

Cooperative Behavior and Knowledge Sharing: Interaction of Risk Management

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Abstract

Purpose – This study analyzes the influence of cooperative behavior and organizational risk management on knowledge sharing in Brazilian agricultural cooperatives. Complementarily, it analyzes the interaction of organizational risk management in the relationship between cooperative behavior and knowledge sharing.

Theoretical framework – The research is based on the literature on cooperative behavior, organizational risk management, and knowledge sharing with variables derived from previous literature.

Design/methodology/approach – A survey was conducted with strategic level managers in Brazilian agricultural cooperatives, with the sample being composed of 104 valid responses. To test the hypotheses, the structural equation modeling technique was applied.

Findings – The results show that cooperative behavior positively and significantly influences risk management and knowledge sharing; however, no statistical significance was found in the relationship between risk management and knowledge sharing. This indicates that higher levels of cooperative behavior are reflected in greater risk management, which helps to mitigate risks, and in greater knowledge sharing in the cooperatives studied.

Practical & social implications of research – It presents new information relating to cooperative behavior and risk management in knowledge sharing in cooperatives that integrate strategic alliances. As practical implications, it is highlighted that knowledge sharing should not be perceived as an immediate risk, but as being inherent to cooperation and collaboration between parties.

Originality/value – It contributes to the literature by presenting new implications of cooperative behavior and risk management, perceived as enablers of knowledge sharing.

Keywords: Cooperative behavior, risk management, knowledge sharing, cooperatives.

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I Introduction

Organizations can cooperate in a network to obtain greater competitiveness instead of competing individually (Jerônimo et al., 2005). Cooperative behavior is related to the culture of mutual cooperation and to the moral values geared toward cooperation (Jerônimo et al., 2005). When focused on contextual factors inherent to the individual, it leads to the ability to cooperate and assume a more positive perspective about others (Bogaert et al., 2008). As a way of obtaining resources and capacities, organizations develop cooperation relationships and share resources with partners (Rolt et al., 2017).

Different resources can be shared between cooperation partners, but one resource highlighted in the literature is knowledge sharing (Rolt et al., 2017; Wu & Zhu, 2012). Knowledge sharing cannot occur randomly; it should be guided by the premise that cooperation is sustained by both parties (Ke & Wei, 2007). Cooperation is a key factor for knowledge sharing (Ke & Wei, 2007), since it has the power to support the transfer of knowledge in organizations (Squire et al., 2009).

Knowledge sharing in cooperation networks is considered beneficial for organizations, primarily by contributing to the quicker development of new ideas and innovations and obtaining answers to possible problems (Wu & Zhu, 2012). Companies whose products add value to the products of a second company usually share knowledge (Levy et al., 2003); however, individuals do not usually see that in a natural way, so it is necessary to dedicate time and effort in order for that sharing to occur (Cyr & Choo, 2010).

In knowledge management, knowledge sharing is the process that presents the greatest challenges in its execution (Lin et al., 2012). Knowledge is considered a valuable resource, so the partners in a cooperation network often do not support sharing it due to fear of opportunist behaviors (Davenport & Prusak, 1998; Trkman & Desouza, 2012). Assuming that knowledge is one of the essential resources of an organization, it is essential to identify and manage the risks inherent to that resource (Tsai et al., 2010).

Risk management is a challenge for organizations that share knowledge, which often inhibits doing so in networks (Ensign & Hébert, 2009; Majchrzak, 2004; Trkman & Desouza, 2012). However, organizations that adopt risk management strategies work with a greater level of security (Soper et al., 2007), as they tend

to mitigate uncertainty and increase their chances of achieving their goals (Xia et al., 2018). Risks can impact the way organizations share knowledge (Keers & Van Fenema, 2018; Soper et al., 2007), so it is important to manage them.

Although the literature recognizes the relevance of cooperative behavior, of knowledge sharing, and of risk management, little is known about the interaction between these constructs. Trkman and Desouza (2012) highlight that there has been little investigation regarding the management of risks derived from knowledge sharing in collaboration networks. Keers and Van Fenema (2018) emphasize the relevance of studying risk management in partnership networks, where simultaneous exchanges occur.

The possible interactions between these variables suggest a research gap, which it is assumed may be prominent in cooperative organizations involving different levels of exchange with related parties. In light of that, this study aims to analyze the influence of cooperative behavior on risk management and on knowledge sharing in Brazilian agricultural cooperatives. Complementarily, it analyzes the interaction of risk management in the relationship between cooperative behavior and knowledge sharing.

