

Influence of governance instruments on supply chain quality: a qualitative investigation in the dairy industry

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Abstract

Purpose – This paper aims to explore the formal (i.e. contracts, standards, processes, and structure) and informal (i.e. social structure, norms, information sharing, and value system and culture) governance instruments used in supply networks and their influence on quality.

Design/methodology/approach – This research is qualitative-exploratory in nature, involving semi-structured interviews with 20 managers from three essential layers in the dairy industry's supply chain: companies that supply essential inputs to milk producers; milk producers; and milk cooperatives.

Findings – Analysis of the generated data show that formal governance instruments have a strong and/or weak influence on products' and operations' quality in the dairy industry context; informal instruments have a strong and/or weak influence on quality, as a counterpart to formal instruments; and the integration of verified governance instruments positively influences the quality of products and operations.

Practical implications – This paper offers several managerial and practical implications. The first is to encourage suppliers of primary inputs and milk producers to invest in the formal structure, primarily in formal contracts with each other. The second implication suggests the relevance of creating different training and qualification courses with members from all organizational levels. Third, there is a need for cooperatives, encompassing all industries, to consider several informal instruments, complementary to contracts and standards currently used for processes.

Originality/value – Governance instruments can lead to desired supply chain outcomes, including those related to quality. Although previous supply chain studies have investigated the relationship between governance instruments and the supply chain, and quality management and the supply chain, studies on governance instruments' influence on supply chain quality are limited.

Keywords Governance, Supply networks, Supply chain, Quality, Dairy industry

Paper type Research paper

1. Introduction

The supply chain is a network consisting of nodes and links (Carter *et al.*, 2015). Based on this premise, this work will use the terms supply chain (SC) and supply network (SN) interchangeably. Studies on supply chain network (SCN) governance have become more prevalent in recent supply chain research (Cardoso de Oliveira *et al.*, 2019; Denolf *et al.*, 2015; Eltantawy, 2016; Formentini and Taticchi, 2016; Gereffi and Lee, 2016; Martins *et al.*, 2020; Soundararajan and Brown, 2016; Varoutsas and Scapens, 2015). These studies emphasize that through its instruments, governance can lead to desired outcomes (e.g. performance, control, coordination, innovation) across the SC.

The SN results will depend on the context (i.e. economic, political, and social) (Pilbeam *et al.*, 2012). The context of SN refers to the industrial environmental characteristics in which



the networks operate, such as globalization, organizational changes, uncertainties and unpredictability, risks, legislation, partner characteristics, and relationship history (Pilbeam *et al.*, 2012). However, governance instruments may also lead to positive changes in the SN context. Social upgrades can be obtained depending on the type of governance involved in the SC actors' interactions (Gereffi and Lee, 2016). These arguments reinforce the assertion that understanding the governance role in the SN can help drive desired results, and that the SN context has essential significance.

SN governance is related to the coordination mechanisms used in the network, both formal (contracts, standards, processes, and structure) and informal (social structure, norms, information sharing and value system, and culture) (Pilbeam *et al.*, 2012). Some studies have found that formal governance mechanisms establishing buyer-to-supplier governance can guarantee the quality expected by the buyer and provided by the seller (Jiang, 2009; Yu *et al.*, 2006). However, other studies have identified that it is informal mechanisms and instruments that are the foundation of governance in a SC. These informal instruments create enabling conditions and enhance trust related to supply chain quality (SCQ) (Alvarez *et al.*, 2010; Machado *et al.*, 2019). The quality of a product or service, when it reaches the consumer, is a function of the quality performance of each chain operation used to supply it. This demonstrates, simply and objectively, what quality represents in SNs. This condition can lead to cost reduction as well as improved efficiency and flexibility, which will impact the quality of the network suppliers (Sila *et al.*, 2006). From these arguments, we can infer that formal and informal instruments can impact SCQ.

Much attention has been paid to the investigation of supply chain management (SCM), on the one hand, and quality management, on the other hand (Dellana and Kros, 2014; Denolf *et al.*, 2015; Gray and Handley, 2015; Machado *et al.*, 2019; Soltani *et al.*, 2011). Previous research has also shed light on formal and informal instruments' relevance for SC outcomes (Martins *et al.*, 2020; Oliveira *et al.*, 2019). However, research that seeks to investigate the influence of formal and informal instruments, specifically on SN quality, is limited and tangential. While some authors have analyzed only the isolated influence of each dimension (formal or informal) (Hernández-Espallardo *et al.*, 2010; Wang *et al.*, 2014), others have neglected the association of both types of instrument in relation to the quality of the network suppliers (Yu *et al.*, 2006). In other words, some studies have investigated the influence of the formal dimension or the SN. However, studies associating the influence of both dimensions are scarce. Further, studies exploring the formal and informal dimensions in relation to the SC's quality remain limited. This theoretical gap suggests the following research question: How do formal and informal governance instruments influence supply chain quality?

This paper seeks to partially fill this theoretical gap by empirically investigating 20 small producers in a Brazilian dairy industry SN. The dairy industry is an empirical context relevant to the study of governance instruments' influence. In the dairy industry, small producers supply large cooperatives. In terms of quality in the small businesses context, the output is impacted by large companies' demands (Graafland, 2018; Machado *et al.*, 2020). Therefore, small dairy producers need to meet cooperative standards to achieve the quality expected (Chen *et al.*, 2014; Souza *et al.*, 2017). Moreover, buyer trustworthiness can impact output quantity and quality (Gorton *et al.*, 2015).

The empirical results show that governance instruments significantly influence quality in the SN and that when both formal and informal instruments of governance are combined, results may be improved. This paper has theoretical and empirical contributions. At the theoretical level, this paper elaborates on a novel conceptual model that associates formal and informal instruments' relevance with the quality of the SC. At the same time, it sheds light on the impact of formal and informal instruments on the empirical context in which SNs operate.

The remainder of the paper is organized as follows. In Section 2, we review the literature necessary for the framework design and the consequent proposition development. In Section 3,

we describe the methodology and present the results. In [Section 4](#), we analyze the findings, with further discussion, including contributions to managerial practice and theory, provided in [Section 5](#). [Section 6](#) provides the conclusions, including limitations and areas for future research.

2. Literature review and proposition development

2.1 Supply network (SN) governance

Governance in SNs can be defined as a hybrid form of governance (e.g. [Verwaal, 2004](#)). This hybrid form is based on the assumptions of [Coase \(1937\)](#), which served as the basis for [Williamson \(1979\)](#) to define a third structure of governance in the coordination of production, which is situated either within the market, through the pricing system and the hierarchy, or the organization, through the complete internalization of resources, called vertical integration. This hybrid structure may contain both formal and informal governance instruments ([Yu et al., 2006](#)). Formal contracts and financial commitments act as formal mechanisms of governance, which establish bonds of reciprocal obligations ([Ferguson et al., 2005](#); [Williamson, 1979](#)), while informal or relational governance is defined as inter-organizational exchanges that include significant specific relationship assets, denoting a high degree of trust ([Granovetter, 1985](#)), and that “can enhance exchange performance by embedding private and public information flows in a matrix of social ties” ([Ferguson et al., 2005](#), p. 221).

2.2 Formal governance

Formal governance, which supports and sustains cooperation and collaboration among organizations participating in a SN to achieve common objectives, can include contracts, standards, processes, and structure ([Pilbeam et al., 2012](#)).

