

MANAGING EXOGENOUS AND ENDOGENOUS RISKS IN AUSTRALIA'S AGRICULTURAL SUPPLY CHAINS

Delwar Akbar*

Centre for Regional Economies and Supply Chains (CRESC) and School of Business and Law, Central Queensland University, Rockhampton QLD 4701, Australia. Email: d.akbar@cqu.edu.au

Trang Thi Thuy Nguyen

Centre for Regional Economies and Supply Chains (CRESC) and School of Business and Law, Central Queensland University, Rockhampton QLD 4701, Australia. Email: trang.nguyen@cqu.edu.au

Azad Rahman

Centre for Regional Economies and Supply Chains (CRESC) and School of Business and Law, Central Queensland University, Rockhampton QLD 4701, Australia. Email: a.rahman2@cqu.edu.au

John Rolfe

Centre for Regional Economies and Supply Chains (CRESC) and School of Business and Law, Central Queensland University, Rockhampton QLD 4701, Australia. Email: j.rolfe@cqu.edu.au

Susan Kinnear

Centre for Regional Economies and Supply Chains (CRESC), and School of Graduate Research, Central Queensland University, Rockhampton QLD 4701, Australia. Email: s.kinnear@cqu.edu.au

Surya Bhattarai

Institute of Future Farming Systems, Central Queensland University, Rockhampton QLD 4701, Australia. Email: s.bhattarai@cqu.edu.au

*Corresponding Author

ABSTRACT: Previous research suggests that collaboration among supply chain actors can help mitigate uncertainties and risks. However, little attention has been paid to risks which occur within the chain collaboration itself. This study examines how supply chain actors' agency contributes to effective risk management in agricultural supply chain collaboration (ASCC). Data were obtained from a multi-stakeholder workshop discussion focused on ASCC in

regional Australia. An analysis of the stakeholders' positions suggests that internal agency (single chain member's autonomy), collaborative agency (shared goals and interests), and integral agency (connection with internal and external chain entities) performed by chain actors are critical to ensure that the supply chain's risk management plans are put into action. Implications for managing collaboration risks associated with each form of the agency are identified, both for supply chains in general as well as for agricultural supply chains in particular.

KEYWORDS: Agricultural supply chain collaboration value chain; agency; risk management; regional Australia.

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1. INTRODUCTION

In the face of increasingly globalised economies, supply chains across sectors are being more exposed to opportunities, but simultaneously, are also more vulnerable to risks (Vilko *et al.*, 2019). Research on supply chain risk management suggests that collaboration among different entities within and beyond the chain is often key to mitigating risks and uncertainties, given that a key focus of supply chain collaboration is to build integration among chain entities, that allows win-win solutions for chain processes (Esper and Williams, 2003). However, different supply chain actors (e.g. supply chain members and those involved in the chain collaboration) may view the controllability and visibility of risks quite differently, which makes it difficult for a single actor to gain an understanding of other actors' strategies in managing risks (Vilko *et al.*, 2019). In the absence of collaboration, risk management efforts are unlikely to be comprehensive or effective across the supply chain (Revilla and Saenz, 2017). Risk management, therefore, should go beyond the actions of a single chain entity and instead be based on collaborative, systematic and holistic practice (Revilla and Saenz, 2017; Vilko *et al.*, 2019). Long-term collaborative relationships between supply chain members and other entities can result in reduced risks because these relationships can facilitate systematic approaches to identify, plan, and monitor risk sources and risk management processes in supply chain activities (Ali and Shukran, 2016).

There are many examples within existing research that identify supply chain collaboration as a risk management solution (e.g. Ali and Shukran, 2016; Chen *et al.*, 2013; Revilla and Saenz, 2017; Vilko *et al.*, 2019). To

date, however, little is known about the risks that might lie in the collaboration itself. For Chen *et al.* (2013), there are not only disruption risks caused by anthropogenic or natural disasters in supply chain collaboration, but also operational risks related to processes, people and systems in the chain. Zeng and Yen (2017) suggest that in addition to operational risks, there are relational risks which deal with relationship issues between members of the supply chain. Chen *et al.* (2013) and Zeng and Yen (2017) point to the fact that there are multiple kinds of risks in the process of developing and managing supply chain collaboration. It is hence important to acknowledge that as different supply chain actors have different collaboration goals and attitudes (Li *et al.*, 2015), any integration between chain members can be associated with certain risks, due to increased complexity and costs (Chaudhuri *et al.*, 2018). Developing strategies for risk management in supply chain collaboration, therefore, should be considered by all participating members in the chain (Delbufalo, 2018).

