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Published in:
Journal of Purchasing and Supply Management

DOI (link to publication from Publisher):
10.1016/j.pursup.2023.100817

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Publication date:
2023

Document Version
Publisher's PDF, also known as Version of record

Link to publication from Aalborg University

Citation for published version (APA):
Wu, Q., Zhu, J., & Cheng, Y. (2023). The effect of cross-organizational governance on supply chain resilience: A mediating and moderating model. *Journal of Purchasing and Supply Management*, *29*(1), [100817]. https://doi.org/10.1016/j.pursup.2023.100817

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Journal of Purchasing & Supply Management 29 (2023) 100817

Contents lists available at ScienceDirect

Journal of Purchasing and Supply Management

journal homepage: www.elsevier.com/locate/pursup

The effect of cross-organizational governance on supply chain resilience: A mediating and moderating model

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ARTICLE INFO

Keywords:
Supply chain resilience
Cross-organizational governance
Supply chain collaboration
Institutional environment

ABSTRACT

This study examines the effect of a novel antecedent, namely cross-organizational governance (which can be further divided into contractual and relational governance), on supply chain resilience. Additionally, it explores the mediating and moderating effects of supply chain collaboration and institutional environment, respectively, on the relationship between cross-organizational governance and supply chain resilience. Accordingly, a research model, together with four hypotheses, is constructed based on institutional theory. These are further tested based on data collected from a single-respondent survey of 358 Chinese manufacturing companies. The results reveal that contractual and relational governance have significant positive effects on supply chain resilience; supply chain collaboration plays a partially mediating role and institutional environment plays a moderating role in the effects of contractual and relational governance on supply chain resilience. This study enriches the understanding of the relationships between cross-organizational governance, supply chain collaboration, supply chain resilience, and institutional environment. It also provides a reference for supply chain managers' decision-making activities.

1. Introduction

Supply chains must constantly address different risks and complexities (Benjamin et al., 2015 ; Asmussen et al., 2018). The outbreak of the recent COVID-19 pandemic has caused them to face even more problems, such as short supply, demand blows, price volatility of raw materials and transportation purchases, logistics network blockage, and shortage of funds. The combination of these events has not only compromised the procurement and supply management (PSM) system (Glas et al., 2021), but has also created numerous operational challenges for global supply chains. Accordingly, it has caused higher requirements on supply chain resilience as a comprehensive ability of companies in the face of emergencies or risks for ensuring the security of procurement supply and effective response to demand. Consequently, both scholars and business managers have begun to pay more attention to supply chain resilience, when they commit to reduce supply chain risks and help supply chains face the turbulence and changes caused by emergencies better (Kern et al., 2012).

Supply chain resilience, defined as the capability of a supply chain to prepare for and mitigate the influence of unexpected risk events and respond and recover quickly and effectively from interruptions (Wang et al., 2017), can be affected by various factors. To build and improve supply chain resilience, it is necessary to explore the underlying factors and influencing mechanisms. Existing research has demonstrated that supply chain resilience can be affected by supply chain visibility (Macdonald et al., 2018), flexible management capabilities (Liu et al., 2012), information technology (Gu et al., 2020), PSM strategies (Handfield et al., 2020; Van Hoek, 2020; Hoek, 2021), and more importantly, supply chain collaboration (Scholten and Schilder, 2015; Al-Talib et al., 2020). To execute supply chain collaboration in the entire process of procurement and supply, production, sales, and logistics, cooperation is necessary between a company and its supply chain partners. However, it is difficult to ensure consistency in inter-organizational communication and cooperation (Love et al., 2004). Therefore, more efforts are needed to intervene in and govern the behavior of members, and cross-organizational governance is expected to play an essential role in this aspect (Cao and Lumineau, 2015; Benítez-Ávila et al., 2018).

Cross-organizational governance is an institutionalized method for managing firms' cross-organizational activities through contractual and relational governance (Liu et al., 2009). In contrast to supply chain collaboration, which focuses on the collaborative behavior of a company and its supply chain partners, cross-organizational governance

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https://doi.org/10.1016/j.pursup.2023.100817
Received 8 February 2022; Received in revised form 1 January 2023; Accepted 7 January 2023
Available online 6 February 2023
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emphasizes the role of institutionalized methods implemented in the process of collaboration formation between the company and its partners. On the one hand, to minimize transaction costs and avoid opportunistic behavior, it is necessary to formulate a clear legal contract (Williamson, 1985; Yu et al., 2006). Therefore, contractual governance can be understood as the use of contracts with legally bound regulations to restrict partners' behavior. Through the signed content within it, the contract clearly stipulates the behavioral requirements, rights, and responsibilities of the company and its partners in various situations to respond to future events, reduce risks, and form a code of conduct or institutional requirement between them. On the other hand, considering that the contract cannot completely list all problems and restrict all possible opportunistic behaviors, informal exchange relationships are needed in addition to formal contracts for linking a company and its partners. Therefore, relational governance can be defined as the tacit agreement and coordination behavior among members through non-economically constrained exchange relations (Zaheer and Venkatraman, 1995). It includes two aspects: the exchange of trust and relationship commitment (Cao and Lumineau, 2015). Trust is based on the full understanding of the counterparties and positive expectations of their behavior. Relationship commitment refers to members' willingness to make efforts to maintain the relationship. The exchange of trust and relationship commitment can form a norm for the reduction of opportunistic behavior and a common understanding for relationship maintenance.

Previous studies have focused on the effects of cross-organizational governance on both economic (Lu et al., 2017; Dekker et al., 2019) and non-economic performance (Arranz and Fdez de Arroyabe, 2012; Cheng et al., 2014; Roehrich et al., 2020). Specifically, some studies have discussed the effects of contracts (Kyoung-Joo, 2011; Awan et al., 2018; Chi et al., 2020; Xie et al., 2021), trust (Anderson and Dekker, 2014; Um and Oh, 2020), and relational governance (Hernández-Espallardo et al., 2010; Cheng and Fu, 2013) on collaboration between supply chain partners. However, they failed to extend the discussion to supply chain resilience. Other studies have confirmed the effect of cross-organizational (mainly relational) governance on relationship resilience (Kaufmann et al., 2018; Song et al., 2019; Eckerd et al., 2021). Nevertheless, these studies mainly referred to the resilience of buyer-supplier relationships and addressed risks arising from behaviors within a buyer-supplier dyad, such as violations, betrayals, and conflicts among members. Their discussions were generally between the levels of the individual and supply chain, so the concept of relationship resilience they studied is essentially different from the supply chain resilience discussed in this paper. Finally, a stream of studies examined the effect of relational competencies on supply chain resilience (e.g., Fabbe-Costes and Jahre, 2007; Paulraj et al., 2012; Wieland et al., 2013; Chowdhury et al., 2022), but they mixed up relational governance and supply chain collaboration as relational competencies and considered them collectively, without distinguishing their differences and discussing their connections. Nevertheless, cross-organizational governance is essentially different from supply chain collaboration. The former is generally believed to not only promote the formation of collaboration, but also strengthen the management of collaborative behavior between the company and its supply chain partners (Lumineau, 2012), which facilitates the development of their capabilities to jointly manage risks. Hence, it may potentially affect both supply chain collaboration and resilience. In addition, previous studies have confirmed the effect of supply chain collaboration on resilience (Scholten and Schilder, 2015; Al-Talib et al., 2020). It is therefore speculated that cross-organizational governance may also have an indirect effect on supply chain resilience through supply chain collaboration.

Meanwhile, the supply chain, as an open system, can interact with the external institutional environment. Organizations in a supply chain desire legality in their actions, and they can be both encouraged and recognized by external society. In other words, an institutional environment can restrict and change the behavior of each organization. Recent studies have affirmed the importance of the institutional environment (Scott, 2010; Wang et al., 2016; Donbesuur et al., 2020), indicating that the obligations imposed by politics and the imitations and norms arising from standards and specialization are able to control organizations' behavior (DiMaggio and Powell, 1983). Hence, it is considered that the constraints of an institutional environment could change the implementation of cross-organizational governance followed by a company and its supply chain partners and cause its effects on supply chain resilience to differ. However, research on such effects is still lacking, and institutional environment has rarely been considered a key factor in the relationship between cross-organizational governance and supply chain resilience. This, in turn, leads to this study's other speculation that institutional environment can moderate the relationship between cross-organizational governance and supply chain resilience.

