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Abstract: Regional strategic networks (RSNs) are long-term purposeful arrangements among firms that cooperate and compete in a regional context allowing them to win or sustain a competitive advantage. RSN coopetitive strategy requires an open approach with inclusiveness of members and internal transparency of the formulation and implementation processes. This open approach of a coopetitive strategy raises questions concerning the outcomes of RSNs. How does strategic openness affect the outcome of RSNs? What are the outcomes of an open strategy formulation and open strategy implementation? This paper focuses on the effects of greater strategy openness on the outcomes of RSNs. To achieve this goal, the study follows a quantitative exploratory survey based on 150 firms associated to 50 RSNs established by a regional public policy in southern Brazil. The unit of analysis of this study are the RSN. Results indicate that an open approach supports the RSNs' coopetitive strategy and ultimately affects their collective outcomes. Results also show a significant relationship between the member inclusion and internal transparency of the strategy process and the networks' outcomes.

Keywords: regional strategic networks; RSNs; open strategy; coopetition; networks; small firms; Brazil.

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1 Introduction

In a world of networks, firm competitiveness is immersed in the relationships with its network of partner firms (Zaheer et al., 2000). Networks are collaborative long-term arrangements in which firms establish joint strategies and structures and form governance relationships to achieve common goals (Hinterhuber and Levin, 1994; Kilduff and Tsai, 2003). For small firms with limited resources, networking turns into both a solution and a challenge (Lindman, 2002; Street and Cameron, 2007). The challenge lies in orchestrating the goals, gains and knowledge generation (Lindman, 2002). A critical issue that networks face on the basis of their nature itself, the number of firms collaborating for network-level outcomes, is that the needs and activities of a number of firms must be concerted, accommodated and coordinated, making network governance complex (Antivachis and Angelis, 2015). Therefore, to overcome this challenge and obtain the positive outcomes of networks, small firms must consider their relational context, which gives rise to regional strategic networks (RSNs). Based on strategic networks (Jarillo, 1993) and small firm network concepts (Perrow, 1992; Verschoore et al., 2016), RSNs are defined as long-term purposeful arrangements among firms that, while remaining independent, closely interact in a regional context, allowing them to win or sustain a competitive advantage (Lundberg and Johanson, 2011).

The coopetitive approach supports RSNs. Small firms collaborate with others firms to collectively become more competitive. The RSNs' coopetitive strategy takes an open approach, with strategy formulation and strategy implementation processes based on both

inclusiveness and internal transparency (Almiral and Casadesus-Masanell, 2010; Whittington et al., 2011; Vangen and Huxham, 2011; Chang et al., 2012). In fact, this open approach of a coopetitive strategy raises questions concerning the outcomes of RSNs. How open are the strategic processes in RSNs? Which strategy practices are to be open? And which are to be closed? What are the effects of an open approach for strategy formulation and strategy implementation? How does strategic openness affect the outcomes of RSNs?

This paper focuses on the effects of the strategy openness on the firms associated to the RSN created and supported by means of regional public policies, the cooperation networks program (CNP). Since 2000, CNP has fostered the establishment of more than 200 RSNs, turning this policy into the main empirical field of studies on small-firm networks in Brazil (Verschoore and Balestrin, 2011). The unit of analysis of this study are firms associated to the RSN. Our study follows a quantitative exploratory survey based on previous qualitative exploratory research. Our sample is composed of 150 firms associated with 50 RSNs. In addition to that, we have different sizes and ages due to the operating cycle of the public policy program. We select only the networks that had records of performance at the time of the research. Based on the data collected, we utilised a multivariate multiple regression analysis to evaluate the relation between our variables and the RSN outcomes.

The paper is organised as follows. Section 2 discusses RSNs and their possible outcomes. Section 3 presents the discussion of strategic formulation and implementation from the coopetitive perspective, emphasising issues related to the inclusion and the transparency of processes. Section 4 describes the methodology procedures used in the research, while Section 5 presents our results. Section 6 discusses the results and the contributions of our research to this subject. By gathering the limitations of the study, the final section presents potential areas of study in RSN that may be fertile ground for future research.

2   Regional strategic networks

Network cooperation has received increased attention from academics and managers due to the socio-economic changes occur with the rapid expansion of international markets, fast technological advances, the increased flow of information, and the dynamics of social media communications (Castells, 2013). In this context, open business models have emerged in the business literature. This concept refers to a company's process of buying, selling, licensing, transferring ideas and technologies to external parties in order to develop business, being more effective in creating as well as capturing value (Chesbrough, 2012; Schneider and Spieth, 2013). The open approach emphasises connectivity and engagement, and firms involved are more transparent about their decisions vis-à-vis closed business models (Kleindorfer and Wind, 2009).