In the present study, we investigated risk management in agricultural supply chain collaboration (ASCC) using the lens of agency (i.e., one's potential or capability to make decisions and take action). The two main risk domains explored were operational/relational risks occurring in or resulting from endogenous issues in supply chain collaboration; and disruption risks resulting from anthropogenic or natural disasters, which are exogenous to the chain. To investigate this, we assessed an Australian case study to examine how supply chain members' agency contributes to reducing business risks and building effective chain collaboration. This involved drawing on the perspectives of multiple stakeholders who either are a member of, or have knowledge/experience about, supply chain collaboration in central and northern Queensland's regional agriculture. Farmers and agri-businesses who are involved in agricultural supply chains have been recently suffering from many risks and uncertainties related to extreme weather, market saturation, trade sanctions, or supply chain disruption due to the Corona Virus 2019 (COVID-19) pandemic. In the context of regional supply chains, moreover, there may be higher risks related to transportation barriers, lack of support services, or worker shortages. Addressing these risks requires actions in both top-down and bottom-up directions. A more holistic approach to risk management is therefore important to enable regional ASCC actors to properly respond to their complex operating environment. This might usefully include enhancing understandings of risk management processes and developing insights into actor agency in dealing with risks, especially in ASSC where risk management is more pressing and complicated than in other networks.

2. THEORETICAL DOMAIN

Supply chains in the agricultural sector often have to deal with multiple risks, including: (1) exogenous risks, or risks to collaboration (e.g. environmental, political, institutional, market, or disruption risks), and (2) endogenous risks, or risks associated with collaboration (e.g. operational or relational risks) (Chen *et al.*, 2013; Yeboah *et al.*, 2014; and Zeng and Yen, 2017). Due to the complexities of high-level coordination among multiple individual and business entities, the inflexibility of the collaboration, as well as the interdependency among chain partners, operational and relational risks in the collaboration process may be inevitable (Perrow, 1984; Terjesen *et al.*, 2012). For example, disruption of information, material, financial or product flows among chain entities (Munir *et al.*, 2020) can be a consequence of collaboration risks and uncertainties. These exogenous and endogenous risks are common in different kinds of supply chains and inter-organisational settings. As agricultural supply chains' business products often have a short shelf-life, the supply chain is vulnerable and risk management in ASCC is, arguably, much more pressing compared with that in manufacturing supply chains or other networks.

Supply chain risk management, which is a process of identifying and assessing risks, and mitigating their negative impacts and consequences across the chain (Norrman and Jansson, 2004), is, therefore, important to deal with such exogenous and endogenous risks. Supply chain risk management often includes two main components: planning and practice. Regarding planning, supply chains need to build a strong infrastructure and develop relevant strategies for managing different kinds of risks. Regarding practice, supply chain members need to show and enact their *agency* at different levels of their collaboration practice in order to translate these strategies into actions. The concept of agency in this study is not referred to as a business or an organisation that provides a particular service (Oxford University Press, 2022) as it is often publicly understood, but defined according to the structuration theory (Giddens, 1984). This theory views agency as the potential or capability that one has for reflecting and taking actions to pursue one's own purposes and interests (Giddens, 1984). As such, supply chain members who hold such potential and capacity can be seen as *actors* who can exercise their agency in making necessary decisions in the face of risks. Supply chain actors can be individuals or firms involved in one or more than one connection point along the chain, including chain members and external entities. Chain actors' agency, hence, can either help or hinder the management of risks

and uncertainties in the supply chain. In addition to well-developed risk management infrastructure and strategies which allow chain members to systematically respond to disruption and manage different kinds of risks (Ambulkar *et al.*, 2015; Revilla and Saenz, 2017), actor agency is critical to ensure that the supply chain's risk management plans and strategies are put into action. Drawing on Revilla and Saenz's (2017) proposition of a taxonomy of strategies for managing supply chain risks, we suggest that chain actors can have and exercise different forms of agency in line with such strategies in responding to supply chain risks and uncertainties. A detailed discussion of each agency form in relation to risk management in supply chain collaboration is presented below.

In their study on the impact of risk management on the frequency of supply chain disruptions, Revilla and Saenz (2017) suggest four main types of strategies for managing supply chain risks, namely passive strategies, internal strategies, collaborative strategies, and integral strategies, to explain how firms respond to supply chain disruptions. In the present study, however, we do not focus on a single firm, but on the whole supply chain and its collaboration practice. We therefore re-interpret and re-contextualise Revilla and Saenz's (2017) theory so it better suits our research purpose which is to examine chain actors' agency in supply chain risk management. In addition, we combine these strategies with the concept of agency (previously discussed) to highlight different forms of agency which could be enacted and performed by different chain actors when dealing with different exogenous and endogenous risks. Arguably, if the four types of strategies described by Revilla and Saenz (2017) are more related to what we would call risk-management-in-planning (risk management approaches or projects), supply chain members' agency in applying these strategies to manage different types of risks is important to translate the planned strategies into practice or action. In other words, agency is key to what we would describe as risk-management-in-practice (risk management actions or practices performed by one or more than one chain actor).