The investigation of these variables and their interaction in the context of cooperatives is primarily motivated by the fact that these organizations are governed by cooperative principles (Jerônimo et al., 2005). In the seven principles established, that of cooperation between cooperatives is the one that seeks to incentivize integration and interorganizational relationships (Konzen & Oliveira, 2015). It enables the development of intercooperative networks, which are seen as one of the most expressive strategic trends of cooperativism (Simão et al., 2018).

Cooperatives perform a globally relevant role, employing more than 100 million people and favoring social development and economic growth (Ruostesaari & Troberg, 2016). Cooperativism is also relevant due to the fact that cooperatives can help to improve the conditions of producers in relation to market power (Maraschin, 2004). Cooperatives perform an important role in the management of rural properties and in the spread of new technologies (Silva et al., 2022). In Brazil, for example, cooperatives accounted for 16 billion in taxes and spending on personnel in 2018, according to the Organization of Brazilian Cooperatives (Organização das Cooperativas Brasileiras, 2019). It is also highlighted

that the agricultural sector presents the greatest number of cooperatives registered with the OCB.

In light of these numbers and of specific characteristics of cooperatives, it is important to investigate them, especially agricultural cooperatives. The social and economic relevance of agricultural cooperatives in Brazil instigates investigations regarding the strategies they adopt, given that this can promote development and ensure their survival in the market (Jerônimo et al., 2005; Ruostesaari & Troberg, 2016). Behzadi et al. (2018) point to the lack of studies on risk management in agricultural supply chains and highlight that the context of agribusiness is one of the most exposed to risks, including market, seasonality, perishability, institutional, and collaborative risks, which instigates investigating risk management.

The relevance of this study lies in the fact that the factors that promote knowledge sharing remain scarcely understood (Connelly & Kelloway, 2003; Renzl, 2008; Wu & Zhu, 2012). Few empirical studies have been conducted on mechanisms, intentions, and behaviors of subjects in knowledge sharing (Wu & Olson, 2010; Wu & Zhu, 2012). A similar situation is observed in the literature regarding risk management, particularly with regard to knowledge sharing between agricultural cooperatives, despite the importance of that management to ensure long-term cooperation.

Therefore, this study seeks to contribute to the flow of research on the effects of cooperation and risk management on knowledge sharing. It seeks to answer questions relating to factors and behaviors that can promote knowledge sharing, which is considered vital in the consolidation of interorganizational relationships (Beuren et al., 2019; Trkman & Desouza, 2012). In addition, it seeks to fill some of the gaps related to risk management in cooperation networks (Keers & Van Fenema, 2018).

From a managerial practice perspective, the results of this study can guide cooperative organizations regarding the antecedents of knowledge sharing, in the sense of indicating where these organizations should focus their attention for a more appropriate and prosperous exchange. Agricultural cooperatives need to be competitive within the context of the competition to ensure their market position (Silva et al., 2022). In addition, the study contributes to providing cooperatives with a greater understanding about aspects involved in risk management and sustaining the business.

2 Theoretical framework and hypotheses

2.1 Cooperative behavior and risk management

Cooperative behavior is defined as voluntary goodwill and reciprocal actions, which occurs when individuals work in coordination seeking common or complementary goals (Pearce, 2001; Rolt et al., 2017). Such behavior is engaged in actions of trust and reciprocity between the individuals (Ferster et al., 2020). However, cooperative behavior is permeated with risks that need to be managed by its participants in order to maintain the network (Keers & Van Fenema, 2018; Ke & Wei, 2007).

Risk analysis permeates the risk management process and helps organizations to evaluate, monitor, and control the risks they are exposed to (Damodaran, 2009; Dionne, 2013; Zonatto & Beuren, 2010). Besides the negative impact, risks can have positive effects on organizations, so it is necessary to manage them in order to take advantage of the opportunities and achieve better performance (Kutsch & Hall, 2009). Risk management involves the organized and economic application of resources to mitigate the probability of the impact of negative events or to enhance opportunities (Hubbard, 2020).

