separate regressions excluding each variable with a high pairwise correlation with another variable. Except for one exception, the signs of the statistically significant coefficients remain consistent and their magnitude varies only slightly. In the last column where the control variable for firm size is excluded, the coefficient of the variable measuring intangible assets turns negative and statistically significant at a 5% level. Nevertheless, this does not affect the coefficient of our variable of interest. Hence, given this insight, the low variance inflation factors and condition number and previous

research in this field, we rely on our control variable selection.

Regression Results

Table 4 contains the regression results of the hierarchical model testing H1. Column one shows the pure effect of the number of cooperative alliances on credit rating when only controlling for industry and year effects. Here, the coefficient for the number of cooperation deals is negative and highly significant ($\beta = -0.24$, $p = 0.00$). Hence, more cooperative deals lead to a higher credit rating. Column two presents the results when including all control variables and excluding the independent variable. All control variables except return on assets and capital intensity display a highly statistically significant coefficient. The sign of each statistically significant variable is in line with findings from previous research. Higher leverage, a loss in the current and previous year, subordinated debt, higher stock returns, and more intangible assets lead to lower credit ratings. While higher interest coverage, higher book-to-market value of equity, new equity capital, and larger firm size bring about higher credit ratings. The results of the full model when adding the independent variable into the regression model in column three support our previous findings. The coefficient of the number of cooperative alliances remains negative and highly statistically significant ($\beta_{H1} = -0.14$, $p = 0.01$). These results support hypothesis H1. Given the increased Log pseudolikelihood and Wald χ^2 the model's goodness-of-fit improves within the hierarchical regression analysis.

The next hierarchical model addresses H2 (see Table 5). The dependent variable changes to the binary variable, indicating a downgrade in credit rating in the years after the cooperation deals were announced. Column one of table 5 shows the pure effect of the number of cooperative alliances on a downgrade in credit rating when solely controlling for industry and year effects. The positive, statistically significant coefficient of the independent variable already gives a positive indication for H2. In the full model (see Column 3) the number of cooperation deals presents with a positive, at the 5-percent level statistically significant coefficient ($\beta_{H2} = 0.10$, $p = 0.02$). These results support H2. Again, the goodness-of-fit of each model increases up to the full model.

Table 2. Correlation and descriptive statistics

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Credit rating	1.00												
(2) Coopetition	-0.17* (0.00)	1.00											
(3) Leverage ratio	0.44* (0.00)	-0.07* (0.00)	1.00										
(4) Return on assets	-0.38* (0.00)	0.05* (0.00)	-0.35* (0.00)	1.00									
(5) Loss	0.39* (0.00)	-0.03* (0.00)	0.30* (0.00)	-0.56* (0.00)	1.00								
(6) Interest coverage	-0.37* (0.00)	0.10* (0.00)	-0.42* (0.00)	0.30* (0.00)	-0.20* (0.00)	1.00							
(7) Subord. debt	0.21* (0.00)	-0.05* (0.00)	0.25* (0.00)	-0.08* (0.00)	0.05* (0.00)	-0.14* (0.00)	1.00						
(8) Capital intensity	0.06* (0.00)	-0.02 (0.03)	0.12* (0.00)	-0.11* (0.00)	0.10* (0.00)	-0.06* (0.00)	-0.03* (0.00)	1.00					
(9) Stock return	0.11* (0.00)	-0.02 (0.01)	-0.02* (0.00)	0.19* (0.00)	-0.03* (0.00)	0.00 (0.73)	0.02 (0.12)	-0.01 (0.35)	1.00				
(10) Book-to-market	-0.15* (0.00)	0.01 (0.27)	-0.23* (0.00)	0.31* (0.00)	-0.23* (0.00)	0.04* (0.00)	0.01 (0.12)	-0.05* (0.00)	0.07* (0.00)	1.00			
(11) Intan. assets	-0.33* (0.00)	0.12* (0.00)	-0.09* (0.00)	0.08* (0.00)	-0.09* (0.00)	0.05* (0.00)	-0.06* (0.00)	-0.16* (0.00)	-0.02* (0.00)	0.03* (0.00)	1.00		
(12) New equity capital	-0.12* (0.00)	-0.01 (0.47)	-0.12* (0.00)	0.13* (0.00)	-0.13* (0.00)	0.09* (0.00)	0.03* (0.00)	-0.18* (0.00)	0.02* (0.00)	0.12* (0.00)	0.02 (0.01)	1.00	
(13) Firm size (log)	-0.57* (0.00)	0.13* (0.00)	-0.30* (0.00)	0.25* (0.00)	-0.24* (0.00)	0.21* (0.00)	-0.14* (0.00)	-0.15* (0.00)	-0.03* (0.00)	0.05* (0.00)	0.41* (0.00)	0.02* (0.00)	1.00
N	20929	20929	20929	20929	20929	20929	20929	20929	20929	20929	20929	20929	20929
Mean	10.71	0.08	0.36	0.02	0.14	18.53	0.16	0.65	0.65	27.93	3207.81	0.79	9.24
Std. dev.	3.53	0.42	0.24	0.21	0.35	263.75	0.37	0.52	21.81	1986.26	10255.59	0.41	1.68
VIF	2.07	1.04	1.52	1.79	1.58	1.33	1.10	1.09	1.09	1.16	1.26	1.07	1.66