Formal contracts are documents that are legally binding, in which the parties agree on rights and obligations pertaining to the transactions carried out ([Burkert et al., 2012](#)). The greater the complexity of these contracts, the greater the specification of pledges, obligations, and dispute resolution processes ([Poppo and Zenger, 2002](#)). Therefore, formal contracts and financial commitments are formal governance mechanisms, which establish bonds of reciprocal obligations. However, contracts *per se* may not be enough to mitigate opportunism in the presence of a high degree of uncertainty ([Williamson, 1979, 1985](#)).

Standards are instruments used for output and participation in the SN. In addition, standards may specify, for example, the product quality threshold or describe the achievement or possession of certain participation criteria that enable SC coordination ([Pilbeam et al., 2012](#)). Standards ensure encodability that reduces transaction costs associated with chain governance. Some of the most important standards are the International Organization for Standardization (ISO) 9000 quality management standards, food safety standards such as Hazard Analysis and Critical Control Points (HACCP), and the British Retail Consortium’s (BRC) Global Standards ([Nadvi, 2008](#)).

Processes are considered one of the key elements in the SC framework and are defined as an organized and evaluated set of activities designed to produce a specific outcome for a particular client or market ([Davenport, 1993](#)). Therefore, a process is a structure of activities designed to focus on the end customer, based on the dynamic management of flows involving products, information, money, knowledge, and ideas ([Lambert et al., 1998](#)).

Structure refers to identifying key actors in the SC and the consequent linking of processes to them. Therefore, explicit knowledge and understanding of the SN’s structural configuration are key elements for its management ([Lambert et al., 1998](#)). The challenge is to establish a governance infrastructure that aims to improve communication and

coordination between partners in the chain, which infrastructure facilitates (Fawcett *et al.*, 2006).

When the application of formal control is excessive, due to legal and emotional pressures, managers must develop the same degree of joint socializing actions between buyers and sellers, based on the formal control infrastructure. These actions help companies search for cooperative advantages in their SC to build a relationship between buyers and sellers. In this way, managers can solidify collective interests, reducing both opportunism and conflicts among individual members (Huang *et al.*, 2014).

2.3 Informal governance instruments

The social structure, which involves relationships and immersion, is a much-discussed informal governance instrument, as are the contracts in formal instruments. This immersion or “embeddedness” establishes the argument that behavior and institutions are so limited by ongoing social relations that interpreting them as independent is a severe misunderstanding. Therefore, the embeddedness argument emphasizes the role of concrete personal relationships and structures (or “networks”) in generating trust (Granovetter, 1985). SCs have an inherent social structure, where relational constructs of power and trust provide alternative and equally satisfactory explanatory mechanisms for the interrelation between context and instruments and instruments and results (Pilbeam *et al.*, 2012).

Relationships between firms are shaped not only by economic rationales, but also by social (Reimann and Ketchen, 2017) or relational (Marques *et al.*, 2022) norms. Social norms are informal rules that link parts to their sets of activities and reflect flexibility (willingness to adapt procedures) and solidarity (desire to maintain a relationship) (Bello *et al.*, 2004). They produce goal alignment and reduce traditional agency costs related to incentives and monitoring (Bertels and Vredenburg, 2004). Social norms may appear as a substitute for formal contracts in the regulation of exchange and cooperation (Grandori, 2006). Therefore, social norms are defined as informal instruments that encourage or discourage particular behaviors at both an individual and organizational level (Pilbeam *et al.*, 2012).

Information sharing is another identified informal governance instrument. When decision-making mechanisms are participatory and informal, performance risks are reduced by the participation of partners in the sharing of their respective expertise (Das and Teng, 1998). Information sharing allows for the capture, storage, and provision of information needed to ensure effective decision-making. Each member of the SC has the necessary view of the processes to monitor and control products’ progress at each SC stage (Simatupang and Sridharan, 2008). In some cases, occasional and straightforward interactions for sharing information can be more beneficial in terms of costs than highly sophisticated technical connections in real-time (Ghosh and Fedorowicz, 2008).

In established relationships, organizations tend to be compatible, sharing common value systems, and often having similar cultures (Pilbeam *et al.*, 2012). The value system, in the context of SNs, refers not only to material flow networks, but also to knowledge flow networks (Choi *et al.*, 2001). In some governance systems, strategic decisions are jointly defined by participants and activities are coordinated through the definition of participatory rules, which reflect shared values (Parrilli and Sacchetti, 2008). Despite the many different definitions of culture in the literature, there is consensus that organizational culture refers to a pattern of beliefs and values that are manifested in shared practices and behaviors among the organizational members of a SC (Cadden *et al.*, 2013).

2.4 Quality in Supply Chain Networks (SCNs)

Quality management in SCs is defined as an approach based on a performance improvement system that leverages opportunities created by upstream and downstream linkages with

suppliers and customers (Foster, 2008). Integrated quality assurance in the SC means agreement on specifications, information exchange, coordination, and control, or even redesigning the SC to realize value for the customer at the lowest organizational cost, emphasizing the cooperation required (Ziggers and Trienekens, 1999).

Quality coordination in production chains is defined as the set of activities planned and controlled by a coordinating agent, aiming to improve quality management. It also assists in the processes of guaranteeing and improving the quality of the products along the chain, through the process of acquisition, management, and distribution of information, which contributes to the improvement of customer satisfaction (Wibowo *et al.*, 2019) and the reduction of costs and losses in the chain (Borrás and de Toledo, 2007).

Quality refers to the results of management practices, delimited by the mechanisms of governance (Kaynak and Hartley, 2008). The choice of governance type is also shaped by the degree of quality uncertainty at various stages of the SC (Raynaud *et al.*, 2005). Studies on the alignment between quality management and SC governance emphasize that the quality management system (QMS) can facilitate the coordination of quality by setting standards, monitoring compliance with those standards, and signaling compliance (or nonconformity) with the different actors involved in the SC (Wever *et al.*, 2010).

Although much attention has recently been paid to SCM, its interconnection with the quality management perspective is often of a limited and tangential nature. Robinson and Malhotra (2005, p. 319) defined the concept of supply chain quality management (SCQM) as:

The formal coordination and integration of business processes involving all partner organizations in the supply channel to measure, analyze and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace.

Likewise, the effect of formal and informal instruments on quality results in SCs is a topic addressed tangentially in studies on SNs' results.

2.5 Formal and informal instruments in the quality of supply networks (SNs)

As discussed in Section 2.1, formal and informal instruments can influence the supply chain network's results. Quality is one of the expected results of the SC. Therefore, it is possible to infer that the governance instruments also influence quality results in the SC context.

2.5.1 Formal instruments in the quality of supply networks (SNs). A contract is a formal instrument of governance that can be a safeguard against business partners' opportunistic behavior in the quality management context. Therefore, the ideal contract in the SCQM context is based on defining a quality objective agreed between the buyer and the seller, followed by explicitly sharing the cost of ensuring quality (Yao and Zhang, 2009). Contracts can thus mitigate the inherent difficulty faced by the buyer in accurately evaluating the supplier's quality performance (Gray and Handley, 2015).

Standards, a critical formal instrument of governance in SCM, are the primary governance instruments driving quality among SC members. However, standards, e.g. the ISO 9000 family, may have different implications for quality in SCs. ISO 9000:2000 benefits, in terms of integration and quality assurance, will be greater or lesser across the entire (Sroufe and Curkovic, 2008), depending on the organization type (Miles *et al.*, 1978).

As mentioned earlier, Robinson and Malhotra (2005, p. 319) defined SCQM as "the formal coordination and integration of business *processes* involving all partner organizations in the SC channel" (emphasis added). Therefore, companies need to pay immediate attention to internal and external mobilization processes to achieve the integration of quality management and SCM.