In association with Revilla and Saenz's (2017) passive, internal, collaborative, or integral risk management strategies, chain actors' agency in implementing the strategies can be either passive, internal, collaborative, or integral. *Passive agency* is where chain actors have no or limited actions, or lack the motivation to spend time and resources on understanding, preventing, and minimising potential risks, and instead interpret the environment as it is. *Internal agency* refers to the situation where each member (firm, supplier or producer, for example) in the chain articulates their own capabilities to proactively manage supply chain risks and

maintain the operational and information flow in their own unit. This agency, according to Revilla and Saenz (2017), can help the chain member understand their environment and learn from their experiences. Internal agency, however, does not always work if the actor is part of a complex and interdependent supply chain collaboration. Therefore, the *collaborative agency* is much more important to successfully deal with multiple kinds of risks in such a collaboration. Chain actors' collaborative agency is where they attempt to manage risks through their chain relationships and networks, and liaise and work jointly with other members of the supply chain. For example, making the decision to develop a risk information-sharing mechanism and improving responsiveness, is a typical method of exercising collaborative agency by chain actors. Finally, *integral agency* is where chain actors are willing to connect with not only chain members, but also external chain entities (such as governments, competitors or market analysts) to find solutions for supply chain risks, that allows them to build better capabilities to cope with operational, relational and disruption threats in their collaboration and business activities (Revilla and Saenz, 2017, pp. 561-563) (Figure 1).

The discussion on types of risks and forms of agency serves as a theoretical lens for examining the research question guiding the present study:

What are Australian stakeholders' perceptions of supply chain members' agency in managing risks in agricultural supply chain collaboration?

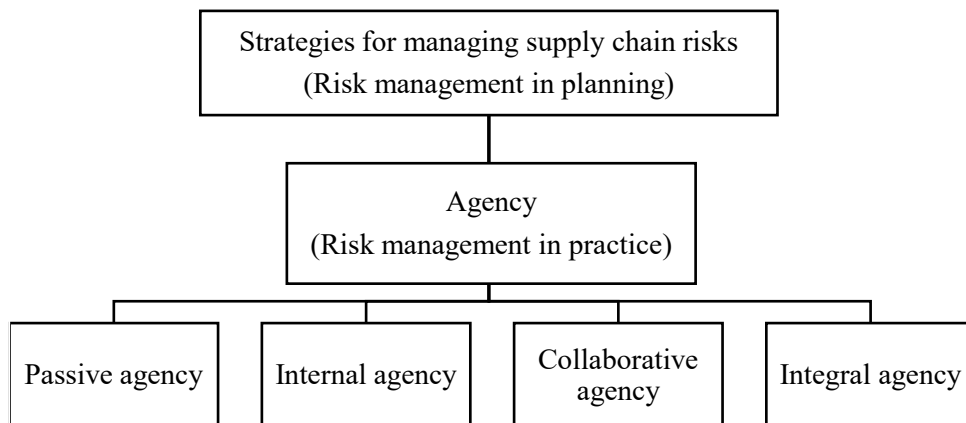


Figure 1. Forms of Agency in Managing ASCC risks. Source: the Authors.

3. METHODS

The present study applied a qualitative approach to identify the agency exerted by multiple chain members in managing risks in supply chain collaboration. This approach allowed the collection of rich and in-depth data regarding individual perceptions of stakeholders participating in the research. The participants discussed the issues of ASCC in the context of central and northern Queensland. These are large and productive geographic and economic regions, which are connected with road, port and domestic airport networks, and well equipped with air facilities. Central and northern Queensland are also agriculture-intensive regions, which generated a gross value of agricultural production of more than \$1.4B and \$1B in the year 2020/2021, respectively (Australian Bureau of Statistics, 2022). The two regions have diverse agricultural products including beef, sugar, cotton, grains, horticultural products, and other commodities. Due to the high international (but low domestic) demand for perishable agricultural commodities, developing effective supply chain collaboration is important to better enable export of these high-value agricultural products to Asian markets (Akbar *et al.*, 2019; Akbar *et al.*, 2021).

Workshop Design

A workshop process was initially designed to analyse three strategic components (i.e., leadership, business management, and support) when translating two models of ASCC into practice. Drawing on our past reports on related issues (Akbar *et al.*, 2019; Akbar *et al.*, 2021) and a review of literature, an interactive workshop-based survey and discussion activities were developed, with a structured survey questionnaire and follow-up open-ended discussion questions. This workshop was designed for compatibility with the online Zoom meeting application.