*p < 0.10.

Table 3. Tests for multicollinearity: Results of regression analysis for H1

Regression model:	(1)		(2)		(3)		(4)	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage			0.46*** (0.05)	0.00	0.47*** (0.06)	0.00	0.53*** (0.06)	0.00
Return on assets	-0.05* (0.03)	0.10			0	0.99	0.05 (0.03)	0.14
Loss	0.89*** (0.08)	0.00	0.82*** (0.08)	0.00	0.82*** (0.08)	0.00	0.89*** (0.08)	0.00
Interest coverage	-0.46*** (0.05)	0.00	-0.37*** (0.05)	0.00	-0.38*** (0.05)	0.00	-0.37*** (0.05)	0.00
Subord	0.55*** (0.11)	0.00	0.44*** (0.11)	0.00	0.47*** (0.11)	0.00	0.43*** (0.11)	0.00
Capital intensity	-0.02 (0.08)	0.77	-0.07 (0.08)	0.36	-0.13 (0.08)	0.11	0 (0.08)	0.98
Stock return	0.37*** (0.02)	0.00	0.37*** (0.02)	0.00	0.37*** (0.02)	0.00	0.41*** (0.02)	0.00
Book-to-market	-0.31*** (0.04)	0.00	-0.28*** (0.03)	0.00	-0.27*** (0.03)	0.00	-0.31*** (0.03)	0.00
Intan. assets	0.25*** (0.08)	0.00	0.24*** (0.08)	0.00			-0.18** (0.09)	0.04
New equity capital	-0.35*** (0.08)	0.00	-0.033*** (0.08)	0.00	-0.32*** (0.08)	0.00	-0.39*** (0.08)	0.00
Firm size (log)	-3.56*** (0.14)	0.00	-3.50*** (0.14)	0.00	-3.39*** (0.13)	0.00		
Industry effects	Included		Included		Included		Included	
Year effects	Included		Included		Included		Included	
H1: Number of cooperation	-0.15*** (0.06)	0.01	-0.14*** (0.06)	0.01	-0.15*** (0.06)	0.01	-0.21*** (0.06)	0.00
Observations	20,929		20,929		20,929		20,929	
Log pseudolikelihood	-35000.17		-34862.13		-34890.43		-36610.77	
Wald chi ²	4403.80		4319.14		4331.21		3723.37	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

Table 4. Hierarchical model: Results of regression analysis for H1

Regression model:	(1) Credit rating OLogit		(2) Credit rating OLogit		(3) Credit rating OLogit	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage			0.47*** (0.06)	0.00	0.46*** (0.06)	0.00
Return on assets			0.01 (0.03)	0.79	0.01 (0.03)	0.78
Loss			0.82*** (0.08)	0.00	0.82*** (0.08)	0.00
Interest coverage			−0.38*** (0.05)	0.00	−0.38*** (0.05)	0.00
Subord			0.44*** (0.11)	0.00	0.44*** (0.11)	0.00
Capital intensity			−0.07 (0.08)	0.38	−0.07 (0.08)	0.38
Stock return			0.37*** (0.02)	0.00	0.37*** (0.02)	0.00
Book-to-market			−0.28*** (0.04)	0.00	−0.28*** (0.04)	0.00
Intan. assets			0.24*** (0.08)	0.00	0.24*** (0.08)	0.00
New equity capital			−0.33*** (0.08)	0.00	−0.33*** (0.08)	0.00
Firm size (log)			−3.51*** (0.14)	0.00	−3.50*** (0.14)	0.00
Industry effects	Included		Included		Included	
Year effects	Included		Included		Included	
H1: Number of coopetition	−0.24*** (0.06)	0.00			−0.14*** (0.06)	0.01
Observations	20929		20929		20929	
Log pseudolikelihood	−37902.4		−34868.19		−34862.04	
Wald chi ²	1938.09		4372.72		4370.33	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

Lastly, Table 6 contains the regression results when considering the effect of the share of balanced coopetition on a downgrade in credit rating. After adding the control variables, the coefficient of the share of balanced coopetition in column three is negative, yet statistically insignificant ($\beta_{H3} = -0.13$, $p = 0.63$). Thus, we have to reject H3.