When combined with a quality management strategy, the formal SC structure can improve products' quality (Xie *et al.*, 2011). The producer and buyer define the formal SC structure and can make the upstream and downstream partners feel loyal, cooperative, and

collaborative, or, conversely, disloyal, uncooperative, and uncollaborative, thus exacerbating the rift among inter-firm partners involved in SCQM (Soltani *et al.*, 2011). Therefore, the SC structure can positively or negatively influence quality in the SC.

2.5.2 Informal instruments in the quality of supply networks (SNs). The social structure (Raj and Khanna, 2018), which is an informal instrument of governance, has an important influence on the relationship between quality and SC performance (Schniederjans, 2018). Internally, managers' transformational leadership style can entail a significant and positive impact on a firm's SCQ performance (Teoman and Ulengin, 2018). Externally, a committed relationship fosters supplier quality and, in such relationships, informal social pressures to act consistently with shared values and norms lead to goal alignment (Gray and Handley, 2015).

Norms can support a learning environment and ensure that the knowledge acquired is passed from member to member (Spekman *et al.*, 2002). This knowledge transfer among SC members leads to a loop learning that focuses on problem-solving and correcting errors or double-loop learning that involves learning about how one learns about how one defines and solves problems, fostering, therefore, quality performance (Fynes *et al.*, 2005).

Information sharing, in the SCQM context, is related to cooperative relations with SC partners (Teoman and Ulengin, 2018). These cooperative relations aim to provide maximum quality to customers, at low cost and high speed (Huo *et al.*, 2019). Successful SCM has been linked to information flows reflected in the quality of information shared as well as the amount of information (Spekman *et al.*, 2002). In a SN, the information sharing between all quality management nodes is the premise and basis for further learning (Vanichchinchai and Igel, 2011).

Value system and culture can affect the introduction of both SCM and total quality management (TQM) in organizations (Vanichchinchai, 2014). Leadership by top management shapes organizational quality culture, and a favorable quality management culture drives organizations to improve their efficiency beyond organizational boundaries and along the SC (Yeung, 2008). Therefore, the value system and culture of an organization represent a factor that inhibits or promotes the integration of quality management and SCM within the organization (Foster, 2008).

2.6 Conceptual framework

The literature review enabled the development of a framework based on three fundamental propositions, which can in isolation (*P1* or *P2*) or jointly (*P3*) establish this specific result, as shown in the conceptual model in Figure 1. *P1* states that formal instruments (contracts, standards, processes, and structure) have a strong and/or weak influence on quality of SNs. It

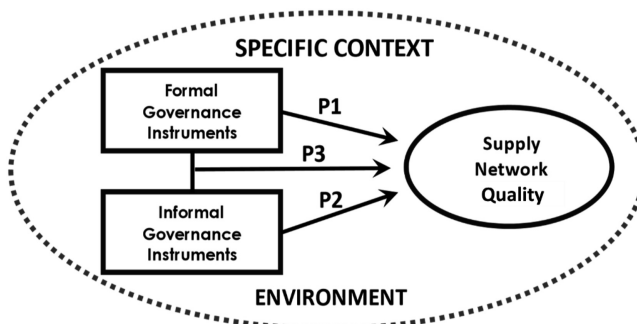


Figure 1.
Framework for
formulated
propositions

also aligns the idea that different governance instruments should be used for different relations between clients and vendors in a SN, since standardized instruments can lead to the feeling of imposition and consequent resistance to the achievement of quality goals (Zu and Kaynak, 2012).

P2 suggests that informal governance instruments (social structure, norms, information sharing, and system of values and culture) have strong and/or weak influence on quality results. Regarding, for example, cost savings, trust can play a key role because it leads the contracting company to significantly reduce inspection costs (Sila *et al.*, 2006; Zu and Kaynak, 2012), which reinforces this proposition because, when informal instruments are used, they can generate safeguards without increasing bureaucracy or costs; for the purpose of this study, the positive influence on SC quality.

The joint use of governance instruments (P3) can amplify the quality results in the SN if the formal and informal instruments are acting positively. If the action of formal instruments on SCQ is negative, the result will depend on the intensity of informal instruments in the SC, and *vice versa*. These governance instruments will be significantly influenced by the environment in which the network is located. The success of governance instruments will depend on exogenous-factor contingencies (Huang *et al.*, 2014).

3. Methodology

3.1 Design

This study is based on an interpretivism perspective, in which “knowledge and understanding are socially constructed” (Eisenhardt *et al.*, 2016, p. 1114). Such a philosophical stance is appropriate as we are trying to understand, in-depth, how formal and informal governance instruments influence supply chain quality. The investigated instruments include, for example, trust, information sharing, and value and culture systems, all of which are based on a socially constructed process. This study utilized a qualitative methodological strategy, which is suitable for research that seeks to understand a given phenomenon in-depth (Yin, 2015a, b). Further, qualitative research is proper for investigations whose questions begin with “how” (Ebneyamini and Sadeghi Moghadam, 2018; Yin, 2015a, b). The objective was to deeply understand how formal and informal governance instruments affect the quality of SC results. Qualitative research is also considered useful for exploratory studies (Yin, 2015b).

The research method employed was a single, integrated case study. Scholars have widely used the case study method to research the SC context (Chen *et al.*, 2014; Li *et al.*, 2014; Nollet *et al.*, 2017). Further, Eisenhardt *et al.* (2016) highlighted how unique or extreme cases offer opportunities to examine a given situation in-depth. This type of research can also facilitate the novel insights (Eisenhardt *et al.*, 2016). Gibbert *et al.* (2008), Ketokivi and Choi (2014), and Pagell and Wu (2009) have defended the importance of case studies in the context of knowledge elaboration, as is foreseen here. Further, this study predicts “the formulation of theoretical insight” as the “outcome of the interaction between a general theory [that] the extant literature offers . . . and the empirical context” (Ketokivi and Choi, 2014, p. 232). According to these authors, “there are many ways in which theories can be elaborated,” one of which is to “conduct an in-depth investigation of the relationships among concepts” (Ketokivi and Choi, 2014, p. 236), as performed here between the formal and informal dimensions of governance instruments. In addition, according to Gibbert *et al.* (2008, p. 1465), case studies are especially relevant in the early phases of a “management theory, when key variables and their relationships are being explored.” In turn, Pagell and Wu (2009) used this method as they considered it adequate to understand better various elements for which understanding is still incomplete in the literature. The need for better understanding seems to be the case of the still limited knowledge associated with formal and informal instruments’ influence on the quality of SNs.

3.2 Case selection

According to the Brazilian Agricultural Research Corporation, Brazil currently ranks among the world's three largest milk producers. The country is second only to the United States and India (Neiva, 2020), highlighting the relevance of understanding the country's dairy industry, including the quality of their SC results. The case investigated was the dairy industry's SC in the state of Minas Gerais, Brazil, which has empirical relevance as this state is the leading milk producer in Brazil (responsible for 27.35% of the total milk produced in Brazil). In general, the Brazilian milk industry, especially that of Minas Gerais, is characterized by instability and intense competition. This competitiveness ranges from access to raw material to delivery to the final consumer (Magalhães, 2007). Different factors affect this competitiveness, including fluctuations in supply from the producing regions and variations in the economic sector, such as government subsidies and exchange rate policy.

3.3 Empirical units of analysis and observation

Two empirical units of analysis formed the case: (1) formal governance instruments (contracts, standards, processes, and structure); and (2) informal governance instruments (social structure, norms, information sharing, and system of values and culture). The observation units, i.e. the elements that provided information about the empirical analysis units and the case (Yin, 2015b), were formed by professionals from three essential layers in the dairy industry's SC in the state of Minas Gerais.