Kritzman (2000) and Beuren et al. (2019) warn that some risks assume more important characteristics in the context of cooperativism, due to the data, information, and knowledge that can cause uncertainties, which points to the need to carry out risk management. According to Zsidisin et al. (2000) and Beuren et al. (2019), the constant verification of risks surrounds the communication and analysis of information that contributes to suitable risk management strategies.

Risk management requires the joint effort of members of the cooperation network, for example, of the supply chain (Giunipero & Eltantawy, 2004), in the same way that occurs in other relationships. In this case, according to the authors, the buyers seek closer relationships with suppliers in order to more effectively manage the risks. The premise is that joint efforts help to mitigate the risks inherent to the processes (Giunipero & Eltantawy, 2004; Xia et al., 2018).

Thus, it is assumed that cooperation can help to identify and mitigate the risks present in the relationship (Williams & Stemper, 2002), impacting on the organizational risk management (Xia et al., 2018). It is believed that this

situation is repeated in cooperatives, so as to translate the cooperation into joint risk management efforts, which leads us to postulate that:

H₁: There is a positive influence of cooperative behavior on risk management.

2.2 Cooperative behavior and knowledge sharing

Knowledge sharing can be defined as the transfer of knowledge and experience to other members or organizations (Cyr & Choo, 2010). It is a social interaction that covers the exchange of experiences, skills, and knowledge in a network (Lin, 2007; Wang & Hu, 2017). Nooteboom (2000) believes that companies seek to align distant individual knowledge to achieve a common objective and suggests that cooperation reduces the cognitive distance between companies.

Individuals or organizations can show a certain amount of aversion to the sharing of knowledge, since this represents a valuable resource (Trkman & Desouza, 2012). In this aspect, cooperative behavior can contribute in a positive way, since cooperation is a key factor of knowledge sharing (Ke & Wei, 2007). Wang and Hu (2017) indicate that collaborative activities are essential for obtaining knowledge. Sordi et al. (2014) investigated the relationship between cooperation and knowledge sharing in a credit union and found evidence that, in a competitive organizational context, knowledge sharing depends on people's cooperation, and that cooperation needs knowledge sharing in order to endure.

Ghobadi and D'Ambra (2013) identified mechanisms by which cooperative and competitive behaviors influence knowledge sharing. Squire et al. (2009) found positive effects of cooperation on the knowledge transfer between buyers and suppliers and that rising levels of cooperation between companies resulted in greater knowledge transfer between them. Thus, it is presumed that a higher level of cooperation favors organizations creating a perception of sharing, in which knowledge transfer becomes possible (Squire et al., 2009). Based on the theoretical support and following the assumption that cooperative behavior influences knowledge sharing, it is conjectured that:

H₂: There is a positive influence of cooperative behavior on knowledge sharing.

2.3 Risk management and knowledge sharing

The occurrence of relational problems concerning opportunism and own interests, for example, compromises

the achievement of strategic objectives (Yu & Huo, 2018). Knowledge risk is understood as the probability of an event that implies a relative loss to the identification, storage, or protection of knowledge that reduces the benefit to one of the parties involved (Perrott, 2007). Some studies suggest that an increase in knowledge sharing increases the risk of it being leaked (Desouza, 2006; Trkman & Desouza, 2012). Therefore, reconciling the increase in knowledge sharing and confidentiality protection is a dilemma faced by organizations (Ahmad et al., 2014; Beuren et al., 2019). The inadequate sharing or loss of knowledge can have catastrophic effects on organizations (Hackney et al., 2008; Wu, 2010).

This dilemma faced by organizations, primarily those that operate in networks, is associated with another challenge, which is that of managing the risks related to knowledge sharing between these companies. There can be security breaches when two or more organizations share knowledge (Majchrzak, 2004; Trkman & Desouza, 2012). With this, organizations can present resistance to sharing knowledge, due to that fear, primarily because of the lack of control (Beuren et al., 2020; Ensign & Hébert, 2009).

Sometimes, the risks can be more imminent in the knowledge sharing than the benefits themselves. A lack of risk management in knowledge sharing can mean the cooperation network does not obtain a competitive advantage (Keers & Van Fenema, 2018; Swink & Zsidisin, 2006). Trkman and Desouza (2012) indicate that although knowledge sharing is relevant, it should involve a balance, as well as self-protection in relation to what is being shared in the network.