In this context, small firms have built and nurtured networks as an alternative to remain competitive. Although research on small-firm networks dates further back, such networks have begun to be studied more intensively during the 1990s with the publication of a few seminal studies (Jarillo, 1993; Perrow, 1992; Borch and Arthur, 1995). Small-firm networks were then broadly defined as long-term purposeful arrangements by which firms established a web of close relationships that form a veritable system allowing them to win or sustain competitive advantages (Jarillo, 1993).

Since then, different approaches and networks types and forms have explained and enriched our knowledge of the phenomenon (Hammarfjord and Roxenhall, 2017). Among such approaches, this paper focuses on horizontal networks understood as "[a]lliances with similar firms in similar markets in order to develop and/or exploit a particular technology or penetrate a geographical market segment" [Hinterhuber and Levin, (1994), p.47].

As geographic proximity is an essential element to nourish the relationships needed to establish horizontal networks, recent studies on horizontal small-firm networks have named them RSNs (Lundberg and Johanson, 2011; Persson et al., 2011; Eklinder-Frick et al., 2011, 2012; Andrésen et al., 2012). Small firms that take part in a RSN, operate in the same industry and bring with them similar backgrounds. Because they are located in the same region, they also share the same context, and as a result, they begin to understand common problems and joint opportunities over time. "This also means that they share a single view of business. Here we find companies that are both business partners and competitors" [Lundberg and Johanson, (2011), p.12].

RSNs are different from small-firm networks in two aspects. First, whereas small-firm networks arise based on opportunities that strictly benefit firms, RSNs are formed with the objective of providing outcomes that serve the purpose of regional development in accordance with public policies (Lundberg and Johanson, 2011). Second, RSNs are supported by representatives from universities or government agencies because they are part of a regional development policy funded by public resources (Lundberg and Johanson, 2011).

According to Lundberg and Johanson (2011), the goal structures of these networks are complex, and it is difficult to identify direct cause-effect relationships between measures and outcomes. The same situation occurred with the earliest initiatives of horizontal networks (Hinterhuber and Levin, 1994). However, recent advances in the network studies on small have been able to explain some determinants of success (Schoonjans et al., 2013; Naudé et al., 2014). Research has shown that the RSNs provide learning outcomes (Balestrin et al., 2008), innovation outcomes (Gronum et al., 2012), and collective capabilities (Jansson and Boye, 2011). RSNs have been able to achieve the collaborative advantage (Huxham and Vangen, 2005) through different outcomes, such as collective solutions, scale and market power, learning and innovation, social relationships, and cost and risk reduction (Verschoore and Balestrin, 2011).

Unlike strategic networks, which are built and managed by a leader firm (Jarillo, 1993), RSNs receive public support for their formation and development. Public agents seek to motivate the companies chosen to participate in the network through activities of promotion and coordination that they believe to be useful and valuable. "These activities will lead to the development of social and business relationships that foster the interaction among companies that is claimed to characterize economically successful regions" [Lundberg and Johanson, (2011), p.7)]. Such imperatives have generated implications for governments seeking to promote network initiatives among firms to promote regional development through improved firm performance, while also generating a more uniform income distribution and increased employment. Therefore, public resources have been expanded to include projects and programs aiming to establish and nurture relationships among firms (Parker and Ekelund, 2011). There is evidence of this active role of public and private actors in supporting the creation and success of RSNs (Huggins, 2000; Eklinder-Frick et al., 2012).

In 2001, in southern Brazil, the State Government of Rio Grande do Sul established a regional development policy based on RSNs called the CNP. The CNP consists of a methodology of training and supporting infrastructure, obtained through partnerships with regional universities and specialists acting as brokers among small firms (Verschoore and Balestrin, 2011). The strategy supported by the CNP assumes a coopetitive emphasis, in which small firms cooperate to compete against firms that do not take part in the RSN (Bengtsson and Kock, 2000, 2014; Padula and Dagnino, 2007; Walley, 2007).

To establish and maintain the cooperative relationship in a perennial network, the CNP adopted a strategy formulation and strategy implementation mechanisms allowing to bring together the open approach, focused on the collective network strategy, and the closed approach focused on the individual firm strategy. The next section will discuss issues related to such an open and closed strategy as well as to RSN strategy formulation and strategy implementation processes.

3   Formulation and implementation of an open strategy

In the field of strategic management, competition and cooperation have commonly been understood as distinct alternatives of the interaction between firms (Nag et al., 2007). The increase of such phenomena as interfirm networks and strategic alliances has progressively motivated scholars to study how the simultaneous combination of cooperative and competitive actions may lead to firm superior performance and, in particular, small firms performance (Nakos et al., 2014; Gnyawali and Park, 2009).