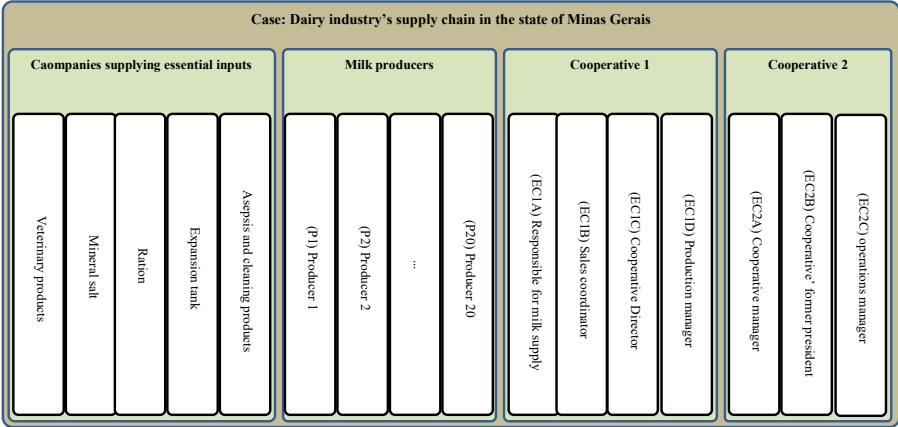
The first comprises companies that supply essential inputs to milk producers. According to the milk producers themselves, the primary inputs are veterinary products, mineral salt, animal feed, expansion tanks, and asepsis and cleaning products. For this reason, the researchers collected empirical evidence related to the formal and informal governance instruments of five companies considered by milk producers as representative of the market in which they operate. The first company sells veterinary products, has about 100 employees, and has been in the market for over 40 years. The second company sells mineral salt; it is part of an organizational group that has been in the market for 70 years and has about 600 employees. The third company sells feed; it is a member of a group with more than 2,000 employees and has been in the market for more than eight decades. The fourth company sells aseptic and cleaning products; it has 700 employees and has been in the market for 30 years. Finally, the fifth company sells expansion tanks; it has approximately 140 employees and has been in the market for over 30 years.

The second layer comprises milk producers. In all, the researchers collected empirical evidence from 20 producers (referred to as P1–P20). These 20 producers have 700 dairy cows and handle the daily production of more than 5,100,000 liters of milk, distributed by two significant (and investigated) milk cooperatives. Finally, the third layer comprises the milk cooperatives themselves. As noted, two primary cooperatives were selected. The first has been on the market since 1970. The average daily supply of milk to this cooperative is 64,000 liters. Currently, the internal processing industry itself handles the consumption of 48% of the milk supplied by local producers. The cooperative produces cheese, such as mozzarella and parmesan, among others, in addition to butter and milk cream for industrial purposes. Different dairy manufacturers buy the rest of the milk collected by the cooperative. The second cooperative was created in 2006; it arose from the need for local producers to increase their bargaining power with milk buying companies in the region. Figure 2 illustrates and expands the observation units representative of the dairy industry's supply chain network in the state of Minas Gerais.

3.4 Instruments

The research utilized three evidence collection instruments. The first and the most important was the semi-in-depth interview, which is considered the case study's most crucial instrument

Figure 2.
Observation units and
coding



(Ebneyamini and Sadeghi Moghadam, 2018; Yin, 2015a, b). The second instrument was secondary documentation. According to Yin (2015b), documents are relevant to virtually every topic in a case study. Finally, the third instrument was a non-participant observation, which is one of the oldest techniques in qualitative research (Smit and Onwuegbuzie, 2018).

According to Ebneyamini and Sadeghi Moghadam (2018, p. 2), “Case studies are designed to bring out the details from the viewpoint of the participants by using multiple sources of data.” Multiple sources of evidence were used to search for convergence between them. This convergence, called data triangulation, allows for an increase in the study’s credibility and reliability (Gibbert *et al.*, 2008; Pagell and Wu, 2009). According to Pagell and Wu (2009, p. 43), triangulation involves combining “data from multiple sources and/or different types of data.” In this study, both documentation and observation were techniques used to corroborate information obtained from the interviews. Table 1 details the interview script, presenting the empirical units of analysis, the attributes, and examples of the open questions. Table 1 also details the evidence-gathering techniques used for each formal and informal governance instrument, thus revealing the occasions where data triangulation was used. Table 1 also highlights the questions of particular interest in each data collection technique.

3.5 Data collection

Data collection took place interactively and flexibly. As suggested by Yin (2015b), the interviews consisted of fluid and guided conversations. Observations and the collection of documentary evidence were carried out during the field interviews themselves. The interviews were recorded and transcribed by the researchers.

3.6 Data analysis

The empirical data analysis occurred at different times: (1) after the interviews; (2) during the data transcription process; (3) during the categorization of evidence; and (4) during production of the research report. Aside from looking for emerging patterns in the data, the data analysis comprised two other analytical strategies: one general, the other specific (Yin, 2015a, b). According to Yin (2015b), the analytical strategy’s objective is to link the data to the concepts of interest. The general strategy was based on theoretical propositions, i.e. a theoretical orientation pointed out the relevant conditions that were collected and described. The literature also helped organize the entire analysis (Yin, 2015a, b). The specific analytical

Empirical units of analysis	Instrument	Data collection technique	Questions
Formal governance instruments	Contracts	Interview/ documentation	Q1: How do contracts address product quality? Q2: Are contractual assumptions revised according to environmental changes? Q3: Is the cooperative subject to standards for milk supply? Q4: Does the company have codes of conduct? If so, what are they? Q5: Are there established standards for participation in the SC? Q6: Are there defined processes for the supply of milk? Q7: Are there processes aimed explicitly at product quality? (e.g. quality audits, periodic evaluation meetings, QCC)
	Standards	Interview/ documentation	Q8: Is there a formal governance structure aimed at improving communication and coordination between partners in the chain? Q9: How does the structure define the chain's key members, its processes, and the level of integration and management of each process? Q10: How does the structure increase the visibility of processes and mitigate functional conflicts?
	Processes	Interview/ documentation	Q11: How is opportunism avoided in the relationship between customers and suppliers? Q12: What is the influence of earlier relationships in formalizing partnerships between customers and suppliers? Q13: How does knowledge sharing occur between suppliers and customers?
	Structure	Interview/ documentation	Q14: How do social norms impact results concerning the quality of products and operations in the network? Q15: How does information sharing occur? Are there mechanisms or routines for this? Q16: What types of information (planning, product, process) are shared, and how often? Q17: How are communications related to product quality problems made? Q18: How are values and beliefs shared in the network? Q19: Are there initiatives that look to create a collaborative culture with suppliers and customers? Q20: Are cultural assessments considered in the supplier selection process?
Informal governance instruments	Social Structure	Interview/ documentation/ observation	
	Norms	Interview/ documentation/ observation interview	
	Information sharing	Interview	
	System of values and culture	Interview	

Table 1.
Data collection
roadmap

strategy was based on content analysis. Two hierarchical levels were used to arrange the evidence derived from the interviews, documentation, and observation: (1) formal or informal instruments, and; (2) contracts, standards, processes, structure, social structure, norms, information sharing, or system of values and culture.