Robustness Checks and Additional Analyses

We conduct multiple robustness checks to confirm durability of the results and mitigate potential endogeneity concerns. First, considering reverse causality as a potential source of endogeneity in the first regression model we lag the independent

variable by one year. The coefficient of the independent variable, number of coopetition deals per year, slightly increases but remains negative (see Table 7). Hence, the effect of the number of coopetition deals continues to be positive on credit ratings, now at a 5-percent level, reaffirming H1.

The second robustness check addresses a potential measurement error of the dependent variable for hypotheses two and three. Instead of relying on the binary dependent variable for a downgrade in credit rating, we replace the dependent variable with an ordinal variable indicating a change in credit rating in the short term. Here, the dependent variable equals zero if the credit rating decreased in the time frame of $t + 1$ to $t + 2$, one if the credit rating remained stable, and two if the credit rating increased. In the case of H2, the coefficient for the

Table 5. Hierarchical model: Results of regression analysis for H2

Regression model:	(1) Downgrade Logit		(2) Downgrade Logit		(3) Downgrade Logit	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage			0.22*** (0.03)	0.00	0.22*** (0.03)	0.00
Return on assets			−0.28*** (0.03)	0.00	−0.28*** (0.03)	0.00
Loss			0.06 (0.08)	0.48	0.05 (0.08)	0.50
Interest coverage			−0.20*** (0.05)	0.00	−0.20*** (0.05)	0.00
Subord			−0.10 (0.06)	0.14	−0.09 (0.06)	0.14
Capital intensity			0.05* (0.03)	0.08	0.06* (0.03)	0.08
Stock return			−0.58*** (0.05)	0.00	−0.58*** (0.05)	0.00
Book-to-market			0.24*** (0.02)	0.00	0.24*** (0.02)	0.00
Intan. assets			−0.07** (0.03)	0.01	−0.07** (0.03)	0.01
New equity capital			−0.11* (0.06)	0.07	−0.11* (0.06)	0.07
Firm size (log)			0.26*** (0.03)	0.00	0.25*** (0.03)	0.00
Industry effects	Included		Included		Included	
Year effects	Included		Included		Included	
H2: Number of coopetition	0.10* (0.05)	0.06			0.10** (0.05)	0.02
Constant	−1.4*** (0.28)	0.00	−2.06*** (0.33)	0.00	−2.06*** (0.33)	0.00
Observations	17031		17031		17031	
Log pseudolikelihood	−6910.87		−6371.02		−6368.87	
Wald chi ²	44463.49		57087.62		57585.18	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

number of cooperative alliances per year measures $\beta_{H2} = -0.11$ with a p-value of 0.01 (see Table 8). Hence, an increase in the number of cooperation leads to a decrease in credit rating underlining the previous result. Considering H3, the coefficient of the independent variable again translates to a positive effect of a higher share of balanced cooperation on credit rating, but it remains statistically insignificant.

The treatment of financial institutions and regulated utility firms divides previous research. While Chou, Ou and Tsai (2014) excludes these from their sample, other researchers (e.g. Ashbaugh-Skaife, Collins and LaFond, 2006; Kuang and Qin, 2013)

choose to include these firms and control for their industry classification separately. Our third robustness check follows the latter scheme and thus enlarges the dataset. All results of this test (see column 1 to 3 in Table 9) underline our previous results.