In this sense, coopetition is an interfirm strategy which allows the firms involved to manage a partially convergent interest and goal structure and to create value by means of coopetitive advantage (Dagnino, 2009). Coopetition in interfirm networks enhances the results of interdependent mechanisms of value creation in which private interests converge to a certain point (Dagnino, 2009), as there is a paradoxical tension between creating and capturing value across network firms (Raza-Ullah et al., 2014; Laursen and Salter, 2014).

Studies in this research area seek to understand firm strategy at both the firm level and network level (Pathak et al., 2014). "It has been claimed that coopetition has moved from the firm level to the network level, and that we now refer to strategic networks" [Bengtsson and Kock, (2014), p.184]. Also, coopetitive strategies have greater explanatory power for the activities of creating value (Dagnino, 2009) and capturing value from open business models (Bengtsson and Kock, 2000; Madhavan et al., 2004; Ritala, 2012).

In the context of open business models, Chesbrough (2012) and Chesbrough and Appleyard (2007) show that value can be created and captured alternatively by the single firm and by the network in which it is inserted. However, the business models discussed by these researchers do not detail dimensions that affect the opening of practices and processes. For Appleyard and Chesbrough (2017, p.310–311) "Open strategy, an open initiative is characterized by: the reliance on assets outside of the firm's boundaries (inclusion), and the (free) access to project results by outsiders (transparency)."

Such details were provided by the concept of an open strategy (Lindman, 2002; Whittington et al., 2011; Matzler et al., 2014). An open strategy, as well as open business models, occurs in different contexts and different formats. The importance of open strategy is consistent with the current strategy-as-practice ambition to connect macro-level trends with the micro level (Hautz et al., 2017). In the context of networks, the macro-level represents the collective network strategy and consequently the micro-level represents the individual strategy of each firm associated.

However, open strategies encompass a set of practices and broader and ambiguous processes that include internal and external insights in the strategy formulation and internal and external involvement in the strategy implementation. "The opening of a strategy will, we argue, widen the search for strategy ideas and improve the commitment and the understanding in strategy implementation" [Whittington et al., (2011), p.535]. Consequently, these authors propose inclusion and transparency as two dimensions that can increase the openness of the strategy formulation and the strategy implementation processes.

The inclusion of network members in strategy formulation and strategy implementation refers to interactive participation, in which information, standpoints and proposals are shared among participants to shape the evolution of the strategy (Whittington et al., 2011). In this perspective, open strategy becomes a process of communication, being built and nurtured through iterative relations (Spee and Jarzabkowski, 2011). An iterative involvement provided by the inclusion of network members in the strategy formulation helps establish a shared vision of what they aim to achieve, but also leads to the difficulties associated with inclusion in the strategy processes (Mantere and Vaara, 2008; Kwon et al., 2014). Therefore, scholars propose that understanding strategy formulation as a dialectic top-dow plans and bottom-up suggestions, stimulating critical thinking and genuine involvement, and dismantling strategy into operationalised goals to enable the aligning of activities that motivate the inclusion in the strategy process (Mantere and Vaara, 2008).

Whittington et al. (2011) consider the transparency of strategic processes as the sharing of information in the formulation process and, in particular, in the implementation process. Transparency consists of the intentional provision of qualified information (Schnackenberg and Tomlinson, 2014) that drives the strategic implementation of firms (Berggren and Bernshteyn, 2007). The study of relationships between firms by Larsson et al. (1998) showed that transparency intensifies the dilemma of sharing or not sharing strategic information. Therefore, the critical caveat of network coopetition is establishing which strategic processes should be open between firms in the network and which should be kept closed to collectively create value and individually capture value.

In this dilemma, two conflicting strategic approaches stand out. In the closed approach, strategy is formulated and implemented in a confidential and exclusive way for actors who do not always consider the expectations of others actors involved. On the other hand, in the open approach, strategy is formulated and implemented interactively. In this open approach, issues such as the inclusion of actors and transparency with those involved ones, even those that are outside the boundaries of the firm, become relevant dimensions in the strategic process. "Moreover, it extends the notion of inclusion beyond the boundaries of the firm, to incorporate outside actors such as consultants, suppliers and

complementors; likewise, it refers to internal transparency as well as external" [Whittington et al., (2011), p.535].

In RSN' context, which bring together firms with processes, practices, and discourses that are often different and conflicting (O'Leary and Bingham, 2007), both approaches, open and closed, complement each other in the simultaneous dynamics of cooperation and competition. The two approaches represent a combination and recombination of individual and collective resources, in which the outcomes are determined both by the closed and open formulation and by the closed and open implementation (Bengtsson and Kock, 2000; Gadde et al., 2003; Chang et al., 2012).