3.7 Case tests

This study employs three case tests: construct validity; external validity; and reliability (Gibbert *et al.*, 2008; Yin, 2015a, b). According to Gibbert *et al.* (2008, p. 1466), construct validity refers to the “quality of the conceptualization or operationalization of the relevant concept.” By using multiple sources of evidence, such as interviews, documentation, and observation, and by triangulating them, we have sought to increase the certainty that the evidence observed corresponds to the theoretical constructs of interest (construct validity) (Gibbert *et al.*, 2008; Yin, 2015a, b). Regarding the external validity, i.e. the “intuitive belief that theories must be shown to account for phenomena not only in the setting in which they are studied but also in other settings” (Gibbert *et al.*, 2008, p. 1468), we have sought to achieve this using theory in the single case (Yin, 2015a, b). According to Yin, 2015(a, b), external validity relates to the definition of the domain to which the study’s findings can be generalized. It should be noted that the generalization of the study was analytical, in which field evidence was extrapolated on the basis of the relevant literature. Finally, the creation of a study protocol (see Table 1), aimed to increase the reliability of the study, i.e. the extent to which the study can be repeated, obtaining the same results (Yin, 2015a, b).

3.8 Presentation of results and analysis

The presentation and analysis of the data followed an exposure logic based on formal and informal governance instruments. It initially presented the formal instruments (contracts, standards, processes, and structure), followed by the informal instruments (social structure, norms, information sharing, and system of values and culture). Each instrument sought to present the relationship from (1) input suppliers to milk producers, (2) milk producers to cooperatives and *vice versa*, and (3) cooperatives to other large dairy industries, with this relationship based on anecdotal data. In other words, the researchers did not collect evidence directly from other dairy industries. Cooperative professionals provided anecdotal and illustrative evidence of the relationship between formal and informal instruments with such firms. In collecting evidence related to such bonds/nodes in the dairy industry SC, the researchers believe they are investigating the case, analyzing it from the empirical units associated with the formal and informal instruments of interest here. Figure 3 illustrates the relationship between the fundamental links in the SC.

4. Results and analysis

4.1 Formal governance instruments

4.1.1 Contracts. The relationship between input suppliers and milk producers is not patterned. Among the inputs are medicines, mineral salt, animal feed, expansion tanks, and asepsis and cleaning products. While the relationship was mostly informal, the animal feed

Figure 3.
Nodes of the dairy
industry supply chain
(SC) in the state of
Minas Gerais



supplier showed evidence of formal contractual elements. Some contracts provide for the quality of the animal feed provided to producers.

The interaction between milk suppliers and milk cooperatives is fundamentally informal. The producers maintain corporate ties with the cooperatives, showing an interest in the supply of milk. Producers must follow the bylaws' formalities. Nevertheless, the contract for the supply of milk is typically informal. Notwithstanding, observational evidence suggests that milk producers should follow milk quality standards. The milk sent by the rural producers goes through tests for the temperature and thermal stability of the product: "The cooperative demands quality" (P1). The quality of the milk supplied must adhere completely to the standard required by the regulations in force: "We receive monthly reports on the quality of the milk sent" (P7). According to P2, the "cooperative helps a lot in terms of the overall quality. We try to do the best." According to P4, quality guarantees better bonuses.

Finally, formal contracts exist regarding raw milk supply from the cooperatives to the large dairy manufacturers (EC1C; EC2A). These contracts have clauses that provide for differentiated quality standards. These standards also have criteria above what is required by current regulations. As exemplified by EC2A, "The higher [the quality], [the more] we get a bonus; the worse the quality, [the more] we are penalized" and a "company present in the whole of Brazil with one of the best desserts has already returned an entire truck because the fat (%) did not produce 3.6, the cargo arrived there, and it was 3.4." For EC2A, contract renewal is usually of mutual interest, with the contract renewed annually. Environmental motivations can also influence the contracts' fundamental assumptions (EC1C; EC2A).

4.1.2 Standards. All input suppliers investigated here follow the quality standards recommended by the Ministry of Agriculture, Livestock and Food Supply. Documents related to "standard operating procedures," acceptable production practices, and quality policy also attest to the standards followed by organizations. In addition, the mineral salt supplier also follows international standards, such as ISO 9001:2015.

Concerning milk suppliers, when looking to enter the network, they are subject to preliminary analyses that follow stipulated standards: "There are cases of a neighbor who did not get approval for admission to the network" (P9). However, maintenance on the network may require compliance with standards that exceed those needed when entering the network: "The producer is given time to adapt" (P10). These rules of entry and maintenance in the network were seen in the producers of both cooperatives.

Concerning the cooperatives, EC1D stresses how the entire dairy segment must follow standards set up by the Ministry of Agriculture, Livestock and Food Supply: "We have some quality programs, such as Standard Operating Hygiene Procedure, Self-Control Program," among others (EC1D). Further, cooperatives need to follow various new standards demanded by the big dairy industries. Quality certification from the Genesys Group is just one of them. For EC2A, each major customer requires specific standards that may differ from each other and be more rigorous than those required by current legislation: "A customer asks for a certain level of fat, another for protein, another for the count of bacteria" (EC2A).

4.1.3 Processes. The companies supplying inputs are large and they all have different processes. However, the processes are mainly associated with immediate dyadic suppliers and customers. Further, each company has its own set of processes, making it challenging to analyze similarities. Such processes involve quality management, internal and external audits, and meetings, among others. Among the suppliers of inputs, the one related to asepsis and cleaning incorporates customers' opinions in developing new products, showing more innovation than the others.

In turn, milk suppliers employ processes concerning milk production and transportation. All investigated producers stress the relevance of processes associated with the cleaning of milking and other equipment. For example, "Everyone is important, but milking hygiene is

the main thing" (P10), while according to P5, "one process depends on the other." Producers also carry out customer relationship processes when quality problems are detected.

Regarding cooperatives, they adopt a large part of the processes recommended by the Global Supply Chain Forum. Among these processes, we highlight those focusing on product quality, such as quality audits by customers and visits to support suppliers: "We know the milk that is coming. If a producer is in trouble, we focus on that supplier" (EC3C). There are return-management processes for non-compliance, although they are rarely used and are associated with low product conservation. The cooperative rejects the product when there is contamination by antibiotics. In these cases, the responsible producer pays for the entire value of the milk: "There was already a case of a producer paying for a whole milk truck" (EC1D). Although standardized, demands from different customers drive the cooperative to adjust processes over time: "The cooperative has a pattern, but sometimes one customer differs from another. So, I attend a customer in one way and another customer in another way" (EC1D).

4.1.4 Structure. The suppliers of inputs and milk producers do not have structures for managing the networks. Concerning the essential input suppliers, evidence suggests only functional structures related to the aforementioned dyadic management processes. The mineral salt company and the aseptic and cleaning product company are the only ones that have structures for managing customer service and relationships with suppliers.

Regarding the two cooperatives, these also do not have formal network governance structures, i.e. structures aiming to improve communication and coordination between partners, striving for corporate excellence, and facilitating inter-organizational collaboration. The identified structures are explicitly functional. For instance, the first cooperative has created structures to manage the main raw milk supply and supply processes: "The cooperative's functional structure provides visibility to processes, and facilitates the integration of areas, influencing the quality of operations" (EC1B). In turn, the second cooperative has created functional structures to meet the cooperative's needs concerning customers and suppliers: "Each one knows what to do, each one in their sector" (EC2A).

4.2 Informal governance instruments

4.2.1 Social structure. Among input suppliers, there is consensus on the existence of opportunistic relationships in the segment: "This market is not a loyal one. It is a brothel," said a managerial-level interviewee from the expansion tank company. For this reason, companies favor doing business based on earlier interactions to reduce opportunism. Most customer partnerships originate from long-term relationships.