Addressing these gaps in previous studies, this study aims to explore the relationship between contractual/relational governance and supply chain resilience and analyze whether and how supply chain collaboration and institutional environment affect the relationships between contractual/relational governance and supply chain resilience. In doing so, we expect to not only indicate more benefits derived from cross-organizational governance, but also enrich our understanding of supply chain resilience by identifying a new influential factor and revealing the underlying mechanisms. The findings of this study are also conducive for supply chain managers to discover countermeasures to improve supply chain resilience.

The remainder of this paper is organized as follows. In the next section, the relevant literature is reviewed and the research gaps are highlighted. In Section 3, four hypotheses are elaborated from the perspective of institutional theory and a theoretical model is developed. Section 4 introduces the study's research methodology. The analysis results are presented in Section 5 and discussed in Section 6, which also elaborates the theoretical contributions, managerial implications, and limitations of this study.

2. Theoretical foundations and literature review

To better retrace the relevant studies on cross-organizational governance and supply chains, a systematic literature review was conducted following the methodology shown in Appendix 1. As a result, we identified 110 articles addressing at least some combinations of contractual/relational governance, supply chain collaboration, supply chain resilience, and institutional environment. Analyzing these identified articles allows us to better reveal the research gaps and highlight the novelty of this study. The classification of these articles can be found in Appendix 1, and the analysis results are presented below.

2.1. Supply chain resilience and influencing factors

Existing research understands supply chain resilience in different ways; for example, in PSM literature, resilience is usually defined as the ability to recover from disorder (Sheffi and Rice, 2005) or gain from disorder (Nikookar et al., 2021). In this study, we follow the division of the process, namely managing the predictive preparation, current emergency response, and subsequent adjustment and recovery of supply chain breaks (Chowdhury and Quaddus, 2016), and adopt the definition of supply chain resilience mentioned in the introduction. In particular, in contrast to research addressing buyer-supplier relationship resilience, our study emphasizes the ability of supply chain members to jointly deal with risks arising from events such as market demand fluctuations, supply or logistics disruptions, purchase price volatility, political events, and natural disasters. Resilience can help a supply chain respond and recover quickly in the event of a risk, as opposed to the ability of supply chain robustness to maintain performance in the face of risk (Golnar et al., 2020). Hence, when companies in a supply chain comprising close-knit suppliers, manufacturers, and retailers suffer from severe

disruptions, supply chain resilience can help them detect and address vulnerabilities early (Nikookar et al., 2021); hence, it has a positive effect on their risk management, market value, and supply chain performance (Wong et al., 2019). Although higher resilience is not always preferable in terms of the cost of building resilience (Mensah and Merkuryev, 2014), its positive effect on supply chain development is undeniable, especially considering that cost reduction is not the only goal of supply chain managers (Kırılmaz and Erol, 2017). In recent years, an increasing amount of research has been conducted to understand the factors and mechanisms that affect supply chain resilience. A range of factors has been identified. These include supply chain fragility, resilient management capabilities, supply chain capabilities (Liu et al., 2012); risk propensity and security practices (Park et al., 2016); information accuracy (Li et al., 2017); supply chain visibility, adequacy of stocks, buffer plans for supply chain disruption (Macdonald et al., 2018); information technology (Gu et al., 2020); and PSM strategies such as supplier segmentation (Handfield et al., 2020), reduced reliance on global sourcing (Van Hoek, 2020), active inventory management, and development of responses to demand risks with suppliers (Hoek, 2021).

In addition to these, another important factor that can affect supply chain resilience is supply chain collaboration. Supply chain collaboration refers to companies in the supply chain cooperating based on benefit and risk sharing, so as to form collaborative operations and achieve a win-win situation (Haken et al., 1995). Through supply chain collaboration, the high cost due to the bullwhip effect can be reduced and operational efficiency and overall competitiveness can be improved (Cao and Zhang, 2011). Additionally, supply chain collaboration is also expected to have a positive effect on supply chain resilience (Al-Talib et al., 2020). Companies are expected to construct a more resilient supply chain through collaboration activities (Scholten and Schilder, 2015). While the effect of supply chain collaboration on supply chain resilience has been in the spotlight, the other homologous factor that can significantly influence the relationship between a company and its supply chain partners (i.e., cross-organizational governance) has been largely ignored.

2.2. Cross-organizational governance and supply chain collaboration

Cross-organizational governance differs from supply chain collaboration, as discussed in previous studies. Cross-organizational governance emphasizes the need to intervene in the process of forming collaborations between a company and its supply chain partners, whereas supply chain collaboration involves the collaborative behavior and methods of various firms. The latter does not further incorporate the role of contracts and exchange relationships as institutional means in the formation and maintenance of the collaboration, as they belong to the scope of the former. Nevertheless, there is an inherent connection between cross-organizational governance and supply chain collaboration. Institutional means seem to be prerequisites for collaboration. Supply chain collaboration emphasizes the collaborative behavior of a company and its partners; however, the formation and maintenance of collaboration requires the intervention of cross-organizational governance. In other words, cross-organizational governance can be regarded as a precondition for supply chain collaboration. Considering that a supply chain is composed of multiple organizations with different interests, it is necessary to guide or control the behavior of all parties to improve the efficiency of cooperation between organizations. Hence, a discussion of the relationship between cross-organizational governance and supply chain collaboration is essential.

As seen in the extant literature, the effect of cross-organizational governance on cooperation has received continuous attention from scholars. It has been suggested that contracts can affect the behavior of partners (Awan et al., 2018; Chi et al., 2020; Xie et al., 2021), and alliances with contractual arrangements are more likely to conduct research together (Kyoung-Joo, 2011). Studies have also shown that relational governance can facilitate knowledge sharing among organizations and improve overall performance (Hernández-Espallardo et al., 2010; Cheng and Fu, 2013), while trust can influence cooperation (e.g., Anderson and Dekker, 2014; Um and Oh, 2020) and help maintain the cooperative relationship between transaction parties (Kaufmann et al., 2018). Although cooperation was not clearly defined as supply chain collaboration in these studies, most of them involved the core elements of supply chain collaboration, such as sharing, coordination, and synchronicity, in their discussions.

2.3. Cross-organizational governance and supply chain resilience

Although existing studies have explored the effect of cross-organizational governance on supply chain collaboration and the effect of supply chain collaboration on supply chain resilience, less effort has been made to link cross-organizational governance and supply chain resilience. Only a limited number of studies have addressed the relationship between these two aspects. Moreover, these studies suffer from imperfections in two ways.

These studies mainly explored the effect of cross-organizational governance, especially trust, on relationship resilience. Specifically, they discussed the impact of trust restoration on the resilience of buyer-supplier relationships (Liu et al., 2009; Kaufmann et al., 2018), argued that trust can reduce conflict and maintain resilience to instantly repair relationships between member organizations (Song et al., 2019), and proposed that contractual relationship governance can mitigate damage to mutual relationships due to members' business violations (Eckerd et al., 2021). However, these studies limited their discussions to the level of the buyer-supply dyad and merely addressed the effect of trust on the response to risks arising from behaviors within a buyer-supplier dyad, such as violations, betrayals, and conflicts among members. In other words, they did not study supply chain resilience comprehensively.

Moreover, these studies mainly discussed the effect of relational competencies on supply chain resilience. They tended to propose that relational competencies could enhance relationship strength in supply chains by building trust and improving cooperation (Nahapiet and Ghoshal, 1998; Fabbe-Costes and Jahre, 2007; Paulraj et al., 2012; Wieland et al., 2013; Chowdhury et al., 2022). However, these studies did not address contractual governance. More importantly, they regarded relational competencies as a combination of information sharing, collaboration and integration activities, trust, and willingness. In other words, they mixed up relational governance and supply chain collaboration as relational competencies and considered them as a whole, without distinguishing their differences and discussing their connections.