In this perspective, the formulation and implementation of network strategy broaden the scope and integrate collective actions among member firms toward the network goals (Park, 1996). In other words, the outcomes of RSNs depend on not only the relationships among small firms, but also on the collective strategy implementing by them. RSNs require network skill sets and network strategic capabilities in selecting appropriate partners and managing relationships (Möller and Svahn, 2003; Love et al., 2014) to address the issues of value creation and value appropriation in a network environment (Ryan, 2013).

Therefore, the importance of strategy formulation and strategy implementation to achieve the outcomes of RSNs lead to formulate the first set of research hypotheses:

Hypothesis H1a   The formulation of a network strategy positively affects the RSN's outcomes.

Hypothesis H1b   The implementation of a network strategy positively affects the RSN's outcomes.

Additionally, scholars postulate that the needs of network members can be met by jointly defining their collective goals (Grandori and Soda, 1995) and aligning the individual goals with the congruence of common objectives (Huxham and Vangen, 2011). Nevertheless, studies have shown that information sharing and goal alignment between actors (Chesbrough and Appleyard, 2007), in addition to network participation (Stam, 2009) in the strategic implementation of open business models, positively affects firm outcomes. Therefore, the opening of the strategy formulation and the strategy implementation processes through greater inclusion (Whittington et al., 2011; Mantere and Vaara, 2008; Spee and Jarzabkowski, 2011) and greater transparency (Whittington et al., 2011; Larsson et al., 1998; Schnackenberg and Tomlinson, 2014) will allow member firms to achieve collective and individual outcomes. The importance of openness in strategy formulation and strategy implementation to achieve RSN outcomes leads to the second set of research hypotheses:

Hypothesis H2a   The opening of the network strategy formulation positively affects the RSN's outcomes.

Hypothesis H2b   The opening of the network strategy implementation positively affects the RSN's outcomes.

To test the four hypotheses above, we have conducted a quantitative exploratory survey based on previous qualitative exploratory research. The next section discusses the methodological issues of the research.

4 Methodology

4.1 Research setting and sample

Our study follows a quantitative exploratory survey. From the analysis of the literature (Bengtsson and Kock, 2000; Dagnino, 2009; Whittington et al., 2011; Lundberg and Johanson, 2011), we develop four hypotheses to be tested on two constructs linked to the outcomes provided by the networks and to the outcomes absorbed by the firms. We utilised a multivariate multiple regression analysis to evaluate the relation between our constructs and the RSN outcomes.

Our sample was composed of 50 RSNs out of 250 networks participating in the CNP. We adopted a stratified sampling technique in order to embrace a variety of network ages, network sizes and network activity sectors. The sample selected considered only active networks in accordance to the CNP and covered 20% of the overall population of RSN in the State of Rio Grande do Sul. Among the selected RSNs, 28% were service networks, 12% were manufacturing networks, and 60% were retail networks. The average network size in our sample was 37.78 small firms (s.d. = 54.83), and the average age of the RSNs was 8.68 years (s.d. = 3.01). In order to capture different perspectives of each RSN, we collected data from three respondents: a representative from the board of directors, a representative from the member firms and the network's executive director. All respondents were in key positions to assess the situation of the RSN in which they participated. Thus, our final sample was composed of 150 observations from 50 RSN participating in the CNP.

4.2 Data collection procedures

Rio Grande do Sul is the southernmost state of Brazil; it has a population of approximately 11.3 million people and a GDP of approximately 120 billion dollars in 2015. The networks investigated belong to the only Brazilian state that has a public policy with actions aimed at fostering cooperation among small firms. According to Brazilian economic standards, small firms are those with annual revenue of less than US$ 600,000. Since 2000, the Rio Grande do Sul State Government runs the CNP to support small firms, which promotes a socially sustainable regional development and supporting RSNs through a triple helix logic (government, firm, university). The main goal of the CNP is to create RSNs to achieve coopetitive advantages working as a group rather than competing alone and against one another. The firms affiliated to the RSN present convergent private interests. Thus, firms can survive in the long-term in a hostile environment and face the intense competition imposed by medium and, more specifically, large multinational firms. Since its beginning, CNP helped approximately 5,000 small firms to establish 250 RSNs.

The operationalisation of the CNP includes instruments for the strategy formulation and strategy implementation. CNP works together with universities that received and managed funds to support the creation and maintenance of RSNs in different regions of the state. The participating universities develop an action plan based on the instruments proposed by the CNP and hire employees responsible for visiting small firms, forming RSNs, and coordinating actions to facilitate their continuous growth.

We did not identify similar examples in other Brazilian states; therefore we did not find studies that proposed an instrument for data collection that was adequate to the reality of RSNs established by the CNP. This led to the creation and development of a test for a new instrument. Thus, in a qualitative study guided by the design research method (Takeda et al., 1990), we developed the instrument for data collection. Our measurement instrument was developed from a complete inductive approach that allowed the measurement items to come up from the in-depth interviews we had with representatives of the firms associated to the RSNs and executives associated with the CNP (Bortolaso et al., 2010, 2013).