Regarding milk producers, most of them buy inputs from the cooperative itself. In these cases, the producers do not set up relationships with the input suppliers also investigated here. Despite this, field evidence suggests that such producers have the same confidence in the quality of products, the flexibility, and punctuality of deliveries from suppliers of inputs as other producer-buyers. When associated with the cooperative, as previously mentioned, there are no formal contractual relationships between both parties.

On the one hand, this feature allows the flexibility to exit the network. On the other hand, trust between producers and the cooperative keeps the number of milk suppliers under control: "Because the cooperative is solid, having many years in the market, this helps a lot. If the cooperative pays a little less, the supplier will think twice before leaving" (EC1A). Further, trust between suppliers and the cooperative encourages the entry of new customers. EC1A stresses that the partnership over 20 years with a customer has driven other suppliers to set up partnerships with the cooperative. According to EC2A, despite the crisis, companies are looking for the cooperative to sign contracts, resulting from other companies' reputation and trust in the quality of the cooperative's milk: "We gain confidence over time. Now, there are companies that open doors for us."

4.2.2 Norms. Input suppliers have different norms, including behavioral norms, inter-organizational knowledge exchange routines, flexibility (expressed in the willingness to adapt procedures), and solidarity (expressed in the willingness to maintain relationships). According to the managers of all the investigated input suppliers, the association between the standards provides positive aspects that affect the quality of products and the network's operation: "The relationships help to have a product that is more and more updated in the market," stresses the manager of the asepsis and cleaning products company.

Most of them were willing to support expected behavioral norms among milk suppliers, especially related to mutual aid and to knowledge and information exchange. Among these norms, that of mutual aid proved to be the most apparent. Regarding knowledge sharing, however, few investigated suppliers have standards in this direction. Despite this, they stress the relevance of knowledge exchanges for the quality of their products: "Yes, during conversations, there is an exchange of knowledge" (P1). Among the exchanges of knowledge, there are new silage techniques, and corn seeds that provide better production and quality. Finally, all producers emphasize the importance of norms for relationships pertaining to the quality of products and operations.

Concerning cooperatives, EC1C highlights how the repeated interactions themselves stimulate the creation of norms of expected behavior and routines for the exchange of organizational knowledge between cooperatives and suppliers. Another factor that affects the appearance of the norms is the actors' interest in controlling specific behaviors that may be harmful to shared interests. One of the most explicit norms is the sharing of information between cooperatives and suppliers: "This is our search every day. We try to help the producer as much as he needs to provide us with a better product" (EC1A). According to EC1A, "if the milk producer produces with quality, the entire chain will have quality." Another clear norm is associated with maintaining relationships and adapting to procedures: "Everyone's interest is to maintain a stable relationship, without friction, without anything, for the Cooperative to have security, more tranquility" (EC1A); "This environment is important to them" (EC2B). The rules of the cooperatives are also clear in the documentation. There are water and process controls, standard operating hygiene procedures, and self-control programs among the analyzed documentation.

4.2.3 Information sharing. The sharing of information from input suppliers to milk producers occurs principally through face-to-face interactions: "There are not many customers, there are few, we get together, and they come to the Cooperative, or we go to their factory" (EC2A). The most shared information is related to processes, planning, and products. Such information indirectly denotes greater attention to quality attributes.

The same occurs with the interaction between milk producers and the cooperative. Information sharing takes place mainly by telephone and personal contacts. According to EC1A, he uses "the phone a lot because it is the fastest and most direct communication means. [...] E-mail is much less [adopted] because few producers are in front of the computer." The second most used form of information exchange is a face-to-face visit: "We are always going to the property to visit. [...] They want the presence for [the relationship to become] more concrete" (EC1A).

Face-to-face visits are also important on occasions involving adjustments to product quality: "Whenever there is a problem, the person responsible for quality goes to the field, to the producer, visits, guides, explains a new technique, to take to the producer what is best for him to produce a better-quality product" (EC1A). The researchers witnessed this personal contact. In a visit to one cooperative's laboratory, the researchers saw how the cooperative helped the producer's practice. The occasion was a cow owned by a producer that had mastitis but was showing resistance to treatment.

4.2.4 System of values and culture. Among the suppliers of inputs, only the mineral salt company was seen to want to create a collaborative culture to promote shared aims with milk

producers. Workshops, informal meetings, and events allowed the creation of such goals. According to the aseptic and cleaning products company manager, this is “is still very internal to each company;” this collaborative culture “has not yet reached that level . . . and I imagine that many companies have not yet reached it”. As for the self-assessment of the organizational culture, the asepsis and cleaning products company is the only one that had initiatives in this direction, although at an early stage. All companies highlight the impact and relevance of culture on the quality of operations. Among milk producers, empirical evidence suggests that there is no sharing of culture, values, and beliefs, except on occasions when degrees of kinship characterize the relationship between them.

Concerning the cooperatives, empirical evidence suggests that they look to share their milk producers’ values and culture. This sharing runs through the services provided as well as the consultations and services provided. On these occasions, the cooperatives look to convey to producers the company’s concern with its reputation and the importance of its quality: “I try to pass on the values. There is much place where there is a meeting of producers, and they ask us to go.” (EC1A). Despite this, there is no empirical evidence related to cultural self-assessment processes by the cooperatives themselves.

5. Discussion

5.1 Formal instruments and their influence on the quality of supply networks (SNs)

Empirical evidence suggests the relevance and influence of formal governance instruments on the dairy industry SC’s quality in Minas Gerais. This relevance is clear in the alternate and differentiated performance of the four formal instruments investigated. For instance, contracts are instruments used in the relationship between cooperatives and large dairy manufacturers. However, considering the interaction between previous layers of the production chain (essential input suppliers to milk producers, and milk producers to cooperatives), contracts are seldom used. Among the five essential input suppliers, only one, animal feed, has contracts with dairy producers. The same occurs in the usually informal interaction between producers and cooperatives. Although producers must follow milk quality standards, this is informal, not contractual. When related to the interaction between cooperatives and industries, formal contracts gain relevance. In some industries, the cooperative’s milk quality adheres to standards above what is required by current regulations. These contracts define the quality of the milk expected by the dairy industry (Burkert *et al.*, 2012; Gray and Handley, 2015; Yao and Zhang, 2009).

Standards guiding all layers of the chain were investigated. Input suppliers follow different standards, some created by Brazil’s Ministry of Agriculture, Livestock and Food Supply. On the other hand, milk suppliers follow standards necessary for entering the SN stipulated by cooperatives and pertaining to the continuity of supply to cooperatives. Cooperatives follow standards set by the Ministry of Agriculture, Livestock and Food Supply as well as new ones demanded by the big dairy industries. An example of a standard required by such companies is quality certification from the Genesys Group. Note how the key player here (the cooperative), an essential layer of the SC, by specifying the quality requirements necessary to supply products (Pilbeam *et al.*, 2012), improves the chain’s quality in general. For the cooperative to supply large industries, both milk producers and input suppliers must adhere to the stipulated quality standards.

Processes are a set of activities designed to produce a specific outcome for a particular client or market (Davenport, 1993). Although all the companies supplying inputs have different processes, the processes show some similarities related to an immediate dyadic relationship between suppliers and customers. Robinson and Malhotra (2005) stressed the importance of the company processes of all organizations involved in the SC channel. The companies that supply primary inputs do not have such concerns. Concerning the milk

producers, there is similarity and convergence between the processes employed. Such processes focus on the production and transport of milk to cooperatives. The same is seen for cooperatives; they adopt processes related to product quality, recommended by the Global Supply Chain Forum. Although standardized, cooperative processes can be adjusted to customers' needs (Robinson and Malhotra, 2005).