Our main regression models replicate the regression models of the highly ranked publications in the field of credit rating research. Yet, the applied regression model does not address the omitted variable bias. Therefore, the next robustness check focuses on employing the fixed-effects models. This regression model eliminates unobservable, time-invariant firm characteristics, control-

Table 6. Hierarchical model: Results of regression analysis for H3

Regression model:	(1) Downgrade Logit		(2) Downgrade Logit		(3) Downgrade Logit	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage			0.24 (0.18)	0.19	0.24 (0.18)	0.19
Return on assets			−0.12 (0.13)	0.35	−0.13 (0.13)	0.32
Loss			−0.29 (0.40)	0.48	−0.3 (0.40)	0.46
Interest coverage			−0.81* (0.48)	0.09	−0.82* (0.50)	0.10
Subord			0.58 (0.36)	0.10	0.59* (0.36)	0.10
Capital intensity			0.23 (0.16)	0.17	0.23 (0.16)	0.17
Stock return			−0.92*** (0.20)	0.00	−0.92*** (0.20)	0.00
Book-to-market			0.19 (0.14)	0.19	0.18 (0.14)	0.20
Intan. assets			−0.04 (0.11)	0.74	−0.04 (0.11)	0.75
New equity capital			−0.29 (0.31)	0.36	−0.29 (0.31)	0.36
Firm size (log)			0.14 (0.16)	0.38	0.15 (0.16)	0.37
Industry effects	Included		Included		Included	
Year effects	Included		Included		Included	
H3: Share of balanced coopetition	0.08 (0.26)	0.76			−0.13 (0.28)	0.63
Constant	−2.09** (0.92)	0.02	−3.26*** (0.98)	0.00	−3.23*** (0.98)	0.00
Observations	909		909		909	
Log pseudolikelihood	−379.346		−329.51		−329.39	
Wald chi ²	88.75		212.87		217.36	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

ling for a potentially omitted variable bias. For the first hypothesis with an ordinal dependent variable, we use the fixed-effects ordered logit regression model. The command for this regression was newly introduced to the STATA program in 2020 (Baetschmann *et al.*, 2020). Column 1 in table 10 displays the results. Besides small changes in coefficients and significance levels, all insights from our first full model hold up. The fixed-effects logit model achieves the same robustness check for hypotheses two and three. The coefficient of the number of coopetition deals in column two in Table 10 stays positive, increases and even becomes more statistically significant ($\beta_{H2} = 0.19$, $p = 0.00$).

Turning to H3, when cancelling out fixed effects the regression results support the hypothesis. The coefficient of the share of balanced coopetition remains negative and becomes statistically significant with a p-value of 0.06 ($\beta_{H3} = -0.86$) (see Table 10).

Our last robustness check, an instrumental variable test, again addresses potential endogeneity concerns in our data. Other than the commonly used two-stage least squares approach (2SLS), the two-stage residual inclusion (2SRI) regression takes into account the non-linear structure of the model at hand (Bhandari and Golden, 2021). The 2SRI differs from the traditional 2SLS and the

Table 7. Robustness Check 1: Results of regression analysis: measure for cooperation lagged by 1 year

Regression model:	(1) Credit rating OLogit	
	Estimate	p-value
Leverage	0.46*** (0.06)	0.00
Return on assets	0.01 (0.03)	0.79
Loss	0.82*** (0.08)	0.00
Interest coverage	-0.38*** (0.05)	0.00
Subord	0.44*** (0.11)	0.00
Capital intensity	-0.07 (0.08)	0.38
Stock return	0.40*** (0.020)	0.00
Book-to-market	-0.28*** (0.04)	0.00
Intan. assets	0.24*** (0.08)	0.00
New equity capital	-0.33*** (0.08)	0.00
Firm size (log)	-3.5*** (0.14)	0.00
Industry effects	Included	
Year effects	Included	
H1: Number of cooperation (lagged by 1 year)	-0.14** (0.06)	0.02
Observations	20929	
Log pseudolikelihood	-34862.24	
Wald chi ²	4370.52	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

two-stage predictor substitution (2SPS), since the first-stage residual and endogenous variable are included in the second stage (Wooldridge, 2014). This leads to consistent results (Terza, Basu and Rathouz, 2008). For the first-stage regression, we follow Chou, Ou and Tsai (2014) when choosing to include the dependent variable *number of cooperation within the industry* by raising the level of analysis from the focal firm to the industry. Given a higher number of strategic alliances within the industry, a firm tends to engage in strategic alliances more (Chou, Ou and Tsai, 2014; Wassmer, 2010). We assume this effect also holds for cooperative al-

liances. As cooperation generates a new competitive advantage for the participating firms over the rest of the industry, it incentivizes other firms in the industry to form a cooperative alliances as well. The number of cooperation in the industry in turn should not affect the focal firm's credit rating.