In conclusion, the existing literature has failed to develop a holistic understanding of the relationships between contractual and relational governance, supply chain collaboration, and supply chain resilience. It neither explores the effect of contractual and relational governance on supply chain resilience, nor considers the intrinsic role of supply chain collaboration in implementing governance to improve resilience. These issues require further discussion and confirmation.

2.4. Institutional environment

The institution is an artificially designed social game rule. It is used to guide interactions between subjects (North, 1990), provide stability for social life, and provide meaning (Scott, 2010). Correspondingly, an institutional environment refers to the laws, policies, norms, and social cognition set by the government, industry associations, and public-opinion media. The existence of such an environment is an important factor in shaping organizational behavior. It is generally believed that there are three forms of institutional environment: mandatory, normative, and memetic institutional environments (Scott, 1995). The mandatory institutional environment refers to laws, regulations, and policies issued by the government and agencies (DiMaggio and Powell, 1983) to impose compulsory restraints and appropriate

incentives on the behavior of companies. The normative institutional environment consists of industry standards, ethics, and culture established by professional and public institutions, such as industry associations and media, to adapt firm behavior to professional requirements and social norms. The memetic institutional environment emphasizes the leading exemplary role of benchmarking companies in providing imitation templates for other companies in the same industry.

Companies have to operate in an institutional environment. Such an environment is not only their resource warehouse, information source, and output target, but also the source of their existence (Scott, 1987). In addition to meeting their own needs, companies must meet the needs of their institutional environment. In other words, the external institutional environment determines the framework of behavioral systems, the goals of actions for companies, and the means they can use to achieve their goals. For a company to succeed, it must comply with the institutional requirements of its environment (Scott, 2008), and its behavior should be legitimate, legal, and recognized and accepted by powerful external collective actors (Singh et al., 1986).

Previous studies have recognized the importance of institutional environment (Scott, 2010; Wang et al., 2016; Donbesuur et al., 2020). Scholars have paid attention to the specific applications of institutional environment on firm activities. The moderating role of institutional environment in various firm activities was confirmed. For example, it has been found that institutional environment can moderate the effect of mutual learning on collaborative product development (Wang et al., 2016) and the combined effect of technological and organizational innovation on international performance (Donbesuur et al., 2020). In contrast, there is little research linking institutional environment with cross-organizational governance and supply chain resilience.

Early studies generally suggested that the effectiveness of contractual and relational governance depends on context (Liu et al., 2009; Arranz and Fdez de Arroyabe, 2012; Galvin, 2014). For example, it has been argued that the volatility and ambiguity of the environment (Carson et al., 2006), uncertainty (Ryu, 2006), and project scenarios (Arranz and Fdez de Arroyabe, 2012) can affect the implementation of formal and relational contracts, and network complexity can affect the effect of relational competence (Chowdhury et al., 2022). More recently, scholars have begun to focus on the relationship between institutional environment, cross-organizational governance, and performance. For example, Abdi and Aulakh (2012) proposed that institutional distance moderates the relationship between contractual/relational governance and exchange performance, and Jean et al. (2021) found that institutional environment moderates the effect of interaction between virtual governance and relational governance on relational performance. However, to the best of our knowledge, no study has considered the moderating role of institutional environment in the relationship between cross-organizational governance and supply chain resilience.

Organizations always desire their behavior to be recognized by the external environment and be in line with social expectations. Hence, when the institutional environment serves as an external environment closely related to a supply chain, the implementation of cross-organizational governance and its relationship with supply chain resilience are inevitably affected. Therefore, it is meaningful to consider the moderating effect of institutional environment on this relationship.

3. Theoretical model and hypothesis: perspective of institutional theory

The literature review in Section 2 reveals some connections between cross-organizational governance and institutionalization. Contracts set up the guidelines and institutional requirements that can guide the behavior of a company and its supply chain partners. Meanwhile, exchanges of trust and relationship commitment can form a common understanding of the norms for reducing opportunistic behavior and maintaining relationships, namely the manifestation of institutionalization. These characteristics of cross-organizational governance reveal a close relationship with institutionalization. Moreover, the effect of an institutional environment on organizational behavior can also be considered a process of institutionalization. Therefore, this study examines the influential mechanism of cross-organizational governance on supply chain resilience from the perspective of institutional theory.

Institutional theory asserts that the institution is a highly flexible social structure. It is composed of mandatory, normative, and cultural cognitions. These elements, together with related organizational activities and resources, provide stability and meaning to social life (Scott, 2010), and organizations tend to follow the institution to gain meaning. As Scott (2008) said, "the organization itself is composed of many institutional elements. Some rules, norms, or beliefs are formed in continuous interaction, while others are borrowed from their environment." Obviously, the formation of the institution due to cross-organizational governance falls under the former. Contractual and relational governance can be regarded as the processes of forming rules, norms, beliefs, and other institutional elements for a company and its supply chain partners. Such institutionalization can guide the behavior of the company and its partners, including their collaborative behavior when facing risks. Below, we apply institutional theory to elaborate the relationships between cross-organizational governance (contractual and relational governance), supply chain collaboration, supply chain resilience, and institutional environment, as demonstrated in Fig. 1.

3.1. The direct effect of cross-organizational governance on supply chain resilience

Institutionalization is believed to be a process formed through conscious design and intervention. Achieved by instilling value, institutionalization can improve the durability of inter-organizational structures (Scott, 1987). Following this thinking, it is expected that a company can conduct cross-organizational governance of its supply chain partners to achieve overall value instillation and institutionalized management related to supply chain resilience.

In terms of contractual governance, the provisions and validity of a contract can affect supply chain resilience. Regarding contract provisions, most contracts include binding contingency plans and clear change mechanisms that can function as rules and norms to guide firm behavior. When the unexpected conditions listed in the contract occur, these mechanisms are implemented (Lusch and Brown, 1996). Additionally, purpose and benefit are defined and shaped by the institution (Scott, 1987). Thus, the contract can also clarify the powers, responsibilities, benefits, and risks of the company and its supply chain partners, thereby reducing the probability of conflict and dispute between them. Regarding contract validity, the clauses stipulated in the contract are mandatory. On the one hand, they allow a company and its supply chain partners to act in accordance with pre-agreed behaviors and thus reduce the additional risks caused by behavioral uncertainty

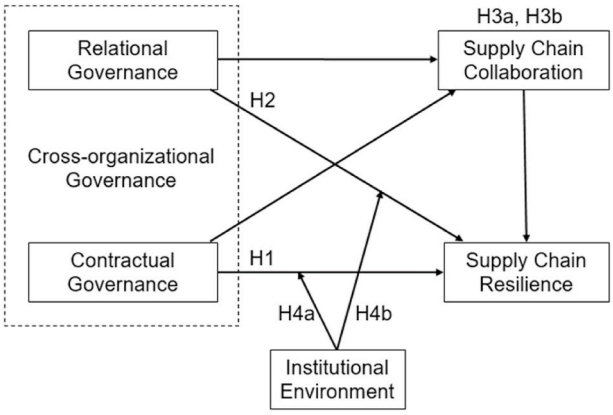

Fig. 1. Theoretical model.

(Lumineau, 2012). On the other hand, they provide restraint and security between the company and its supply chain partners, which enables the supply chain performing better in the prediction of, response to, and recovery from risk events, such as market and demand changes. Therefore, Hypothesis 1 is proposed as follows.

H1. Contractual governance has a positive effect on supply chain resilience.