Finally, the structure has greater or lower influence on the SC's quality depending on its composition (Soltani *et al.*, 2011; Xie *et al.*, 2011). In the dairy industry SC of Minas Gerais, the structures are mainly functional and pertain to various embedded actors. For instance, two of the five input suppliers (the mineral salt company and the aseptic and cleaning products company) have a service and relationship management structure. Milk producers and cooperatives do not have formal network governance structures (Fawcett *et al.*, 2006; Lambert *et al.*, 1998) In other words, structures aim to improve communication and coordination between partners, seeking business excellence and inter-organizational collaboration. Table 2 summarizes the discussion regarding formal instruments and their influence on SNs' quality.

Field evidence shows the significance of two formal governance instruments in the Minas Gerais dairy industry SC's quality: standards; and processes. Different companies and professionals from the chain layers investigated make heavy use of both instruments. Between the two, the patterns prove to be even more relevant. Indeed, processes are seen throughout the SC, although those related to the interaction between suppliers of primary inputs and milk producers are shown to be poorly standardized and more focused on dyadic interaction compared to those among all partners in the chain of supplies. Although restricted in the interaction between cooperatives and large dairy industries, contracts are sufficient to affect the dairy industry's SCQ positively. Indeed, the criteria adopted by large industries are more rigorous than those required by the current legislation, forcing cooperatives and producers to supply quality products, regardless of formal contracts between these chains. Among formal instruments, structure seems less used by companies in the chain. Structure is non-existent among milk producers and cooperatives, and cooperatives with other large dairy industries, and only partially apparent between input suppliers and dairy producers. This finding suggests that structure contributes proportionately less than other formal instruments to the dairy industry SC's quality in Minas Gerais.

5.2 *Informal instruments and their influence on the quality of supply networks (SNs)*

Field data suggests the influence of informal instruments on the quality of the Minas Gerais dairy SC. Schniederjans (2018) highlighted how the social structure has an important impact on quality and SC performance. Further, Gray and Handley (2015) emphasized how, externally, a committed relationship fosters supplier quality and, in such relationships, informal social pressures to act consistently with shared values and norms lead to goal alignment. The influence of informal interactions is clear in the relationship between milk producers and cooperatives. The confidence that producers have in cooperatives stimulates interest in other producers in providing milk to cooperatives, affecting the reputation of, and

	Essential input companies to milk producers	Milk producers to cooperatives, and <i>vice versa</i>	Cooperatives with other dairy industries
Contracts	Weak	Weak	Strong
Standards	Strong	Strong	Strong
Processes	Strong	Strong	Strong
Structure	Weak	Absent	Absent

Table 2.
Formal instruments
and their influence on
the quality of SNs

trust in, suppliers. As a result of an informal social structure, this confidence also affects those producers who buy part of the necessary input for their production from the cooperative itself, instead of the specialized supplier companies. Despite this, the informal social structure's importance is also clear in the relationship between suppliers and producers. One interviewee pointed out how the market "is not a loyal one. It is a brothel." For this reason, suppliers prefer to deal with those companies and customers with which there is a long-term relationship, avoiding opportunistic behavior.

Concerning social norms, i.e. informal rules that link parts to their sets of activities and reflect flexibility (willingness to adapt procedures) and solidarity (desire to support a relationship) (Bello *et al.*, 2004), they are relevant to three layers of the SC. Among the suppliers of primary inputs, the interviewees highlight how the behavioral norms, the inter-organizational knowledge exchange routines, and the flexibility show companies' willingness to adapt procedures. Social norms are even more clear among the milk producers themselves and the cooperatives investigated. Among producers, there are informal social norms that aim to aid each other. This mutual aid involves knowledge sharing: "Yes, during conversations, there is an exchange of knowledge" (P1). According to producers, these standards directly affect the quality of products and operations. Among producers and cooperatives, the long-term relationship also encourages the creation of joint social norms. Together with the cooperatives, the producers look to control the manifestation of behaviors that may be harmful to common interests. The clearest norms among them are the sharing of information and the adaptation of procedures. However, when associated with cooperatives' interaction with other large industries, standards have no impact.

In the SCQM context, information sharing is related to cooperative relations with SC partners (Mor *et al.*, 2018; Teoman and Ulengin, 2018). This cooperative relationship is clear in the interaction between input suppliers and milk producers and between producers and cooperatives. The three layers of the SC appear to make substantial use of information sharing. Face-to-face interactions and telephone communications are the primary means used for this. Among the most shared information is that concerning processes, planning, and products. Information sharing between all quality management nodes is the premise and basis for further learning. It is through their interactions with cooperatives that producers obtain different benefits, including learning or even financial results (Khan *et al.*, 2016; Vanichchinchai and Igel, 2011). When a producer has a problem with the quality of production, the cooperative technicians aid him/her appropriately. Information sharing as an informal tool is not apparent in the interaction between cooperatives and dairy industries.

Finally, the value system refers not only to material flow networks but also to knowledge flow networks (Choi and Krause, 2006). Participants jointly define strategic decisions. They coordinate activities by defining participatory rules, reflecting shared values (Parrilli and Sacchetti, 2008). This flow of knowledge and joint decision-making still seems incipient in the relationship between suppliers and producers. Only the mineral salt supplier showed interest in creating a collaborative culture to promote shared aims with milk producers. Despite this, all supplier companies stress the relevance of culture to the quality of products in the SC (Cadden *et al.*, 2013). Regarding producer-cooperative interaction, there is evidence of the search for sharing the cooperatives' value systems with producers, but not the other way around. Cooperative sharing occurs through the services and consultations provided. Such an instrument is not relevant in cooperative-dairy-industry interaction. Table 3 summarizes the discussion of informal instruments and their influence on the quality of SNs.

Data suggest the prominent relevance of informal instruments for only three layers of the dairy industry SC in Minas Gerais. Data do not present evidence related to the importance of social structure, norms, information sharing, and value systems and culture to the large dairy industries. For suppliers of primary inputs, milk producers, and cooperatives, evidence suggests the relevance of the social structure, standards, and sharing of information to the

SC's quality. The sharing of values and cultures is shown to be an instrument still little used by the network links.

5.3 Formal and informal instruments and their influence on the quality of supply networks (SNs)

The joint analysis of formal and informal instruments to the Minas Gerais milk SC's quality reveals some fundamental findings. The first and most relevant quality of the dairy SC in Minas Gerais's state appears to be the result of the favorable combination of formal instruments and governance information, corroborating *P3*. Indeed, the four layers of the SC analyzed here seem to use, albeit at different intensities, all eight instruments. Furthermore, *P3* supports the idea that SC outcomes can be due to a combination of the impacts generated by formal and informal instruments, which is demonstrated in the case studied.

For instance, note how strict formal contracts between cooperatives and large dairy industries made up for the lack of social structure between both parties. Such formal contracts provide for all requirements associated with the cooperatives' quality of products, ultimately reducing the need to support informal governance instruments. For this reason, the four informal instruments are not apparent in the interaction between cooperatives and the dairy industry. This finding attests to the joint relevance of formal and informal instruments to the SC's quality and mutual influence. Moreover, this observation suggests the existence of relative transitivity between formal and informal instruments and the requirements between the layers of a SC. Specifically, due to the strict formal contracts between the dairy industries and the cooperatives, guaranteeing through these contracts the quality of the milk supplied by them, the cooperatives end up passing to the previous layers of the chain different standards and processes that guarantee the necessary quality demanded by the dairy industry at the end of the studied network.