Ahmad et al. (2014) suggest a more comprehensive managerial structure for the purposes of more strategic protection and management of knowledge. Managerial strategies and methods to address the risks inherent to knowledge transfer, as well as protecting the organization, also help to create trust in the transactions with its partners (Soper et al., 2007). Individuals and organizations become willing to share knowledge and information when they develop relationships, but the incapacity to transfer relevant information requires the causes to be managed (Keers & Van Fenema, 2018).

In this aspect, Keers and Van Fenema (2018) identified seven risks related to project management in public-private partnerships. Among these, one that is important in the present study is inadequate information sharing between the partner organizations. According to the authors, this risk should be controlled to enable

joint actions. In supply chains, companies are expected to improve their relationships and generate greater engagement and sharing as risk management is treated as a strategy (Desai, 2018; Liao et al., 2017). Based on the above, it is presumed that:

H₃: There is a positive influence of risk management on knowledge sharing.

2.4 Mediating effect of risk management between cooperative behavior and knowledge sharing

In the interorganizational relationship, the participants' cooperative behavior favors knowledge sharing between the parties, at the same time that knowledge sharing requires strengthened cooperation (Ke & Wei, 2007). In the research conducted by Squire et al. (2009) in an interorganizational partnership, the results indicated positive relationships between cooperation and knowledge transfer mediated by trust between buyer and supplier companies.

Cooperative behavior can promote the identification and mitigation of risks (Giunipero & Eltantawy, 2004; Williams & Stemper, 2002). On the other hand, risk management can generate engagement, protect, and create confidence in knowledge sharing between the parties in the cooperation (Desai, 2018; Liao et al., 2017; Soper et al., 2007). According to Vivaldini (2020), collaborative management and risk management are complementary as they mitigate risks and uncertainties that supplier companies have in relation to the supply chain.

Based on the above, it is presumed that risk management plays a mediating role in the relationship between cooperative behavior and knowledge sharing. This mediating role implies that cooperative behavior is suitable for knowledge sharing (Sordi et al., 2014), and it can impact risk management (Zsidisin et al., 2000) and bring benefits to those involved in the cooperation

network, such as, for example, more effective knowledge sharing between the parties. Therefore, it is assumed that:

H₄: There is a mediating effect of risk management in the relationship between cooperative behavior and knowledge sharing.

The theoretical research model, developed based on the theoretical framework and the formulated hypotheses, is illustrated in Figure 1.

3 Methodological procedures

The survey was conducted in Brazilian agricultural cooperatives listed with the OCB, the biggest segment of Brazilian cooperatives. This sector is aligned with an important purpose of cooperativism within the national sphere, focused on the modernization of agriculture and of agroindustry, which it seeks to associate with the economic, social, and cultural dimensions of the country's development process (Scopinho, 2007). The choice of this type of organization is due to their cooperative principles, which are internationally recognized by the International Cooperative Alliance (ACI) and highlighted in the study of Mojo et al. (2015), with characteristics that presume cooperative behavior and knowledge sharing. In them, cooperation and the formation of alliances between them appear to be common (Beuren et al., 2020; Briones Peñalver et al., 2018).

The mapping on the OCB website resulted in 990 agricultural cooperatives from 17 Brazilian states. Having obtained this list, we sought to identify each organization in the LinkedIn professional network, enabling us to contact their employees registered on the social network. In this search we identified 1575 professionals, with the purpose of sending the invitation to establish a connection. We chose to send this to between three and five respondents per cooperative, preferably in strategic level positions. A total of 701 respondents accepted the

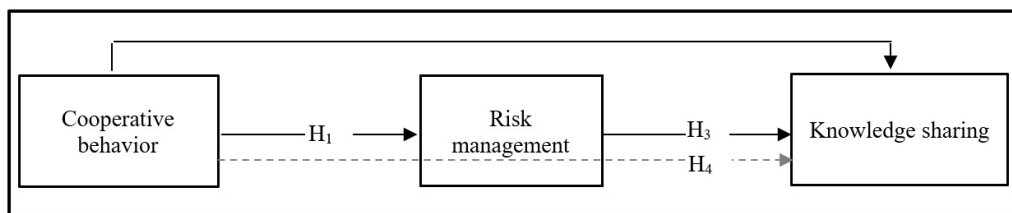


Figure 1. Theoretical research model

Note: The dotted line refers to the mediation relationship (indirect effect)

Source: Own elaboration.

invitation to participate in the study and they were sent a link to the questionnaire through the QuestionPro platform, in the period from December of 2019 to April of 2020, resulting in 104 valid responses.