In terms of relational governance, previous studies have shown that interdependence can affect supply chain resilience (Scholten and Schilder, 2015). Relational governance allows a company and its supply chain partners to fully understand each other and facilitates them to establish trust and further form relationship commitments based on trust. Trust and relationship commitment can, in turn, allow the company to instill the norms of restraining behavior and the belief in maintaining relationships with its supply chain partners, which can have a positive effect on supply chain resilience (Wieland et al., 2013). On the one hand, the norms of restraining behavior can ensure the company and its supply chain partners believe that the other's behavior is consistent with the agreement, and that their own interests will not be harmed by others. Such beliefs can, in turn, increase their willingness to invest in the prediction of supply chain risks in the early stages and actively cooperate when risks occur, rather than focusing on monitoring each other's behavior. On the other hand, the belief in maintaining a relationship also ensures the company and its supply chain partners loyal to the relationship in the long term, which reduces unnecessary adjustments and losses caused by changing partners and thus allows the partners to actively make more joint efforts for effectively preventing and responding to supply chain risks. Therefore, Hypothesis 2 is proposed as follows.

H2. Relational governance has a positive effect on supply chain resilience.

3.2. The indirect effect of cross-organizational governance on supply chain resilience

Although not holistically addressed, the relationships between cross-organizational governance, supply chain collaboration, and supply chain resilience have been discussed in existing studies two by two. On the one hand, previous research has implied the potential relationship between cross-organizational governance and supply chain collaboration. It has been confirmed that contractual governance can positively affect supply chain collaboration (Anderson and Dekker, 2014; Awan et al., 2018; Chi et al., 2020; Xie et al., 2021). Relational governance has also been proved a prerequisite for supply chain collaboration. Trust is considered an indispensable factor that affects supply chain collaboration (Anderson and Dekker, 2014; Um and Oh, 2020). The commitment to maintain and invest in relationships is demonstrated important in forming a common understanding between supply chain partners to reduce opportunistic behaviors in their collaboration (Hitt et al., 2002). On the other hand, the existing literature indicates that supply chain collaboration is positively related to supply chain resilience (Scholten and Schilder, 2015; Al-Talib et al., 2020). Hence, we are able to propose hypotheses regarding the mediating role of supply chain collaboration in the effect of cross-organizational governance on supply chain resilience, according to Rungtusanatham et al. (2014).

In practice, contractual governance can undoubtedly form institutional norms and relational governance can allow a company and its partners to reach consensus. However, the company and its partners still need to take action by implementing contracts and utilizing consensus when facing risks. In this case, if they fail to make joint decisions in accordance with the contract requirements or cannot fully utilize the information, technology, and knowledge resources that the other party actively shares based on trust and commitment, they might be unable to handle risk events adequately. In other words, from both theoretical and practical perspectives, supply chain collaboration is expected to play a crucial mediating role in the relationship between contractual/relational governance and supply chain resilience. Hence, H3a and H3b are accordingly proposed.

H3a. Supply chain collaboration plays a mediating role between contractual governance and supply chain resilience.

H3b. Supply chain collaboration plays a mediating role between relational governance and supply chain resilience.

3.3. The moderating effect of institutional environment

The external environment in which a company and its supply chain partners operate has its own institutional elements. When a company conducts cross-organizational governance with its supply chain partners, the effects of the methods it uses and the goals it wants to achieve are closely related to external institutional environment. The existence of this connection can make institutional environment affect the entire implementation process. Different levels of institutional environment can cause changes in the standardization of contracts, the effectiveness of contracts, and the degree of trust and relationship commitment. All of these, in turn, change the effect of cross-organizational governance on supply chain resilience.

More specifically, regarding the effect of contractual governance on supply chain resilience, the moderating effect of institutional environment is reflected in three aspects. In a mandatory institutional environment in which complete laws and regulations are set, the opportunities for a company and its supply chain partners to take advantage of loopholes in contract law can be reduced, and the rules stated in the contract about rights and responsibilities when facing risk events must be implemented. In a normative institutional environment, industry associations require contractual standards and specifications that can guide a company and its supply chain partners to meet industry requirements. In a memetic institutional environment, benchmark companies that perform well in contractual governance can be taken as a reference template for other companies to stimulate them to abide by the agreements about risk events stated in contracts. In other words, regardless of the type, a better institutional environment would increase the degree of importance a company and its supply chain partners attach to contracts, improve the degree of implementation of contractual behavior agreements in risky events, and enhance the degree of institutionalization of the behavioral rules required by contracts. All of these ensure the final effect of contractual governance, thereby improving supply chain resilience. In summary, a high-level institutional environment can create a more favorable environment for the signing and performance of contracts to increase supply chain resilience. Hence, this study develops the following hypothesis.

H4a. An institutional environment can moderate the effect of contractual governance on supply chain resilience. The higher the level of the institutional environment, the greater the positive effect.

An institutional environment can also influence the effect of relational governance on supply chain resilience. Relational governance entails establishing mutual trust, forming relationship commitments, and consciously suppressing speculation, which improves a company's ability to work with its supply chain partners for cooperating in risk events (Cao and Lumineau, 2015). This process requires long-term and repeated communication. During this process, the company and its partners might doubt each other's trust and commitment and even misuse them for profit. However, in a mandatory institutional environment, laws can protect rights and interests, which reduces the need to monitor each other in future relationships and encourages them to invest more in cultivating cooperation during risk events (Oxley, 1999). In a normative institutional environment, industry associations encourage the company and its partners to exchange trust and cultivate mutual understanding by organizing activities and awarding honors. Hence,

they can feel that their actions of enhancing their relational governance to increase resilience are recognized by the industry. This feeling can reduce the possibility of the company misusing the trust and relationship commitment of other members for its own profit, which consequently improves cooperation between the company and its partners when facing risk events. In a memetic institutional environment, when the industry has exemplar companies that have achieved success in terms of relational governance, other companies tend to learn or imitate their relational governance mechanisms, and thus, a more beneficial memetic institutional isomorphism can be achieved. In short, a better institutional environment is expected to ensure the effect of relational governance on improving supply chain resilience. Therefore, H4b is developed for the moderating effect of institutional environment as.

H4b. An institutional environment can moderate the effect of relational governance on supply chain resilience. The higher the level of the institutional environment, the greater the positive effect.

4. Research method

4.1. Sampling and data collection

In this study, we focused on China to avoid being affected by differences in the institutional environments of various countries. The data were collected from November 2020 to February 2021 under the support of China's largest research platform, Wenjuanxing. Our research sample was designed to reflect the general population of manufacturing companies. The sample companies were randomly selected from a list of Chinese manufacturing companies provided by the platform, which was based on industry codes. Specifically, we attempted to cover 88 major industrial classifications, including cured meat, food processing, animal feed, and beverages. Consequently, 1700 manufacturing companies from 30 provinces in China were selected.

The original questionnaire was developed in Chinese, because the subjects of this survey are domestic companies in China. Before its official release, the questionnaire was extensively pre-tested with company managers. Their active involvement ensured the instruments' high levels of relevance, and content validity was thereby addressed (Cheng et al., 2016).

Data were collected by sending the questionnaire link via email. The questionnaire link was sent to the general, production, operations, supply chain, or plant managers of 1700 manufacturing companies, who were selected because of their knowledge and awareness regarding both operational and strategic decisions related to the supply chain. We also ensured that the questionnaire link was sent to a single respondent from each company in the sample. During the data collection process, bi-weekly reminders were sent to respondents who agreed to participate in order to improve the response rate.

At the end of the data collection period, 524 questionnaires were returned. As the online questionnaires did not allow any omissions during submission, missing data were not a concern for the returned questionnaires. Nevertheless, in the questionnaire, we first asked the respondents whether they had experienced relevant supply chain risks. If the answer was no, the corresponding questionnaire was removed from further analysis. Including other questionnaires with short response times and logical errors, 166 invalid questionnaires were excluded. Our final sample hence comprised 358 valid cases, indicating an overall response rate of 21.1%. The basic characteristics of the case companies are listed in Table 1.

Table 1
Company characteristics.