Column 1 in Table 11 presents the results of the first-stage ordered logit regression. The coefficient of the number of cooperation within the industry is positive and statistically significant at the 1-percent level ($\beta = 0.07$, $p = 0.00$). Column 2 displays the results of the second-stage regression including the residual of the first-stage regression. The results of this ordered logit regression show that the coefficient of the focal firm's number of cooperation alliances per year remains negative with an increase in statistical significance ($\beta_{H1} = -0.43$, $p = 0.00$). Hence, the results of the 2SRI model supports our main findings after controlling for potential endogeneity. Since the usage of 2SRI has only recently been established, we could apply this model only in the context of ordinal dependent variables in the first stage (e.g., Velyka and Guerzoni, 2020). Hence, additionally to the 2SRI model with ordered logit regressions at the first and second stage, we adapted the dependent variable in order to replicate the 2SRI approach by Bhandari and Golden (2021). Here, we convert the number of cooperation per year to a binary variable to then run a GLM regression using the link logit function. The dummy variable for cooperation equals one if the firm engages in one or more cooperative alliances within the year, and zero otherwise. The results in Columns 3 and 4 echo our previous results.

CONCLUSION and DISCUSSION

Discussion of Results

Our empirical results in the main study support H1 and 2. First, firms engaging in more cooperation tend to enjoy higher credit ratings. Second, firms engaging in more cooperation are initially more likely to be downgraded in their credit rating due to the high risks associated with cooperation and the risk sensitivity of debtholders. However, we have to reject H3. The results of our main study do not show a higher share of balanced cooperative alliances to decrease the likelihood of an initial downgrade in credit rating.

Table 8. Robustness Check 2: Results of regression analysis: alternative measure for changes in credit rating

Regression model:	(1) Change in credit rating OLogit		(2) Change in credit rating OLogit	
	Estimate	p-value	Estimate	p-value
Leverage	-0.21*** (0.03)	0.00	-0.25** (0.12)	0.04
Return on assets	0.26*** (0.03)	0.00	0.17 (0.11)	0.14
Loss	0.02 (0.07)	0.78	0.05 (0.37)	0.90
Interest coverage	-0.01 (0.02)	0.64	-0.02 (0.07)	0.75
Subord	0.15*** (0.05)	0.01	-0.55 (0.39)	0.16
Capital intensity	-0.03 (0.03)	0.25	-0.12 (0.14)	0.37
Stock return	0.45*** (0.02)	0.00	0.73*** (0.09)	0.00
Book-to-market	-0.28*** (0.03)	0.00	-0.17* (0.10)	0.09
Intan. assets	0.01 (0.02)	0.65	-0.03 (0.10)	0.79
New equity capital	0.02 (0.05)	0.69	0.43* (0.23)	0.06
Firm size (log)	-0.18*** (.03)	0.00	-0.12 (0.12)	0.34
Industry effects	Included		Included	
Year effects	Included		Included	
H2: Number of coopetition	-0.11*** (0.04)	0.01		
H3: Share of balanced coopetition			0.10 (0.23)	0.66
Observations	17057		946	
Log pseudolikelihood	-11812.37		-572.97	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

We conduct multiple additional analyses to ensure robust results. Here, two results are of particular importance. First, particularly regarding H1 potential endogeneity concerns need to be addressed. Here, the case of endogeneity due to reverse causality is particularly concerning since one could argue a higher credit rating might enable firms to engage in more coopetition. While the first, third and fourth robustness check already mitigate these concerns, especially the results of the instrumental variable test using the two-stage residual inclusion test in our fifth robustness check underline our conclusion of firms engaging in more coopetition to enjoy higher credit ratings compared to firms engaging in less or no coopetition in general. Second, the results of the

fourth robustness check regarding H3 stand out (see Column 3 of Table 10). In our main study we followed the research standards in current literature. However, when going further and controlling for fixed effects in our data we are able to find support for H3. While the results of our main study only hint at this effect due to missing statistical significance, from the results of this robustness check we can conclude that when controlling for fixed effects a higher share of balanced coopetition decreases the likeliness of an initial downgrade in credit rating after engaging in coopetition. Therefore, we believe fixed effects to be present in the dataset for the third hypothesis testing for which we then control in the fourth robustness check.