The research constructs (cooperative behavior, risk management, and knowledge sharing) were measured with instruments tested in international studies, with statements on a seven-point Likert-type scale (see Appendix A). The constructs and variables that support this research are presented in Table 1.

The research was limited to collecting data from a single source, gathered at a single moment in time; therefore, it is subject to common method bias. Thus, statistical tests were conducted in the SPSS software, specifically Harman's single factor test, which formed three factors, where only 28.28% of the variation of the variables was explained by a single factor, which is lower than the common threshold of 50% (Podsakoff et al., 2003). Therefore, the common method bias inherent to the method employed in the data collection is highly unlikely to be a concern in the interpretation of the results.

To analyze the data, we used descriptive analysis, exploratory factor analysis, and structural equation modeling (SEM) techniques, estimated based on the partial least squares (PLS) technique. The exploratory factor analysis precedes the SEM, in which the theoretical combinations the constructs form part of are analyzed, measured by multiple scales (Fávero & Belfiore, 2017). The PLS-SEM model is analyzed in two steps: measurement model and structural model (Hair et al., 2017).

To analyze the hypotheses, SEM-PLS via path analysis was used, with bootstrapping of 5000 resamples (Hair et al., 2017), which resulted in direct relationships (covering the direct hypotheses), and total indirect coefficients (which highlight the results for the mediation hypothesis). In the mediation analysis, we followed the precepts of Hair et al. (2017) that the antecedent variable should influence the mediator and that the latter should influence the dependent one, which are necessary conditions for testing indirect effects.

4 Description and analysis of the results

The analyses begin with the description of the profile of the respondents from the cooperatives studied, as shown in Table 2.

In the research sample, it is highlighted that the respondents are mostly male and have a post-graduate education, with 57% having a specialization or MBA, 9% having a master's, and 1% having a PhD. When asked about their position, roughly half indicated they were a cooperative manager. Regarding time in the position/role, more than half indicated they had been in the role from 1 to 5 years. Concerning the cooperatives, they have mostly operated in the market for more than 50 years and the number of employees is concentrated between 500 and 3000.

4.1 Measurement model and descriptive statistics

In the structural equation modeling, the (internal and composite) reliability and (convergent and discriminant)

Table 1
Research constructs and variables

Constructs	Conceptualization	Indicators
Cooperative behavior (*) (Wu et al., 2017)	Consists of voluntary goodwill and reciprocal actions.	In the exploratory factor analysis (EFA), question CB02 was excluded due to the low commonality index in relation to the construct. Subsequently, CB03 was excluded from the study due to the low factor loading in the structural equation modeling analysis. Single component of total explained variance of 55.71%. KMO=0.742 $\alpha=0.786$
Risk management (Raz et al., 2002).	Helps organizations in the analysis of their risks.	Single component of total explained variance of 72.8%. KMO=0.879 $\alpha=0.901$
Knowledge sharing (Wang & Hu, 2017)	Transfer of knowledge and experience to other members or organizations.	Single component of total explained variance of 85.232%. KMO=0.754 $\alpha=0.913$

Note: (*) construct adapted for organizational risks.

Source: Own elaboration.

Table 2
Profile of the respondents

Position	Nº	%	Time in the position	Nº	%
Manager	53	51	Less than 1 year	6	6
Coordinator	10	9	From 1 to 5 years	55	53
Director	6	6	From 5 to 10 years	22	21
Superintendent	2	2	More than 10 years	21	20
President	3	3			
Others	30	29			
Total	104	100	Total	104	100
Number of employees	Nº	%	Operating in the market	Nº	%
Fewer than 500	40	38	Fewer than 5 years	2	2
From 500 to 3000	47	45	From 5 to 10 years	3	3
From 3000 to 10000	13	13	From 10 to 20 years	10	9
More than 10000	4	4	From 20 to 50 years	34	33
			More than 50 years	55	53
Total	104	100	Total	104	100
Gender	Nº	%	Education	Nº	%
Male	95	91	Elementary/High school	4	4
Female	9	9	Graduation	31	30
			Specialization or MBA	59	57
			Master's	9	9
			PhD	1	1
Total	104	100	Total	104	100

Source: Data from the research.

validity are initially tested by the measurement model (Hair et al., 2017). Table 3 contains this information and the descriptive statistics of the data.