The work was developed based on seven stages.

1   Literature review: we worked on a literature analysis with the objective of understanding the phenomenon.

2   Theoretical support: we analysed the main theoretical elements to be considered for the strategic approaches.

3   Interviews: we performed in-depth interview with selected executives who were chosen because of their experience in managing small firms and participating in the CNP.

4   Creation of management items: we created the measurement items used to capture information about RSN characteristic constructs based on the results of the in-depth interviews.

5   Test with specialists (professors, academics, entrepreneurs and CNP managers): we followed an interative process as we asked seven experts in the field to judge our measurement items in terms of their clarity and adherence to our intended constructs. According to the feedback provided by the experts, we made modifications to improve the quality of our measurement instrument.

6   Pilot study: after the refinement procedures, we conducted a pilot study with four RSNs and 20 participant firms to test the measurement items in the field. The measurement items were evaluated using a five-point scale that varied from '1' for 'poor' and '5' for 'excellent'.

7   Validation: we validated the instrument in these four pilot study cases. It was not necessary to change the items, or he measurement or the proposed scale. With the valid and elaborated instrument elaborated, the second phase of the research began; the application of the instrument of data collection to the 150 respondents, linked as 50 RSNs'. Data gathered from the pilot study was not considered part of the sample of the second research phase.

Data was collected by three expert researchers specifically trained to evaluate RSNs' strategic constructs and firm participants' outcomes constructs. These researchers collected the data to reduce respondents' bias by representing themselves in a positive manner, commonly referred to as the *social desirability problem* (O'Leary-Kelly and Vokurka, 1998). The social desirability problem is typically associated with auto-application surveys in which the respondent evaluates his/herself or its own firm, occasionally feeling pressured to show his/herself and provide information according to the social norms rather than their actual experiences. To avoid the social desirability problem, researchers asked for documents which could ensure

that given answers where realistic (company's marketing and expansion plan, joint purchasing plan, creation and participation in fairs in conjunction with other firms, new products and services and projects developed in partnership with firms from the same RSN). These documents were essential for understanding the common vision among small firms.

4.3   Independent variables

4.3.1   Closed strategy formulation

The following three measurement items were used to measure the closed strategy formulation:

1   the RSN has a clear set of long-term objectives

2   the RSN performs environmental (external) and organisational (internal) analyses

3   the RSN's strategic plan has been translated into short-, medium-, and long-term tasks and activities.

4.3.2   Closed strategy implementation

The following two measurement items were used to measure the closed strategy implementation:

1   procedure for monitoring of actions to achieve the goals

2   indicators for monitoring the actions and targets are reviewed periodically by the RSN.

4.3.3   Open strategy formulation

The following three measurement items were used to measure the open strategy formulation:

1   the formulation of RSN planning together by the members

2   the involvement of all associates in RSN activities

3   the firms' members share relevant RSN planning information.

4.3.4   Open strategy implementation

The following three measurement items were used to measure the open strategy implementation:

1   regular meetings for monitoring corrections and adjustments that were initially formulated

2   actions associated with an aligned network strategy

3   motivation mechanisms for the strategic alignment of its members.

4.4   Dependent variables

4.4.1   Outcomes provided by the RSN

The following seven measurement items were used to measure the outcomes provided by the RSN:

1   participation in RSN learning activities provided for associated firms

2   participation in the RSN provided for the expansion of trade relations for associated firms

3   participation in the RSN provided for better trading conditions for associated firms

4   participation in RSN brought innovations from the market to firms' associates

5   participation in the RSN generally reduces costs and risks for associated firms

6   participation in the RSN provides infrastructure and specialised contracting services to increase the competitiveness of member firms

7   the RSN participation narrowed the relational ties between members of the RSN.

4.4.2   Outcomes absorbed by the firm

The following eight measurement items were used to measure the outcomes absorbed by the firm:

1   revenues from the firms was increased

2   the profitability of member firms has increased

3   the number of employees of member firms has increased

4   the facilities of the associated firms improved

5   the credibility of the associated firms improved

6   there was increased confidence in the business itself by member firms

7   there was increased confidence of entrepreneurs associated

8   participation in the network improved the quality of life of associated entrepreneurs.

5   Results

Data analysis was performed through a multivariate statistical technique that was processed by the statistical package for social sciences (SPSS) software version 21. Initially, the calculation for the Cronbach alpha coefficient was made in order to estimate the internal reliability of the collection instrument; the coefficient was of 0.973 (947%). After this, a factorial analysis was performed for the independent variables, which facilitates the determination of the factors. All variables have high correlations among themselves. Furthermore, the Kaiser-Meyer-Olkin (KMO) test (KMO measure of sampling adequacy) suggests that the sample is adequate in terms of the degree of partial correlation between variables, as it offers a value of 0.918. Thus, we can confirm that the factor analysis is a suitable method for processing the data. Finally, Bartlett's sphericity

test (Hair et al., 2009) rejects the null hypothesis that the model is not suitable to the observed associations because the significance level is less than 5%.