Table 9. Robustness Check 3: Results of regression analysis: larger sample including financial and utility industries

Regression model:	(1) Credit rating OLogit		(2) Downgrade Logit		(3) Downgrade Logit	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage	0.42*** (0.05)	0.00	0.19*** (0.03)	0.00	0.2 (0.16)	0.20
Return on assets	-0.01 (0.03)	0.67	-0.26*** (0.03)	0.00	-0.15 (0.12)	0.23
Loss	0.88*** (0.07)	0.00	0.04 (0.08)	0.64	-0.26 (0.39)	0.51
Interest coverage	-0.37*** (0.04)	0.00	-0.17*** (0.04)	0.00	-0.76* (0.42)	0.07
Subord	0.41*** (0.1)	0.00	-0.14** (0.06)	0.02	0.63* (0.33)	0.06
Capital intensity	-0.09 (0.08)	0.30	0.07** (0.03)	0.04	0.24 (0.16)	0.14
Stock return	0.35*** (0.02)	0.00	-0.56*** (0.04)	0.00	-0.90*** (0.19)	0.00
Book-to-market	-0.23*** (0.03)	0.00	0.22*** (0.02)	0.00	0.13 (0.12)	0.28
Intan. assets	0.17** (0.07)	0.02	-0.05* (0.03)	0.06	-0.04 (0.10)	0.70
New equity capital	-0.31*** (0.07)	0.00	-0.14** (0.06)	0.01	-0.29 (0.30)	0.33
Firm size (log)	-3.22*** (0.12)	0.00	0.19*** (0.03)	0.00	0.13 (0.15)	0.40
Financial & utility industries	-3.87 (2.67)	0.15	-0.37 (0.39)	0.34	1.56 (1.18)	0.19
Industry effects	Included		Included		Included	
Year effects	Included		Included		Included	
H1+2: Number of cooperation	-0.14*** (.05)	0.01	0.10** (0.04)	0.03		
H3: Share of balanced cooperation					-0.10 (0.26)	0.69
Constant			-1.97*** (0.33)	0.00	-3.23*** (1.0)	0.00
Observations	25463		20868		991	
Log likelihood	-42664.98		-7697.84		-362.13	
Wald chi ²	4515.92		71049.14		222.75	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Contributions and Implications for Theory and Practice

This paper contributes to research on credit ratings and on the outcomes of cooperation in the following ways. First, our findings emphasize the theoretical connection of accounting research and research on strategic management. Our results show cooperation to have an ambivalent effect on credit ratings. While in absolute values firms engaging

in more cooperation benefit in their credit ratings, in the short term the relative value of credit ratings may decrease after engaging in more cooperation. We offer a new perspective on cooperation by considering its effect on the debt market. This study complements previous studies on cooperation's effect on the equity market (e.g. Luo, Rindfleisch and Tse, 2007). Thus, with this study research begins to give a full view of cooperation's effect on the financial market. Building on the stud-

Table 10. Robustness Check 4: Results of regression analysis: fixed effects

Regression model:	(1) Credit rating OLogit, fixed effects		(2) Downgrade Logit, fixed effects		(3) Downgrade Logit, fixed effects	
	Estimate	p-value	Estimate	p-value	Estimate	p-value
Leverage	0.35*** (0.06)	0.00	0.17*** (0.05)	0.00	0.61 (0.38)	0.11
Return on assets	0.06* (0.04)	0.09	−0.23*** (0.03)	0.00	−0.12 (0.26)	0.65
Loss	0.81*** (0.08)	0.00	−0.10 (0.09)	0.29	−0.39 (0.65)	0.55
Interest coverage	−0.44*** (0.07)	0.00	−0.04 (0.05)	0.41	0.43 (0.27)	0.11
Subord	0.53*** (0.14)	0.00	0.02 (0.11)	0.83	0.02 (0.71)	0.98
Capital intensity	0.07 (0.1)	0.46	0.33*** (0.08)	0.00	0.79* (0.46)	0.08
Stock return	0.46*** (0.02)	0.00	−0.50*** (0.04)	0.00	−0.59*** (0.21)	0.01
Book-to-market	−0.27*** (0.04)	0.00	0.26*** (0.03)	0.00	0.03 (0.17)	0.84
Intan. assets	0.43*** (0.09)	0.00	−0.13** (0.06)	0.03	0.36 (0.48)	0.45
New equity capital	−0.36*** (0.09)	0.00	−0.07 (0.08)	0.37	−0.67 (0.49)	0.18
Firm size (log)	−3.81*** (0.248)	0.00	1.07*** (0.13)	0.00	2.26** (0.95)	0.02
Industry effects	Included		Included		Included	
Year effects	Included		Included		Included	
H1+2: Number of coopetition	−0.10** (0.05)	0.05	0.19*** (0.07)	0.00		
H3: Share of balanced coopetition					−0.86* (0.46)	0.06
Observations	62212		12774		417	
Pseudo R ²	0.29		0.1		0.27	
Log conditional likelihood	−18565.84					
Wald chi ²	1351.71					
Log likelihood			−3919.28		−101.97	
LR chi ²			875.11		75.79	