In the descriptive statistics, it is perceived that the mode, which represents the most frequent value, that is, the frequency of a dataset, was 5, a number considered to be from average to high on the seven-point scale. This indicates the heavy presence of the variables studied in these organizations, primarily cooperative behavior and knowledge sharing, which also obtained a mean of 5.

The convergent validity, which calculates how much the statements are correlated with their variables, obtained by the AVE, has values above 0.50, which confirms the validity of the constructs. To test the model's reliability, the composite reliability and internal consistency of the variables (Cronbach's alpha) were used, and they were higher than indicated (>0.70) by the literature (Hair et al., 2017).

The discriminant validity was examined according to the precepts of Fornell and Larcker (1981). The results indicated the absence of a high correlation between the statements, and that the values of the square roots of the AVE are higher than the absolute values of the correlations

Table 3
Measurement model and descriptive statistics

Latent variables / Indicators	1	2	3
1. Cooperative behavior	0.791		
2. Knowledge sharing	0.637	0.923	
3. Risk management	0.468	0.318	0.853
Mean	5	5	4.5
Standard deviation	1.27	1.57	1.71
Coefficient of variation (%)	25.48%	31.40%	37.97%
Mode	5	5	5
Average variance extracted (AVE) >0.50	0.626	0.852	0.727
Cronbach's alpha >0.70	0.799	0.913	0.906
Composite reliability (CR) >0.70	0.869	0.945	0.930

Note: N=104. The diagonal elements represent the square roots of the average variance extracted and the elements outside the diagonal represent the correlations between the latent variables.

Source: Data from the research.

between the variables, indicating that each variable is individually distinct from the rest (Hair et al., 2017).

The three variables are positively correlated. A correlation coefficient greater than 50% was found in the relationship between cooperative behavior and knowledge sharing, which indicates that, as cooperative behavior increases, knowledge sharing levels are also

likely to rise. The same was observed in risk management (46.8%), but with less intensity and a moderate correlation. The relationship between risk management and knowledge sharing also presented positive results, but with a much lower coefficient. The correlation analysis is a preliminary analysis, but it already signals a positive relationship between the variables, as proposed in the study.

High correlations can signal the presence of multicollinearity (Hair et al., 2017). Thus, the variance inflation factors (VIFs) were analyzed, which indicated the absence of multicollinearity between the latent variables (VIF<5), according to criteria of Hair et al. (2017). Therefore, the results presented by the measurement model are adequate and indicate that all the variables are characterized by sufficient validity and reliability levels, which enables us to proceed to the stage of evaluating the structural model.

4.2 Structural model and hypotheses test

In the structural model, we proceeded to the bootstrapping analysis to verify the adequacy of the model

and to measure the significance of the relationships between the latent variables (Hair et al., 2017), with 5000 resamples and a bias-corrected confidence interval. In the evaluation of the structural model, we considered the Pearson's coefficient of determination (R^2), which substantiates the predictive validity of the proposed model, the predictive relevance (Q^2), in which the values of the endogenous variables should be higher than zero, and the effect size or Cohen indicator (f^2). Through the bootstrapping, the path values, t-value, and p-value were obtained, as presented in Table 4.

The model presents a coefficient of determination (R^2) of 21.9% for risk management and of 40.6% for knowledge sharing, which are moderate indices when considering the numerous factors that can influence these variables in cooperatives. The predictive relevance (Q^2) obtained results above zero, which attests to the accuracy of the model (Hair et al., 2017). Figure 2 presents the structural path model with a summary of the results for the study hypotheses.

The analysis of the structural coefficients indicates a positive and significant influence for H_1 , supported at

Table 4
Results of the structural model and hypotheses test

Hypotheses	Structural coefficient	f^2	t-value	p-value	Decision
H_1 Cooperative behavior → Risk management	0.468	0.281	5.327	0.000***	Not rejected
H_2 Cooperative behavior → Knowledge sharing	0.625	0.513	8.380	0.000***	Not rejected
H_3 Risk management → Knowledge sharing	0.025	0.001	0.256	0.798	Rejected

Note: N=104. Significant at the level of *** $p < 0.01$. Cohen classification (Cohen, 1988): small effect ($f^2=0.02$); medium effect ($f^2=0.15$); and large effect ($f^2=0.35$). Evaluation of the structural model (R^2): Risk management 0.219; Knowledge sharing 0.406. Predictive relevance (Q^2): Risk management 0.153; Knowledge sharing 0.334.
Source: Data from the research.