In the anti-image matrix for all variables, the values along the diagonal are high, illustrating that these variables are suitable for use in the factor analysis. A principal components analysis was also used as the extraction method. The results of the commonalities evidence that all of the variables have a strong relationship with the retained factors for having high commonalities. The next step is therefore to analyse the retained factors and the total variance explained. The eigenvalues are ranked by size. Initially, the sum of the eigenvalues equals the number of variables (11). Because there is an eigenvalue greater than 1, the number of retained factors is 1. Instead of working with eleven variables, the factorial method suggests using one variable, because this factor can explain 66.49% of the total association between the data. The matrix components of the factors after rotation, rotated by the varimax method, were not considered because of the extraction of only one factor.

The factorial method was also applied to dependent variables (outcomes provided by the RSN/outcomes absorbed by the firm). The KMO test yielded a model fit of 0.928, confirming that the factorial method is appropriate for application in this study. The Bartlett sphericity test validates the rejection of the null hypothesis due to the level of significance of less than 5%. The commonality values are greater than 0.5. Regarding the extraction of factors, the analysis of the dependent variables reveals the extraction of two factors. In this case, the factor model suggested the use of two factors rather than 15. Regarding the observation of the results provided by the application of the factorial method, the four constructs (factors) identified in the literature are not repeated in the empirical test. Thus, another multivariate technique, multivariate multiple regression, was used to explore the data.

In the second stage, multivariate linear regression was used (Hair et al., 2009). The least-squares method is the most established method for estimating the parameters of a regression (Hair et al., 2009). With regard to data analysis, we first performed a correlation calculation. We expected that the independent variables (closed strategy formulation, open strategy formulation, closed strategy implementation and open strategy implementation) would be highly correlated with the dependent variables (outcomes provided by the RSN/outcomes absorbed by the firm).

Similarly, we expect a non-significant correlation between the dependent variables. The independent and dependent variables are significantly correlated (coefficients of 0.574 or more, significance lower than 0.001). As expected, the variables of closed formulation, of open formulation, and of closed implementation and open implementation have a cause-and-effect relation with the outcomes provided by the RSNs and the outcomes absorbed by the firms. However, we are aware that the model needs be adjusted due to multi-collinearity, and the new settings may change this result.

The independent variables are strongly correlated (significant correlations are lower than 0.001), with high values (0.574 or greater). This generates multi-collinearity and exclusion of variables in the model. This high correlation between the independent variables shows that one is a linear combination of the other. In this case, it is possible to use one of them to explain the model. The dependent variables are strongly correlated (coefficient = 0.731, sig < 0.001), indicating that a multivariate model may not be necessary, but it is not preventing its use. We also performed multivariate tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root – Hair et al., 2009).

Table 1   Parameter estimates

Dependent variable		Parameter	B	Std. error	t	Sig.	95% confidence interval		Partial Eta squared
							Lower bound	Upper bound	
dimension0	Absorbed by firm	Intercept	.707	.207	3.421	.001	.299	1.116	.075
		Averege_Open_Formulation	.410	.114	3.603	.000	.185	.635	.082
		Averege_Closed_Formulation	.015	.121	.122	.903	-.224	.254	.000
		Averege_Closed_Implementation	.030	.102	.297	.767	-.171	.232	.001
		Averege_Open_Implementation	.458	.115	3.997	.000	.231	.684	.099
	Provided by the RSN	Intercept	.974	.140	6.975	.000	.698	1.250	.251
		Averege_Open_Formulation	.340	.077	4.417	.000	.188	.492	.119
		Averege_Closed_Formulation	.253	.082	3.103	.002	.092	.415	.062
		Averege_Closed_Implementation	-.008	.069	-.113	.910	-.144	.128	.000
		Averege_Open_Implementation	.278	.077	3.589	.000	.125	.431	.082

The results suggest the exclusion of interaction terms that are not identified as significant. The model was re-estimated with only the main factors. The model is significant in explaining both responses, with adjusted R^2 values above 0.556 for absorbed by firm and adjusted R^2 values above 0.709 for results absorbed by the firm results, which indicates a reasonable model in terms of explanation. Recommended values should exceed 0.800 (Hair et al., 2009). The analysis suggests that the terms connected to the open strategy formulation and open strategy implementations are in fact significant for explaining the behaviour of the network response.

The results do not provide evidence that the closed strategy formulation and closed strategy implementation explain both answers. Additional analyses were performed by systematically removing the other variables to verify the effect of multi-collinearity on the responses. However, the proxy variables for the closed strategy formulation and closed strategy implementation were not significant.