Note: Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

ies by Chen, King and Wen (2015) and Chou, Ou and Tsai (2014) pointing out the positive effect of strategic alliance and joint ventures on the debt market, our study highlights that the debt market initially reacts negatively to alliances and joint ventures with a direct competitor. This insight contributes to research by revealing a downside outcome of coopetition, implying that coopetition does not only have positive outcomes and needs to be critically analysed further. So far, to our knowledge, merely Crick (2019) has investigated the dark side of coopetition empirically and

found that too much coopetition leads to negative effects on customer satisfaction performance, market performance, and financial performance. The negative reaction of credit ratings to coopetition in the short term expands this exploration. With the backward conclusion of the long-term benefits when attending to paradoxical tensions predicted by paradox theory and leading to potential short-term deficits, we give a new potential explanation for our findings. Our results thus underline the embeddedness of coopetition in paradox theory. This rationale can help to further the development of

Table 11. Robustness Check 5: Results of regression analysis: 2SRI

Regression model:	(1)		(2)		(4)		(5)	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Number of cooperation within the industry	0.07*** (0.00)	0.00			0.14*** (0.00)	0.00		
Leverage	-0.04 (0.05)	0.42	0.39*** (0.02)	0.00	-0.01 (0.04)	0.84	0.03*** (0.00)	0.00
Return on assets	0.02 (0.06)	0.74	-0.35*** (0.02)	0.00	0.06** (0.04)	0.07	-0.03*** (0.00)	0.00
Loss	0.30** (0.14)	0.03	1.2*** (0.05)	0.00	0.22** (0.10)	0.02	0.10*** (0.01)	0.00
Interest coverage	0.12*** (0.03)	0.00	-0.44*** (0.02)	0.00	0.07*** (0.02)	0.00	-0.08*** (0.00)	0.00
Subord	-0.14 (0.12)	0.26	0.50*** (0.04)	0.00	-0.05 (0.09)	0.61	0.07*** (0.01)	0.00
Capital intensity	0.04 (0.05)	0.41	-0.20*** (0.02)	0.00	-0.16*** (0.04)	0.00	-0.02*** (0.00)	0.00
Stock return	0.03 (0.04)	0.55	0.34*** (0.02)	0.00	0.03 (0.03)	0.23	0.03*** (0.00)	0.00
Book-to-market	0.01 (0.04)	0.86	-0.08*** (0.02)	0.00	-0.06*** (0.03)	0.03	-0.01*** (0.00)	0.00
Intan. assets	0.02 (0.03)	0.52	-0.20*** (0.02)	0.00	-0.02 (0.02)	0.32	-0.05*** (0.00)	0.00
New equity capital	-0.06 (0.09)	0.47	-0.43*** (0.04)	0.00	-0.09 (0.06)	0.14	-0.04*** (0.01)	0.00

Table 11. (Continued)

Regression model:	(1) Number of cooperation OLogit		(2) Credit rating OLogit		(4) Cooperation – Dummy GLM		(5) Credit rating GLM	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
Firm size (log)	0.71*** (0.05)	0.00	–1.51*** (0.02)	0.00	0.75*** (0.04)	0.00	–0.16*** (0.00)	0.00
Industry effects	Included		Included		Included		Included	
Year effects	Included		Included		Included		Included	
Number of cooperation			–0.43*** (0.05)	0.00				
Residual – Stage 1			0.55*** (0.09)	0.00			0.19*** (0.02)	0.00
Cooperation – Dummy							–0.20*** (0.02)	0.00
Constant						0.99	2.41*** (0.04)	0.00
Observations	20,929		20,929		–11.22 (1240.94)		20,929	
Pseudo R ²	0.282		0.19		20,929		20,929	
Log likelihood					5115.94			
Log pseudolikelihood	–3938.50		–44488.07				–49056.98	
Wald chi ²			15549.64					

Note: This table contains the instrumental variable test results (2SR1). Robust standard errors are in parentheses; Standardized and winsorized regression coefficients are reported for non-dummy variables; Coefficients are rounded to two decimal places; Industry and year effects are included, but not reported.

***p < 0.01, **p < 0.05, *p < 0.10.

a cohesive coopetition theory. As our results support the predictions made by paradox theory, we strongly believe paradox theory needs to be integrated in coopetition theory development.