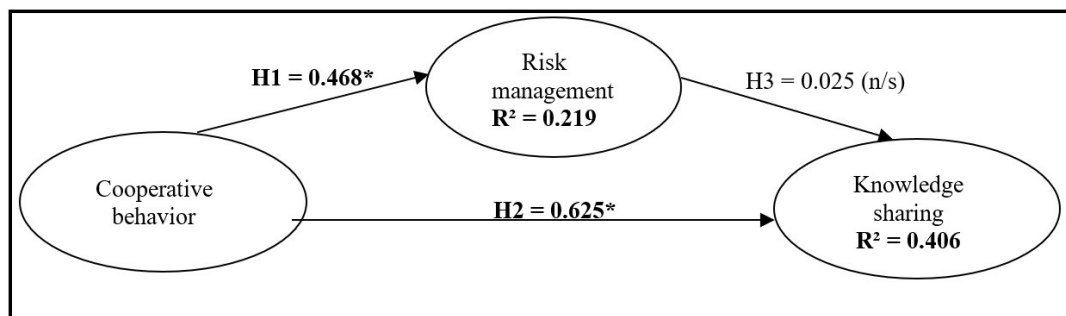


Figure 2. Structural model results

Note: N=104. Significant at * $p < 0.001$; n/s=non-significant

Source: Own elaboration.

a 1% significance level and with a structural coefficient of 0.468. The effect size (f^2) presents a medium effect ($f^2 > 0.15$) for the relationship between cooperative behavior and risk management (Cohen, 1988; Hair et al., 2017). This evidence suggests that cooperative behavior has positive impacts on risk management in the cooperatives investigated.

H_2 , which predicts a positive and significant influence of cooperative behavior on knowledge sharing, was also supported at the 1% significance level. The effect size (f^2) is big ($f^2 > 0.35$) for the relationship between cooperative behavior and knowledge sharing (Cohen, 1988; Hair et al., 2017). This suggests that this behavior stimulates knowledge sharing in the cooperatives studied.

H_3 , which conjectures a positive and significant relationship between risk management and knowledge sharing, did not present statistical significance, which does not support the hypothesis. Thus, f^2 has null strength, as there is no relationship between the variables (Cohen, 1988; Hair et al., 2017). So, it is not possible to affirm that risk management directly influences knowledge sharing in the sample studied.

The non-confirmation of H_3 makes it unviable to test H_4 , which predicted a mediating effect of risk management in the relationship between cooperative behavior and knowledge sharing. That is, H_4 cannot be confirmed due to the non-significance of the influence of the direct relationship between risk management and knowledge sharing, and so no indirect relationship can be assumed in the path proposed in H_3 , which leads to the rejection of H_4 . These results instigate more studies to understand the results of that relationship in other contexts and situations.

4.3 Discussion of the results

The research results indicate that cooperative behavior positively and significantly influences organizational risk management and knowledge sharing, leading to the non-rejection of hypotheses H_1 and H_2 . This finding is consistent with the one indicated by Giunipero and Eltantawy (2004) and Williams and Stemper (2002) that cooperative behavior can help in the identification and mitigation of risks, which is reflected in the risk management of these organizations. This suggests that cooperative behavior helps in the risk management of the cooperation networks between cooperatives.

These results are also consistent with what the literature indicates (Ke & Wei, 2007; Sordi et al., 2014; Squire et al., 2009), that is, that knowledge sharing requires cooperation between the parties, where cooperation is seen as a key factor for greater knowledge sharing. It is thus inferred that higher levels of cooperative behavior are associated with greater knowledge sharing in cooperatives. It is argued that higher levels of cooperation encourage such organizations to share more knowledge with partners.

With regard to H_3 , which postulated a positive and significant relationship between risk management and knowledge sharing, this was rejected as it did not present statistical significance. This result differs from what was presented in the studies of Keers and Van Fenema (2018), Soper et al. (2007), and Trkman and Desouza (2012), who found effects of risk management on knowledge sharing, that is, that managing this sharing avoids breaches and inappropriate or irrelevant sharing. Beuren et al. (2019) observed that information breaches are directly associated with the risk of the alliance. One possible explanation for the findings of the research may be that these organizations do not perceive risks in knowledge sharing, but instead see sharing as something natural in the cooperation between the parties.