As indicated by the multivariate multiple regression, the variables that were not significant were excluded. A new regression analysis was performed with only the open formulation and open implementation. The adjusted R^2 value for the new analysis indicates that the power of the model is 56% for the outcomes achieved by the firms and 69% for the performance provided by the RSNs.

The parameters were estimated to verify the models. The results are shown in Table 1.

The templates formed yield the following components:

$$\begin{pmatrix} YM01_{Absorbed} \\ YM02_{Provided \ by \ the \ RSN} \end{pmatrix} = \begin{pmatrix} 0.707 \\ 0.974 \end{pmatrix} + \begin{pmatrix} 0.410 \\ 0.340 \end{pmatrix} * average \ open \ formulation$$

$$+ \begin{pmatrix} 0 \\ 0 \end{pmatrix} * average \ closed \ formulation + \begin{pmatrix} 0 \\ 0 \end{pmatrix} * average \ closed \ implementation$$

$$+ \begin{pmatrix} 0.458 \\ 0.278 \end{pmatrix} * average \ open \ implementation + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix}$$

$$\begin{pmatrix} YM01_{Absorbed} \\ YM02_{Provided \ by \ the \ RSN} \end{pmatrix} = \begin{pmatrix} 0.707 \\ 0.974 \end{pmatrix} + \begin{pmatrix} 0.410 \\ 0.340 \end{pmatrix} * average \ open \ formulation$$

$$+ \begin{pmatrix} 0.458 \\ 0.278 \end{pmatrix} * average \ open \ implementation + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix}$$

The results indicate that by fixed the open strategy implementation variable, each unit of marginal increase in the proxy of the open strategy formulation (average of three variables) potentially generates 0.401 additional units absorbed by the firms and 0.340 additional units provided by the RSN. Similarly, by fixing the open formulation variable, each unit of marginal increase on the proxy variable of the open implementation (average of three variables) generates 0.458 additional units absorbed by the firms and 0.278 additional units provided by the RSNs.

In a third case, to obtain a measure of the change in the level of response for the two variables under consideration (outcomes provided by the networks/outcomes absorbed by the firms), we attempted to determine the structure of predictor variables using logistic regression, because the dependent variables in the study were originally multinomial.

This option was tested since the degree of change at one of the levels of the predictor variables would imply the degree of change in the variable response.

Furthermore, to apply the technique of multinomial logistics, adjustments were performed to the original data to adjust the data analysis. Thus, instead of the average, we used the sum of the original variables. Then, these summary-variables were recoded. In the application of the multinomial logistic regression, unexpected singularities were found in the Hessian matrix. The identification of these singularities suggests that some of the predictor variables should be excluded from the model or even that some categories should be merged (Hair et al., 2009). A possible explanation for the singularity in the matrix is likely associated with the high correlation between the variables. An alternative to the correction of singularity is reducing the number of categories. In the context of this paper, the categories cannot be reduced because the comparison of these categories is the study's objective. Consequently, we have chosen to return to the multivariate multiple regression and compared its results with the literature.

6   Discussion

The results we achieved suggest some theoretical and practical insights regarding the effects of strategy openness on the outcome of RSNs. First, hypotheses H1a and H1b, which relate strategy formulation and strategy implementation to the outcomes of RSNs, were rejected. However, hypotheses H2a and H2b, which relate to the open strategy formulation and open strategy implementation, were supported by the results.

Such evidences contribute to the understanding of RSNs in two aspects. First, they support the value of the coopetitive approach (Bengtsson and Kock, 2000; Madhavan et al., 2004) in a network context (Pathak et al., 2014) that requires an open strategy approach to achieve and sustain value creation and value appropriation. In fact, the need to address the tension between creating and appropriating value across the firms of the network (Dagnino, 2009; Raza-Ullah et al., 2014; Love et al., 2014) promotes involvement and sharing among the participants of the RSNs.

Second, our results show that open strategy formulation and open strategy implementation positively affect the RSN's outcomes (Verschoore and Balestrin, 2011). Such evidence supports early studies that emphasised the collaborative advantage (Huxham and Vangen, 2005). Collective capabilities, learning, and innovation outcomes (Balestrin et al., 2008; Jansson and Boye, 2011; Gronum et al., 2012) are absorbed mainly with the network members' involvement in the RSN strategy formulation and the RSN strategy implementation. Summing up, we can state that our results clearly indicate that coopetition among small firms in RSNs provides better outcomes when adopting an open strategy approach (Whittington et al., 2011).