As to the practical implications of our research, our results advise managers on the timing when to engage in coopetition. Even if managers do not engage in coopetition to alter their credit rating, they should be aware of the effect it has on credit ratings nonetheless. In general in the context of credit ratings, firms benefit from engaging in more coopetition. Nevertheless, considering the potential initial downgrade in credit ratings, managers need to take into account when to enter a cooperative alliance. In case a potential up- or downgrade in credit rating occurs in the near future, we would advise managers to refrain from coopetition. Regarding the results of robustness check four, managers can prevent this short-term downside of coopetition through conscious cooperative partner selection. If they want to prevent such initial downgrade in credit rating, they need to engage in balanced coopetition.

Limitations and Avenues for Further Research

While the effect of coopetition on credit ratings is of high importance and offers unanticipated results, credit ratings only function as a proxy for credit or default risk and the cost of debt. Future researchers could build on our study by considering it as an entry point for research on coopetition's effect on the debt market. A potentially interesting follow-up study could investigate how the coopetition's effect on credit ratings differs depending on whom the focal firm decides to cooperate with. This signal could differ if they choose to engage in coopetition with a less thriving firm. Further, the coopetition's effect on the debt market could differ depending on the market concentration within the industry. If the market consists of a small number of dominant firms, a coopetition within such industry could have a less favourable effect on the focal firm's overall credit rating. In this case, the potential failure of coopetition would have more severe consequences. Hence, these higher risks could be weighted more when the credit rating agency determines the firm's credit rating. Additionally, the cooperative behaviour of competitors could affect the formation of coopetition. If the other competitors in the industry decide to engage in coopetition, this could drive the

focal firm to form a coopetition with other competitors as well. Future research could investigate peer effects as an antecedent of coopetition. While our measure for competition within coopetition focuses on the market overlap of the coopetitors, future researchers could investigate, if the findings differ, when considering coopetition between down- or upstream firms. Considering our testing of H3, we face another limitation since the dataset significantly decreases as this research question addresses only the subsample of firms actually engaging in coopetition. If a firm does not engage in coopetition, the share of balanced coopetition for this firm-year observation is undefined. Future research can address this limitation by either considering a larger sample of firms actually engaging in coopetition or by altering the measurement of coopetition. We arrive at our dataset due to yearly aggregated data and the definition of strong coopetition when at least four digits of the NAICS code coincide. But by measuring competition with the NAICS code, other than just strong competition degrees could be measured. For example, weak cooperation and competition within an alliance also classifies as balanced coopetition. This case is not considered in our paper as we chose to aggregate our coopetition data over each year. By choosing our data format, we were able to benefit from the panel data structure. A mixed-methods approach to data collection could also be an opportunity for future researchers to analyse this relationship in more detail. Moreover, following our and Crick's (2019) results, researchers could further investigate the dark side of coopetition. Given the juxtaposition of paradox and contingency theory, the difference between short-term and long-term outcomes of coopetition could offer additional interesting insights.

Acknowledgements

Open access funding enabled and organized by Projekt DEAL.

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Cara Droege is a Doctoral Researcher at the Innovation and Entrepreneurship Group (WIN) – TIME Research Area at RWTH Aachen University, Germany. Her research interest lies in the area of inter-firm cooperation.

Andrea Greven is a Postdoctoral Researcher at the Chair of Entrepreneurship – WHU - Otto Beisheim School of Management, Germany. She received her doctoral degree from RWTH Aachen University. Her research focuses on entrepreneurship, technology transfer and public-private partnerships. She has published his work in academic journals such as Journal of Technology Transfer, Journal of International Management, Journal of Business Research, and Schmalenbach Journal of Business Research.

Denise Fischer-Kreer is an Assistant Professor at the Innovation and Entrepreneurship Group (WIN) – TIME Research Area at RWTH Aachen University, Germany. She received her doctoral degree from RWTH Aachen University. Her research focuses on sustainability, entrepreneurship, and leadership. She frequently publishes her research in academic journals such as Journal of Business Ethics, Journal of Cleaner Production or the Journal of Business Research.

Malte Brettel is Professor for Business Administration at RWTH Aachen University, Germany, and Adjunct Professor for Entrepreneurship at WHU Otto Beisheim School of Management. He received his doctoral degree from WHU and is co-founder of several companies. His areas of research interest include entrepreneurial management and development. He has published his work in various books and journals, including the Strategic Entrepreneurship Journal, the Journal of Product Innovation Management, the Journal of Business Venturing, and Research Policy.