Industrial distribution			
Industry	Percentage	Industry	Percentage
Agriculture/Forestry/ Animal Husbandry/ Fishery	2.5%	Pharmaceutical/ Medical	5.6%
FMCG	7.5%	Energy/Chemical/ Environmental Protection	7.8%
Transportation/Trade/ Logistics	16.2%	Metal/Non-metal Smelting and Processing	2.2%
Textile/Clothing/ Apparel	5.3%	Electronic/ Communication Equipment	17.3%
Wood manufacturing	2.5%	General/Special Equipment	4.5%
Paper/Printing/Cultural Education/Sports/ Entertainment Products	5.6%	Automobile/ Aerospace/Other Transportation Equipment	2.1%
Furniture/Home Appliances	6.1%	Other	5.3%
Wholesale/Retail	8.9%		
Company ownership			
Ownership	**Percentage**	**Ownership**	**Percentage**
State-owned	19.6%	Foreign-owned	5.3%
Privately-owned	69.3%	Joint venture	5.9%
Number of employees			
Number	**Percentage**	**Number**	**Percentage**
0–50	13.4%	501–1000	12.3%
51–100	21.8%	>1000	14.5%
101–500	38.0%		
Annual operating income			
Income (Yuan)	**Percentage**	**Income (Yuan)**	**Percentage**
<3 million	9.8%	20-400 million	32.1%
3-20 million	34.9%	>400 million	23.2%
Number of effective samples	**358**		

4.2. Measures

Similar to Wieland et al. (2013), the measurement instruments of this study reflect the unit of analysis: a company and its interfaces with supply chain partners, that is, suppliers and customers. The design of the measurement scale was based on existing research in the relevant fields. However, to ensure the authenticity and reliability of the data, the phrasing was discussed and revised several times. The overall structure of the measurement scale included five parts: independent, mediating, dependent, moderating, and control variables. A seven-point Likert scale was used to measure the first four variables. The respondents were asked to choose from the following options: "1 - very inconsistent," "2 - relatively inconsistent," "3 - inconsistent," "4 - uncertain," "5 - in line with," "6 - relatively in line with," and "7 - very in line with." The details of the measurement items are shown in Appendix 2 and elaborated below.

Independent variable: Existing literature suggests that cross-organizational governance includes contractual and relational governance (Cao and Lumineau, 2015).

Contractual Governance (CG). According to existing research (e.g., Wuyts and Geyskens, 2005; Benítez-Ávila et al., 2018; Wang et al., 2021), contractual governance was measured through four items: (1) "contract pertinence" (CG1), (2) "contract understandability" (CG2), (3) "provisions on powers and responsibilities for foreseeable events" (CG3), and (4) "penalties for the breach of contract" (CG4).

Relational Governance (RG). This study referred to existing research (e.g., Wuyts and Geyskens, 2005; Wang and Wei, 2007; Abdullah and Musa, 2014) and operationalized relational governance as: with supply chain partners, (1) "trust of consistency between actions and goals" (RG1), (2) "mutual consideration of demands" (RG2), (3) "trust of sincere cooperation" (RG3), (4) "willingness to maintain the relationship" (RG4), and (5) "importance of developing a collaborative relationship" (RG5).

Mediating variable: Supply Chain Collaboration (SCC). Similarly, referring to existing research (e.g., Stank et al., 2001; Cao and Zhang, 2011; Togar and Ramaswami, 2005), we measured SCC in terms of six items: with supply chain partners, (1) "joint decision on product

development" (SCC1), (2) "joint decision on demand" (SCC2), (3) "product information sharing" (SCC3), (4) "demand-predictive information sharing" (SCC4), (5) "cooperation on procurement, production, and sales" (SCC5), and (6) "regular exchange meetings" (SCC6).

Dependent variable: Supply Chain Resilience (SCR). Based on its abovementioned definition, supply chain resilience was measured in terms of predictive preparation, response, and recovery. Hence, referring to Wieland et al. (2013) and Scholten and Schilder (2015), the measurement of SCR in this study included five items: (1) "stability of relationship and business over a long period" (SCR1), (2) "a comprehensive emergency plan for risk events" (SCR2), (3) "plan completion when fluctuations occur" (SCR3), (4) "quick response to customer needs" (SCR4), and (5) "quick adaptation to market demand" (SCR5).

Moderating variable: Institutional Environment (IE). Although there are three types of institutional environments (i.e., mandatory, normative, and memetic), we decided to measure them as one construct, considering the similarities of their effects on the relationship between cross-organizational governance and supply chain resilience, as elaborated in Section 3.3. Since companies are direct perceivers and beneficiaries of the institutional environment, we chose to measure IE in terms of the company's actual perception of it to ensure that the data can better reflect the actual implementation of the institutional environment. This approach has also been widely adopted in previous studies (Busenitz et al., 2000; Zhou and Poppo, 2008; Wang et al., 2016; Matusiak et al., 2019; Donbesuur et al., 2020). We further referred to some of the theoretical underpinnings in designing institutional environmental scales (e.g., Grewal and Dharwadkar, 2002; Xu and Shenkar, 2002). Hence, our measurement of IE included four items: (1) "government regulations to ensure contract validity" (IE1), (2) "government policies to encourage collaboration" (IE2), (3) "collaboration and exchange activities organized by industry associations" (IE3), and (4) "benchmarking companies in the industry" (IE4).

Control variables: In this study, company staff size (Claro et al., 2003) and operating income (Lu et al., 2020) were considered as control variables. The staff size (number) was set to "1:0–50 people; 2:51–100 people; 3:101–500 people; 4:501–1000 people; 5:1000 people or more." The operating income (million yuan) was set to "1: less than 3; 2: 3–20; 3: 20–400; 4: 400–1000; 5: over 1000."

4.3. Respondent bias and common method bias

We adopted the inspection method suggested by Armstrong and Overton (1977) to test for non-response and late-response biases. On the one hand, we identified 215 respondents who returned their answers in the early stage of the survey as early responders and considered the remaining 143 late responders. Subsequently, the chi-square test method was adopted to compare the difference between early and late responders in terms of their size, industry, sales, or proprietary structure. The results showed no significant differences. On the other hand, we accessed the required information regarding non-responding companies from a public database. Based on this, another chi-square test was conducted. Again, no evidence of non-response bias was found.

In addition, according to Flynn et al. (2018), a Type 2 design (i.e., employing a single respondent who provides responses for all items) leads to respondent bias and common method bias (CMB). While it is certainly better to avoid a single key informant design, our study still proceeded with such a design, mainly because of time and resource constraints. However, we followed the guidelines of Flynn et al. (2018) and took a series of measures to reduce the respondent bias and CMB derived from the Type 2 design.

CMB might be created because of common rater and item characteristics. The former might arise because of the respondents' perceived need to provide consistent or desirable answers, and the latter, because of social desirability or ambiguity in items. Addressing CMB must start from the research design phase: the most effective remedy is to be ex ante smart about issues (Guide and Ketokivi, 2015). Hence, prior to data collection, we carefully designed the questionnaire to ensure reliable acquisition of the required information. First, we separated the questions on the constructs of this study from each other. Specifically, questions measuring the predictor and criterion variables were segmented into different sections of the questionnaire (Cheng et al., 2016). Second, we used different scale formats for items measuring independent and dependent variables, which reduced the likelihood of CMB by making it difficult for respondents to link the targeted measures together (Podsakoff et al., 2003). Finally, we used clear and concise language and added detailed examples to avoid complex or abstract questions, thereby reducing ambiguity. Additionally, we chose the right level of respondents (e.g., general, production, operations, supply chain, or plant managers) to align with the level of the questions, maintained the anonymity of both the respondent and the firm to eliminate incentives for socially favorable answers, ensured that respondents had the appropriate experience to link key terms to relevant realities, and asked only what respondents could answer. Moreover, similar to Anderson et al. (2006), some of the items we designed transformed the research questions to align with the monadic perspective by considering the company's perceptions of the behavior and impact of its supply chain partners. This meant that our study switched from a Type 2 to a Type 1 design and respondent bias was reduced.