Furthermore, we have observed that the network members' involvement in the strategy process assumes different shapes in the strategy formulation process vis-à-vis the strategy implementation process so as to generate RSNs' value creation and appropriation (Afuah and Tucci 2012; Chesbrough, 2012). In the strategy formulation process, our results show that open network mechanisms, such as joint planning and information sharing, have a weighted influence on the outcomes provided and absorbed by the member firms. In the strategic implementation process, instead, regular meetings and motivation mechanisms for strategic alignment exert a moderate effect on the outcomes.

Our results also corroborate the existing theoretical assumptions on the importance of member firms align individual and collective strategies and jointly define network objectives (Grandori and Soda, 1995; Huxham and Vangen, 2011). In this way, we strengthen the proposition that sharing and alignment of actors (Chesbrough and Appleyard, 2007; Stam, 2009) positively affects the RSNs' outcomes. The two specific dimensions of open strategy we have studied, inclusion and transparency, are underscored in previous investigation (Whittington et al., 2011). Our results show that strategy formulation in RSNs is a dialectic process between top-down plans and bottom-up suggestions that stimulate the network members' genuine involvement and transparency (Mantere and Vaara, 2008; Kwon et al., 2014), given that members share strategic information for network development (Larsson et al., 1998; Schnackenberg and Tomlinson, 2014). We also highlight the importance of inclusion in the strategy implementation through regular meetings and through motivation mechanisms for the strategic alignment of the network members (Whittington et al., 2011).

Finally, we underscore the contributions that this study provides to RSNs practitioners and managers. Results have pinpointed that participation in RSNs positively affects small firms performance (Schoonjans et al., 2013; Naudé et al., 2014), therefore, stimulating them to deliberately take coopetitive strategies. This finding supports the idea that small firms are expected to develop capabilities to continuously deal with variations in processes, practices, and strategic discourses and solve potential conflicts among them (O'Leary and Bingham, 2007). Therefore, if small firms wish to leverage the positive outcomes of being embedded in a network, we can conclude that they need to pursue an open strategy approach, encouraging simultaneous cooperation and competition, and accepting greater inclusiveness and transparency in strategy formulation and strategy implementation. This does nothing more than confirming that coopetition is in fact a viable strategic option for pursuing regional growth by means of the implementation of a set of well designed and RSNs in a specific region or state (Persson et al., 2011; Andrésen et al., 2012).

Results also emphasise the role of government as a catalyst agent of cooperation among small firms (Lundberg and Johanson, 2011). Public policies, such as the CNP initiative in the Rio Grande do Sul state in southern Brazil; need to strengthen public instruments for inclusion and transparency. Such public instruments may include the participation of firm and network representatives in the definition of action plans' goal and policy implementation, the creation of member communication spaces in the network, and the establishment of practices of information-sharing among network members.

7 Concluding remarks

In this paper, we addressed the open strategy approach for small firm coopetition in RSNs. Based on networks created in the context of the CNP in southern Brazilian state of Rio Grande do Sul, we have performed a quantitative analysis from a survey of 150 representatives taken from 50 RSNs. The results have overall showed the importance of establishing open strategies for mitigating the cooperative and competitive tensions among firms and particularly for the outcomes provided by the RSNs and outcomes absorbed by the firms. The evidences regarding the use of instruments of inclusion and

transparency in formulating and implementing strategy allow for a deeper understanding of coopetition. Thus, this study may serve as a guide for scholars and practitioners toward unravelling the usefulness and efficiency of an open approach in the strategic processes of RSNs.

As any other research, this study presents some limitations. First, we acknowledge that a limitation of our study is the sample analysed, which is limited to RSNs existing in a specific geographical area in Brazil. We are aware that a larger sample may provide better and more robust results in terms of regression coefficients, which could in turn provide more precise effects of predictor variables on the results provided and absorbed. Future studies should collect data from a larger number of RSNs and member firms.

In addition, we know that the data available did not allow us to examine in more detail the interactive relations that forge and nurture inclusiveness and transparency in RSNs' open strategy. Thus, future studies on RSNs' could use qualitative approaches to uncover the dynamics of strategic openness and how it develops in the context of coopetition among small firms. A third limitation of this paper is related to the collection instrument. We did not use control variables, such as network size, network age, and industry dummies. Furthermore, predictor variables may be added to the model to contribute to its accuracy. The inclusion of such objective variables as income, expenses, number of employees, and sales might be used to provide a more refined perspective on RSNs and the characteristics of member firms.

Despite these limitations, every strategy entails trade-offs. In the context of the RSNs, the strategy allows for the addition of individual and collective resources to improve competitiveness, but it requires a difficult combination of cooperation and competition in the formulation and strategic implementation, for which few firms are prepared. We are aware that many of the RSNs studied maintain closed strategy processes and top-down managerial decisions. However, we must consider that organisational forms, such as RSNs, are still developing their own business practices to better align the simultaneity of their multiple and occasionally contrasting strategy processes, which is the real network challenge.

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