According to Keers and Van Fenema (2018), a first condition for risk management is to know and recognize risks, that is, the developed perception of risk. Thus, it is conjectured that these cooperatives do not include knowledge sharing within the scope of their risk management, perhaps because cooperative behavior can convey the impression of good conduct between the partner organizations. Another supposition is that these organizations have difficulties managing the risks derived from knowledge sharing with partners (Majchrzak, 2004; Trkman & Desouza, 2012). However, these presented points instigate new studies in other cooperatives, including from other economic sectors.

5 Concluding remarks

This study analyzed the influence of cooperative behavior and risk management on knowledge sharing in Brazilian agricultural cooperatives. The results highlighted a positive and significant influence of cooperative behavior on risk management and knowledge sharing. The effects of cooperative behavior on risk management and knowledge sharing indicate efficacy of the cooperation in these aspects in the organizations studied. This corroborates

the cooperative behavior of the cooperatives studied in favor of uniting forces and helping to improve the conditions of the producers from the agricultural sector in relation to market power. Cooperation translates into joint risk management efforts, as well as encouraging knowledge sharing.

Despite the positive relationship observed between risk management and knowledge sharing, no statistical significance was found. This result suggests possible difficulties for these organizations to manage the risks of knowledge sharing and/or they do not see risks in the knowledge sharing between the parties due to the cooperative behavior.

Theoretical implications can be highlighted in the study, since it presents new information relating to cooperative behavior and risk management in knowledge sharing in cooperatives that integrate strategic alliances. As practical implications, it is highlighted that knowledge sharing should not be perceived as an immediate risk, but as being inherent to the cooperation and collaboration between parties. The findings of this research can guide cooperatives in identifying the constructs that had implications in the knowledge sharing within the scope of cooperation, so as to delineate their policies regarding risk management geared toward organizational strategies.

The limitations of the research include the methodological choices, as well as the cross-sectional design, which limits some inferences. The results were based on the respondents' perception and subjective aspects, which may have had an influence at the time of the answer. Future research could identify other variables and the management of other risks in these relationships. Other research instruments could be sought to measure the variables, since two questions were excluded from the instruments used in this research. The cooperatives may have specific characteristics, indicating the need for replication of this study in other economic sectors. In addition, the non-significance in the relationship between risk management and knowledge sharing instigates new studies. Investigating other variables intervening in this relationship (e.g. trust) could provide explanations for the results found.

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APPENDIX A

Research instrument

Cooperative behavior (Wu et al., 2017)

Indicate your level of agreement with each one of the statements that follow regarding the cooperative behavior of your organization.

Scale from 1 = strongly disagree to 7 = strongly agree.

CB1. Flexibility in response to requests for changes is a characteristic of our relationship.

CB2. When an unexpected situation arises, the partners prefer to make a new agreement over maintaining the original terms.

CB3. The information sharing in our relationship occurs frequently, informally, and openly.

CB4. The partners stay informed of the changes and events that can affect them.

CB5. In most of the aspects of our relationship, the parties are jointly responsible for doing things.

CB6. The problems that arise in the innovation relationship are treated as joint and not individual responsibilities.

Risk management (Raz et al., 2002)

Indicate in each one of the statements that follow the extent to which risk management occurs in your organization.

Scale from 1 = to no extent to 7 = to a large extent.

RM01. Systematic identification of risks through documentation and information reviews and information collection techniques, such as interviews and SWOT analysis.

RM02. Probabilistic risk analysis, including an evaluation of the probability of occurrence of a risk and of the consequences if it really occurs.

RM03. Detailed planning for uncertainty in order to reduce the probability and/or consequences of an adverse risk event for an acceptable limit.

RM04. Methodical trade-off analysis (choice of one option instead of another), resulting in a detailed plan of response to the risk.

RM05. Nominating a risk manager.

Knowledge sharing (Wang & Hu, 2017)

Indicate your level of agreement with each one of the statements that follow regarding your organization's knowledge sharing with partners.

Scale from 1 = totally disagree to 7 = totally agree.

KNOWSH01. We share our innovation work reports and technical documents with our partners.

KNOWSH02. We share our manuals and methodologies with our partners.

KNOWSH03. We often share our experience, know-how, or new ideas from the innovation work with our partners.

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The authors have no conflict of interest to declare.

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