The second key finding is that, among the eight instruments, the formal structure and the system of values and culture seem to be the least employed, while the standards and processes, both formal, seem to be the most used by the analyzed layers. Suppliers, producers, cooperatives, and industries present robust evidence of its widespread use. The third finding is that there seems to be a relative balance of influence between formal and informal instruments. Contracts, standards, processes, and structures are strongly present in seven interactions between layers of the network, while social structure, norms, information sharing, and system of values and culture are relevant in six other occasions of interactions between them.

5.4 Practical and managerial implications

This paper offers several managerial and practical implications. The first is to encourage suppliers of primary inputs and milk producers to invest in the formal structure, primarily in formal contracts with each other. Such an instrument, already used intensively by the large

	Essential input companies to milk producers	Milk producers to cooperatives, and <i>vice versa</i>	Cooperatives with other dairy industries
Social structure	Strong	Strong	Absent
Norms	Strong	Strong	Absent
Information sharing	Strong	Strong	Absent
System of values and culture	Weak	Weak	Absent

Table 3.
Informal instruments
and their influence on
the quality of SNs

dairy industries, seems fundamental to the entire chain's quality, reducing the need for a combination of various formal and informal instruments. The second implication suggests the relevance of creating different training and qualification courses with members from all organizational levels, aimed at creating and sharing values and culture systems (Lee and Klassen, 2008; Vanichchinchai, 2014; Yeung, 2008) and highlighting the importance of the formal structure to the quality of the SC (Fawcett *et al.*, 2006; Lambert *et al.*, 1998). Third, although large dairy industries do not have informal governance instruments with cooperatives, such a layer's relevance to the entire SC's quality suggests the need for cooperatives to consider, together with these industries, several informal instruments complementary to the contracts and standards currently used for processes. Moreover, cooperatives represent an essential intermediate link between the suppliers and the dairy industries. In this sense, cooperatives would also have a fundamental role as an intermediary and in coordinating formal and informal instruments that ensure the entire network's quality, advancing quality beyond the different constituent layers' dyadic relations.

5.5 Theoretical contributions

Previous studies addressing governance theory in the SC (Burkert *et al.*, 2012; Ke *et al.*, 2015; Richey *et al.*, 2010; Zhang and Aramyan, 2009) have highlighted the importance of governance instruments in achieving goals and improving performance. Although previous studies have drawn attention to the isolated importance of informal or formal instruments, this study advances understanding by emphasizing the combined importance of both dimensions (formal and informal). Put differently, this study suggests that formal and informal governance can help achieve goals either in isolation, corroborating previous studies, or jointly, thus making a novel contribution to studies in this field. While *P1* and *P3* have already been the object of previous studies, in the present study, *P3* draws attention to the relevance of studies in the area understanding the instruments from a more integrated perspective. Anecdotal evidence suggests that SN' quality is associated with a positive combination of formal and informal governance instruments. For instance, trust plays a crucial role among business partners in the SC (Ghosh and Fedorowicz, 2008). The link between trust and contracts, discussed by Ke *et al.* (2015), shows a positive effect of contractual governance and SC performance, but not on cooperative behavior, while trust has some influence in both. Even though trust is not an instrument of governance in this study, the findings reveal that trust is a fundamental element of other governance instruments discussed in this research. The findings of this paper show that trust between producers and the cooperative keeps the number of milk suppliers under control, and that trust between suppliers and the cooperative encourages the entry of new customers. In this sense, these results reinforce the theoretical foundation that trust has a positive impact on cooperation and performance. SC theory (Carter *et al.*, 2015) suggests that the supply is relative to a particular product and agent. This means that, depending on the focal agent and the specific product, the SC will likely look different for another agent and/or point of reference. This present study asserts that when we employ a specific agent as our empirical unit of analysis, the data collected are, in some cases, completely different from each other. The study of the formal and informal governance instruments shows that, for example, cooperatives differ significantly from the other agents regarding the influence of informal instruments. Thus, the findings confirm that examining a specific agent in the SC makes it possible to realize that what the agent sees and how he/she acts concerning the governance instruments' influence may vary depending on the type of raw materials and parts that he/she sources and delivers. This conclusion broadens understanding of governance instruments and highlights the need for more in-depth studies capable of understanding how each formal and informal governance instrument affects the idiosyncratic characteristics of the segment under analysis.

6. Conclusion

This study links formal and informal governance instruments and SCQ by analyzing the influence of the instruments of governance on quality in a dairy SN. A literature review provided the basis for a theoretical framework development, which encompassed three propositions linking governance instruments to SCQ outcomes. This study applied a case-study approach to test the framework theoretically proposed. The findings indicate that formal governance instruments mostly have a strong influence on the SC's quality. Both "standards" and "processes" appear as the most significant instruments for SCQ. "Contracts" are revealed to be stronger in the cooperative–dairy-industries relationship. Despite the importance of the network structure for the communication and coordination between partners, the formal instrument "structure" is shown to have less influence on SCQ, considering the three layers (essential input companies, milk producers, and cooperatives).

Regarding informal governance instruments, the study suggests that "social structure," "norms," and "information sharing" have a strong influence in SCQ, mainly among the three layers (essential input companies, milk producers, and cooperatives). Nevertheless, a system of values and culture has a weak influence on SCQ. This is evident mainly because it occurs in only one pathway between different layers. The absence of informal governance instruments' influence in the cooperative–dairy-industries relationship may be related to the power of formal governance instruments that exist between them. In this case, further investigation is necessary. This study highlights evidence that, when combined, formal and informal governance instruments can strengthen quality in the SC. This occurs because balancing the usage of formal and informal governance instruments makes it possible to achieve SCQ outcomes. This study sheds light on the importance of instruments, both formal and informal, on SCQ, and, at the same time, opens up possibilities for future studies in this field.

The extant literature has investigated the relationship between governance instruments and the SC and quality management and the SC; however, studies addressing both themes concurrently (i.e. governance instruments' influence on SC quality) are limited. Therefore, this study contributes to the literature by offering an empirical investigation that links SC governance and SCQM. This paper also contributes to the literature by presenting the results from a specific context, namely the dairy industry.

The present study has two main limitations. First, despite the relevance of the empirical data collected to test the framework theoretically developed, the propositions in this study are empirically tested in a specific sector and in a single country. It will be worthwhile replicating this study in different industries and multiple countries to validate the results. Second, this study used the governance instruments proposed by [Pilbeam *et al.* \(2012\)](#). Other researchers, therefore, could investigate this phenomenon using different instruments. For example, although trust is incorporated in this study's results, trust could be studied as an isolated instrument, as suggested by [Burkert *et al.* \(2012\)](#) and [Yu *et al.* \(2006\)](#). Third, the respondents in the present study are primarily milk producers. This study interviewed 20 milk producers, seven representatives of cooperatives, and five suppliers of essential products. Despite the relative importance of the information obtained from producers, further research involving a larger number of input suppliers and representatives of cooperatives could further enrich the relevant analysis presented in this investigation.

This study is, by using the network approach, partially related to the SC theory proposed by [Carter *et al.* \(2015\)](#). Therefore, other approaches in line with [Carter *et al.* \(2015\)](#), such as "SC as a complex adaptive system" and the "SC bounded by a fuzzy horizon," might offer another research perspective on governance instruments in the SC context. Further, SC has more outcomes than quality, i.e. creativity, viability, cooperation, legitimacy, service effectiveness, agility, and cost efficiency ([Kim and Chai, 2017](#); [Pilbeam *et al.*, 2012](#); [Richey *et al.*, 2010](#)), which can be analyzed through the lens of the framework proposed in this study.

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