After data collection, three methods were adopted to test for CMB, as suggested by Podsakoff et al. (2003) and Richardson et al. (2009). While these methods cannot eliminate the CMB associated with the use of a single respondent, they may help estimate the degree of its severity. First, we conducted Harman's single-factor test using SPSS (Podsakoff et al., 2003). The results showed that the first principal component explained 36.038% of the total variation, which was less than 40%. Second, we used the characteristics of managers comprising three indicators as marker variables to carry out confirmatory factor analysis (CFA) marker and followed Richardson et al. (2009) to construct four models for estimation: the Baseline, Method-C, Method-U, and Method-R models. The results showed that the chi-square differences between the Baseline and Method-C models and between the Method-C and Method-U models were significant. However, the Method-R fit was not significantly worse than the Method-U fit, indicating that the presence of common method variance (CMV) was not significant. Finally, considering the demerits of CFA technology indicated by some scholars (Tang and Wen, 2020), such as complexity, partial compliance with the CMV mathematical model, inherent defects of Structural Equation Modeling (SEM), and the strong assumption of Method-C model, we followed the latent error variable control method for further analysis (Podsakoff et al., 2003), which is considered more in line with the CMV mathematical model (Tang and Wen, 2020). The results showed that the improvement in the fitting index of the SEM models was less than 2% in terms of $\chi 2/df$, IFI, TLI, and CFI. In summary, these results indicated that there was no serious CMB in this study.

4.4. Reliability and validity of data

A rigorous process was followed to validate the survey instruments. First, prior to data collection, content validity was established by close collaboration between academics and industry professionals in the development of measurement items and supported by previous literature and pilot tests.

Second, CFA was adopted to test convergent and discriminant validity. As the factor loadings of SCC1 and SCC5 were too low (<0.4), we performed a CFA after removing these two items. The model fit indices were $\chi^2/df = 2.778$, RMSEA = 0.071, IFI = 0.925, TLI = 0.911, and CFI = 0.924, suggesting that the model was acceptable (Hu and Bentler, 1999). Table 2 lists the standardized loadings derived from the CFA. All items had strong loadings on the constructs they were supposed to measure. The average variance extracted (AVE) and composite reliability (CR) were calculated based on these loadings. As shown in Table 2, the AVE values for all constructs were greater than 0.5,

Table 2
Data reliability and validity.

Factors	Items	Standardized loadings	Cronbach's Alpha	CR	AVE
Contractual governance	CG1	0.667	0.7821	0.8679	0.6277
	CG2	0.928			
	CG3	0.888			
	CG4	0.645			
Relational governance	RG1	0.807	0.889	0.8894	0.6172
	RG2	0.779			
	RG3	0.842			
	RG4	0.754			
	RG5	0.742			
Supply chain collaboration	SCC2	0.880	0.853	0.8617	0.6170
	SCC3	0.558			
	SCC4	0.732			
	SCC6	0.920			
Supply chain resilience	SCR1	0.628	0.878	0.8686	0.5733
	SCR2	0.822			
	SCR3	0.650			
	SCR4	0.781			
	SCR5	0.874			
Institutional environment	IE1	0.766	0.862	0.8650	0.6176
	IE2	0.851			
	IE3	0.675			
	IE4	0.839			

Factors	Correlation and square root of AVE					
	M	SD	CG	RG	SCC	SCR	IE
Contractual governance (CG)	5.9434	0.7741	0.792				
Relational governance (RG)	5.7145	0.8440	0.552	0.786			
Supply chain collaboration (SCC)	5.3897	1.0279	0.233	0.374	0.785		
Supply chain resilience (SCR)	5.6307	0.8094	0.292	0.493	0.442	0.757	
Institutional environment (IE)	5.7458	0.8890	0.367	0.494	0.374	0.359	0.786

indicating that the data had convergent validity, and the inter-construct correlations were less than the square root of the AVE, ensuring good discriminant validity of the data. Meanwhile, the Cronbach's Alpha and CR of all constructs were greater than 0.7, hence indicating good data reliability.

5. Hypothesis analysis and results

5.1. Main analysis

SPSS was used to test the proposed hypotheses, and SEM was used to verify the results. Before the analysis was conducted in SPSS, the items were averaged to obtain an observed value for each variable, all the data were standardized, and the interaction terms were centralized to avoid serious covariance problems. Subsequently, regression models were constructed based on the instructions proposed by Aguinis et al. (2016) and Busenbark et al. (2022), and SPSS 22 was used to perform regression analysis and bootstrapping tests. The relevant results are elaborated below. The details of the SEM analysis can be found in Appendix 3.

The results regarding the direct effects referred to in the hypotheses are shown in Models 1, 2, 6, and 7 in Table 3: contractual governance ($p < 0.001$) and relational governance ($p < 0.001$) have positive effects on both supply chain collaboration and resilience, and supply chain collaboration ($p < 0.001$) has a positive effect on supply chain resilience. In other words, H1 and H2 are supported.

Regarding the mediating effect reflected in H3a and H3b, Models 3 and 8 in Table 3 show that the regression coefficients of CG and SCC, and RG and SCC on SCR are significant, indicating that supply chain collaboration mediates the effects of contractual and relational governance on supply chain resilience. Additionally, we used the bootstrapping method to test the model illustrated in Fig. 1. Specifically, 5000 resamples with replacement were used to represent the sampling distribution of the indirect effects empirically. When supply chain collaboration is regarded as the mediating variable, the CIs of its mediating effects on the relationship between contractual governance and supply chain resilience (95% CI [0.058, 0.148]) and the relationship between relational governance and supply chain resilience (95% CI [0.068, 0.169]) do not include 0. In other words, H3a and H3b are confirmed. Furthermore, because contractual and relational governance have significantly positive direct effects on supply chain resilience, the mediating effects of supply chain collaboration on these two paths are considered partial.

Regarding the moderating effect of institutional environment, the results shown in Models 5 and 10 in Table 3 derived from the regression analysis indicate that the coefficients of the interaction terms CG × IE ($\beta = 0.099$, $p < 0.05$) and RG × IE ($\beta = 0.088$, $p < 0.05$) are significant. The results derived from bootstrapping, presented in Table 3, also suggest the positive moderating effect of institutional environment in these two paths. In other words, when the level of the institutional environment is high, contractual and relational governance have greater positive effects on supply chain resilience. Therefore, H4a and H4b are confirmed.

In addition, we conducted two analyses using simple slope analysis and the Johnson–Neyman (J-N) method (Hayes, 2013) to retest the moderating effect of institutional environment. The relevant results are elaborated below. First, we developed a simple slope diagram of M±1SD in Fig. 2, which showed that the higher the level of the institutional environment, the greater the positive impact of contractual/relational governance on supply chain resilience. Next, we observed the J-N region of significance and plotted this region in Fig. 3. This approach makes it possible to avoid the limitation of the "point selection method," which can only test a certain value of the adjusted variable at a time. Considering that only a few companies (5.0%) in our survey reported their scores for the institutional environment to be less than 4.286, Fig. 3 reconfirms H4a and H4b.

5.2. Endogeneity check

The endogeneity problem is difficult to eliminate completely from empirical research; however, this study followed Shou et al. (2020) and took a series of precautions to minimize potential endogeneity risks. First, to address endogeneity problems triggered by changes in respondents' motivation, late-response bias was examined, as detailed in

Table 3
Analysis results in SPSS.

Contractual governance as independent variable					
	SCC		SCR		
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Contractual governance	0.269***	0.370***	0.275***	0.300***	0.249***
Supply chain collaboration	–	–	0.355***	–	0.315***
Institutional environment	–	–	–	0.241***	0.151**
CG × IE	–	–	–	0.111*	0.099*
Staff size	−0.050	−0.028	−0.010	−0.059	−0.034
Operating income	0.123	0.139*	0.095	0.154*	0.113*
F	11.498***	23.279***	34.218***	19.782***	25.439***
R^2	0.089	0.165	0.279	0.219	0.303
Relational governance as independent variable					
	SCC		SCR		
Variable	Model 6	Model 7	Model 8	Model 9	Model 10
Relational governance	0.369***	0.440***	0.327***	0.361***	0.287***
Supply chain collaboration	–	–	0.306***	–	0.274***
Institutional environment	–	–	–	0.196**	0.131*
RG × IE	–	–	–	0.110*	0.088*
Staff size	−0.025	0.003	0.010	−0.027	−0.011
Operating income	0.126*	0.149*	0.110	0.158*	0.122*
F	21.394***	33.841***	38.229***	24.691***	27.485***
R^2	0.154	0.223	0.302	0.260	0.320
Test results of mediating effect using Bootstrapping method					
Path	Effect		Bootstrap Standard Error	Boot 95% CI	P
CG = =>SCC = =>SCR	Indirect	0.095	0.024	[0.058, 0.148]	***
	Direct	0.275	0.047	[0.182, 0.368]	***
	Total	0.370	0.049	[0.274, 0.467]	***
RG = =>SCC = =>SCR	Indirect	0.113	0.025	[0.068, 0.169]	***
	Direct	0.327	0.048	[0.232, 0.421]	***
	Total	0.440	0.047	[0.347, 0.532]	***
Test results of moderating effect using Bootstrapping method					
Path	IE	Effect	Bootstrap Standard Error	Boot 95% CI	p
CG = =>SCR	Low (M-1SD)	0.168	0.057	[0.055, 0.281]	**
	Mean	0.249	0.051	[0.150, 0.348]	***
	High (M+1SD)	0.330	0.069	[0.145, 0.465]	***
RG = =>SCR	Low (M-1SD)	0.207	0.065	[0.079, 0.334]	**
	Mean	0.287	0.051	[0.187, 0.388]	***
	High (M+1SD)	0.368	0.066	[0.238, 0.499]	***

Note. Significant at: ***p-value, 0.001, **p-value, 0.01 and *p-value, 0.05 level.

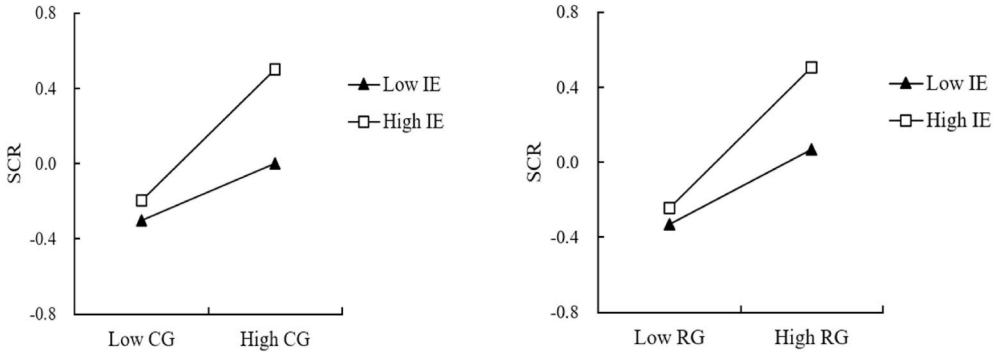

Fig. 2. Simple slope graph of the moderating effect of institutional environment.

Section 4.3 (Damali et al., 2016). Second, this study employed statistical remedies to address endogeneity that may have been due to CMB, as discussed in Section 4.3 (Guide and Ketokivi, 2015). Third, although the cross-sectional data used in this study resulted in the inability to establish and explain causality, the questionnaire was created based on the existing literature and written with common items that strove to obtain time-ordered responses (Damali et al., 2016). Fourth, appropriate control variables were included in this study to reduce potential bias due to omitted variables, and SEM was used to generate estimates based on the maximum likelihood method to address potential endogeneity (Antonakis et al., 2014). Fifth, we considered the possibility of simultaneity and reverse causality. The endogenous risk caused by "simultaneity and reverse causality" between the dependent variables (supply chain resilience) and the independent variable (contractual and relational governance) is minimal. We found little theoretical evidence in the literature to support the notion that supply chain resilience can affect cross-organizational governance. Additionally, the possibility of "simultaneity and reverse causality" between the independent variable

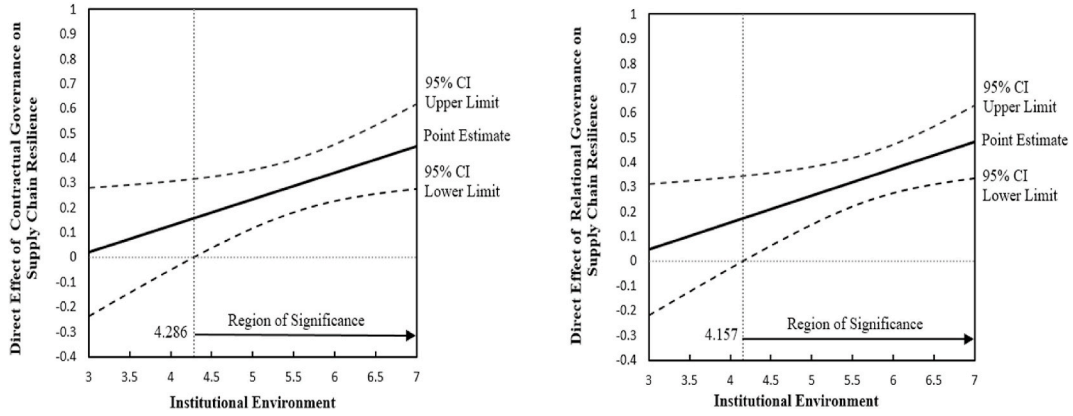

Fig. 3. J-N graph of the moderating effect of institutional environment.

(contractual and relational governance) and the mediating variable (supply chain collaboration) is minimal as well. As shown in Section 2.2, the effect of cross-organizational governance on supply chain collaboration has been well documented in existing studies, while no example of supply chain collaboration promoting cross-organizational governance can be found. Moreover, as elaborated in Section 3.2, contractual and relational governance are natural prerequisites for supply chain collaboration, rather than vice versa. Nevertheless, we followed the suggestion of Sluis and De Giovanni (2016) and used the Hausman test to determine potential endogeneity due to mutual causality. Specifically, we first regressed SCR and other variables on CG and RG, separately. As the standardized regression coefficients of SCR were significant, we substituted the estimates for CG and RG and then utilized a multiple logit regression model to derive the error terms. As the covariance of CG and error terms ($Cov(CG, u_i) = -5.7e\text{-}08$) and the covariance of RG and error terms ($Cov(RG, u_i) = -1.7e\text{-}08$) were not significantly different from 0, endogeneity was not a major concern.

6. Discussion and conclusion

Supply chain resilience has become a hot research topic in recent years, and research on the factors and mechanisms that affect it has both theoretical and practical significance. This study not only explored and confirmed the positive effects of contractual and relational governance on supply chain resilience, but also showed that supply chain collaboration and institutional environment play mediating and moderating roles, respectively, in these direct effects. Thus, this study makes the following theoretical and practical contributions.

6.1. Cross-organizational governance and supply chain resilience

This study extends the existing research on supply chain resilience by addressing a new influential factor: cross-organizational governance (including contractual and relational governance). In previous studies, scholars have focused more on the effect of cross-organizational governance, especially trust, on the resilience of the buyer-supplier relationship (Liu et al., 2009; Kaufmann et al., 2018) and addressed risks arising from aspects such as violations, betrayals, and conflicts among members of a supply chain (Song et al., 2019; Eckerd et al., 2021). As their discussions were between the levels of the individual and supply chain, they did not truly address supply chain resilience. Accordingly, less attention has been paid to resilience in terms of facing risks such as market demand and environmental fluctuations. Addressing this gap, this study elaborated on the direct positive effects of contractual and relational governance on supply chain resilience based on institutional theory, as shown in Section 3.1. Such assertions were further confirmed by the analysis results reported in Section 5. Hence, it is possible to conclude the importance of contractual and relational governance for supply chain resilience both theoretically and empirically. First, contracts can strengthen connections between a company and its supply chain partners, the standardization and effectiveness of the contracts can make the contract regulations form the institutional norms of corporate behavior, and mandatory contract laws can ensure that the contract regulations are implemented. Therefore, contractual governance can reduce the uncertainty of behavior and guarantee cooperation between a company and its partners in external risk events. Second, the exchange of trust and relationship commitment can allow both the company and its partners to establish willingness and consensus to maintain their relationships, long-term cooperation, and investment. This can reduce the monitoring of the other's behavior, increase investment in risk prevention in the early stage, and allow them to trust and cooperate with each other tacitly when external risks arise.

6.2. Cross-organizational governance, supply chain collaboration, and supply chain resilience

This study enriches the understanding of the relationships between cross-organizational governance, supply chain collaboration, and supply chain resilience. Previous studies have not exhaustively analyzed the relationship between these three concepts. Some studies limited their discussions to the relationship between contracts, trust, and supply chain collaboration without extending to supply chain resilience and considering the mediating role of supply chain collaboration (Hernández-Espallardo et al., 2010; Kyoung-Joo, 2011; Cheng and Fu, 2013; Anderson and Dekker, 2014; Awan et al., 2018; Kaufmann et al., 2018; Chi et al., 2020; Um and Oh, 2020; Xie et al., 2021). Other studies merely discussed the influence of relational competencies on supply chain resilience and interpreted relational competencies as a combination of relational governance and supply chain collaboration, without distinguishing between governance and collaboration (Nahapiet and Ghoshal, 1998; Fabbe-Costes and Jahre, 2007; Paulraj et al., 2012; Wieland et al., 2013; Chowdhury et al., 2022). In short, extant studies have failed to systematically discuss the relationships between cross-organizational governance, supply chain collaboration, and supply chain resilience. Addressing this gap, we distinguished between cross-organizational governance and supply chain collaboration, considered cross-organizational governance as the antecedent of supply chain collaboration, and specifically analyzed the mediating effect of supply chain collaboration on the relationship between cross-organizational governance and supply chain resilience, as implied in existing studies. The empirical results in Table 3 and Appendix 3 add evidence supporting the purported positive impacts of contractual and relational governance on supply chain collaboration. More importantly, our research indicates that supply chain collaboration partially mediates the relationship between contractual and relational governance and supply chain resilience. Thus, it complements previous studies by

revealing the essence of how cross-organizational governance influences supply chain resilience, as discussed in Section 3.2: the norms and common perceptions, in terms of contract, trust, and commitment, guarantee the collaborative operations of a company with its partners based on communication, joint decisions, information sharing, and regular meetings, which further facilitate the process of effectively facing risk events in the supply chain. In other words, the implementation of contractual and relational governance can be fully converted into an improvement in supply chain resilience only when the company collaborates with its supply chain partners.

6.3. The moderating effect of institutional environment

This study introduces the moderating role played by institutional environment in the effects of contractual and relational governance on supply chain resilience. Previous studies have demonstrated that volatility, ambiguity, and uncertainty of the environment can affect the implementation of formal and relational contracts (Carson et al., 2006; Ryu, 2006; Arranz and Fdez de Arroyabe, 2012; Abdi and Aulakh, 2012; Jean et al., 2021; Chowdhury et al., 2022), and that the institutional environment can moderate the relationships between various inter-firm activities and performance (Wang et al., 2016; Donbesuur et al., 2020). However, none linked the institutional environment to the relationship between cross-organizational governance and supply chain resilience. To address this issue, this study further incorporated the institutional environment as a key environmental element in the study of cross-organizational governance, extended the discussion of the moderating role of the institutional environment to a new situation, and thus broadened the application of institutional theory in the supply chain management field. The empirical results presented in Table 3, Appendix 3, and Figs. 2 and 3 show that the higher the level of the institutional environment, the greater the direct effects of contractual and relational governance on supply chain resilience. According to our elaboration in Section 3.3, the pursuit of social adaptability requires the cross-organizational behavior of companies to meet the expectations of the institutional environment (Singh et al., 1986). Consequently, the institutional environment can subtly influence the implementation of contractual and relational governance. Such influence of the institutional environment makes the implementation of contractual governance more effective. Additionally, it stimulates companies to actively adjust their behaviors in relational governance. All these make it more conducive for the company and its supply chain partners to reach a common understanding regarding their behaviors and goals, which is essential for supply chain resilience when facing risk events.

6.4. Managerial and policy implications

This study provides companies with practical insights for managing their supply chains. First, it suggests that a company can optimize contractual/relational governance of its supply chain partners to improve the comprehensive capabilities of supply chain resilience. When designing, signing, and executing contracts with supply chain partners, the company must conduct standardized and comprehensive management to ensure the integrity and validity of the contracts. Besides, it is also necessary for the company to strengthen communication and exchange with its supply chain partners. This can promote mutual understanding, cultivate trusting relationships, and strengthen mutual ties through specific investments in common business development or commitments to maintain relationships. Second, a company must recognize the importance of supply chain collaboration to improve resilience, because lack of collaboration in the supply chain would hinder the effects of both contractual and relational governance on supply chain resilience. In this case, it is recommended that the company improves the level of supply chain collaboration through communication, joint decisions, information sharing, and regular meetings with other supply chain partners to ensure that the effects of contractual and relational governance on supply chain resilience can be fully utilized.

This study also offers some policy implications. A higher-level institutional environment can be beneficial for converting the effects of cross-organizational governance into supply chain resilience. For a mandatory institutional environment, the government needs to formulate laws and regulations to protect the validity of contracts. It can also choose to introduce tax relief and preferential financial policies to encourage companies and their partners to fulfill contracts and cultivate collaboration when facing risks. For a normative institutional environment, industry associations must formulate industry standards to regulate company behavior. Industry events and conferences can also be held to promote company exchanges and cooperation regarding supply chain resilience. For a memetic institutional environment, it is necessary to identify a benchmarking company from the industry that has achieved excellent results in applying cross-organizational governance to improve its supply chain resilience, in order to help other companies learn and improve.

6.5. Limitations and future research

Although this study achieved certain results, some limitations remain, and future research is still needed. First, our measures could be refined further, as having longitudinal data would have been very valuable, and it would have been better if the data were collected in pairs comprising companies from the same supply chains. Second, it would also be better to follow the suggestion of Flynn et al. (2018) and conduct a Type 4 design survey, in which multiple respondents are used with dependent and independent variables addressed by different respondents, and some or all of the polyadic constructs are addressed by the best respondents. Third, as our empirical research data were collected only from Chinese companies, they may not be representative of the general situation. It is necessary for future research to extend the research scope to include companies from other countries. Fourth, we only included staff size and operating income as control variables. It may be better to consider more control variables to reduce endogeneity problems in future research. Fifth, we measured perceived IE rather than actual IE. Although measuring perceived IE is commonly accepted in existing studies, as mentioned in Section 4.2, the effect of actual IE on the relationship between cross-organizational governance and supply chain resilience is also worth discussing. We expect that new sampling and analysis will be performed in future research to address this question. Finally, this paper has proposed some explanations for the empirical findings, but more research is needed to fully understand the detailed mechanisms behind them, including the effect of various institutional environments, the ability of contractual and relational governance to mitigate different types of risks, and the trade-off between resilience and cost. We hope that these issues will be addressed in future studies.

Author statement

All authors have seen and approved the final version of the manuscript being submitted. They warrant that the article is the authors' original work, hasn't received prior publication, and isn't under consideration for publication elsewhere.

Declaration of competing interest

There is no conflict of interest that needs to be reported.

Data availability

Data will be made available on request.

Acknowledgement

This study is supported by The General Project of National Natural Science Foundation of China (72272068); Jiangxi Provincial Social Sciences "14th Five-Year Plan" Fund Key Project (21GL04); Jiangxi Provincial University Humanities and Social Sciences Project (GL21131); Jiangxi Provincial Department of Education Science and Technology Project (GJJ180255); Jiangxi Double Thousand Plan.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pursup.2023.100817.

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