Participants and Data Collection

The present study draws on the views and perceptions of multiple stakeholders, who can provide insights of different layered and multifaceted aspects of ASCC (Babacan and McHugh, 2020). Twenty-three stakeholders attended the workshop activities via the Zoom meeting. The main types of participants included researchers ($n = 6$), state and local government officers ($n = 4$ and 3 , respectively), producers/growers ($n = 3$), marketers and exporters ($n = 1$), industry peak body representatives ($n = 1$), and other ($n = 5$). This group of participants reflected a somewhat

diverse cross-section of actors and stakeholders in agricultural supply chains. Due to difficulties in approaching stakeholders and engaging them for the workshop, representatives of some other sectors such as the federal government, transport, warehousing, distribution, or retailing were absent from this group.

The stakeholders were all either a member of or had knowledge/experience about one or more supply chain collaborations in the agricultural sector in central and northern Queensland, Australia. In these settings, the agricultural supply chains often face not only exogenous risks which are typical in regional areas, but also endogenous risks and challenges associated with the chain's operation and relation, such as lack of awareness of what others in the regions are doing; lack of coordination across and within industries; lack of leadership; lack of joint advocacy and vision; cross-jurisdictional governance; contradictory actions at the industry, policy or regional level; or duplication of efforts, infrastructure and training (Babacan and McHugh, 2020).

Participants were invited to take part in two activities during the workshop, including an online pop-up poll, with the results of every question shown on screen to participants, followed by a follow-up discussion after each question. The pop-up poll was to collect participants' perceptions on what is needed for better management of export supply chains, and included 16 questions. Pop-up poll questions focused on reasons for joining a supply chain network, supply chain leadership, skill development for supply chain actors, government support, strategic elements for enterprises in supply chains, and cost responsibility in building supply chain collaboration. The follow-up discussion initially enabled clarification of poll responses, but then also extended to several different topics related to supply chain collaboration. The issues of risks and risk management naturally emerged as the participants discussed difficulties and challenges in supply chain activities. Although the workshop facilitator did not directly raise the question of agency, it was highlighted by many participants in the discussion. The workshop discussion was open in nature, and all participants could freely contribute their ideas to the conversation. However, the extracts selected as illustrations in the present study's findings and analysis section show a greater contribution by participants who represented industry peak bodies and state governments. The researchers mainly played the role of discussion facilitators, although they also occasionally contributed to the conversation. To preserve participants' anonymity, pseudonyms are used for all participants.

Data Analysis

After transcribing the workshop discussion verbatim, a Grounded-Theory informed approach (Strauss and Corbin, 1998) was applied to analyse the qualitative data in a systematic manner. Discussions related to risks and challenges in supply chain collaboration were selected as the primary focus. Data went through three main coding stages: open coding, axial coding and selective coding. In the first stage of the open coding, initial and random themes were allowed to emerge from the data, rather than being predetermined. In the axial coding stage, themes were refined and put in groups and categories of different topics (e.g. risks in entering a supply chain collaboration, strategies for managing collaboration risks, etc.). In the selective coding stage, categories of theoretical themes were created, where extracts of the discussion were connected with theoretical ideas and concepts of agency discussed previously (e.g. internal agency, collaborative agency, integral agency, etc.). We selected extracts related to the issue of risks and uncertainties to illustrate our discussion on different forms of actor agency in supply chains' risk management in the next section.

4. FINDINGS AND ANALYSIS

In the below sections, we explore supply chain members' different forms of agency in managing risks in ASCC by examining two main issues: risks in entering a supply chain collaboration, and strategies for managing risks. Interpretation of how these forms of agency work in responding to different kinds of risks and uncertainties were also brought into the discussion where relevant.

Risks in Entering a Supply Chain Collaboration

The stakeholders' discussion revealed that chain members' agency is critical for managing risks and uncertainties in ASCC. In talking about Australian agricultural entities' motivation for entering a supply chain collaboration, a state government officer highlighted the significance of building trust as well as sharing risks and rewards in the collaboration. The state government officer related a situation when some businesses lost their money through supply chain participation and no longer had the trust to continue with the collaboration, thereby pointing to the issue of internal and collaborative agency among actors who often consider risks and rewards of their supply chain participation. As s/he stated:

Many businesses will put a toe in the water on doing exports and then they'll pull back because once they find that there are various limitations to the way they set up their supply chain. And this is one of the factors is having the right information at the right time to do it. There've been many cases of cooperatives forming and then failing. Because of the strategies that they put in place, so there may be examples that I've seen in the past is constraints due to infrastructure, poor infrastructure selecting the wrong partners and also sometimes they will select the right partner [...]. Because it's what they'll do is they'll have a taste and they'll lose a fair bit of money and they'll never come back to it.

The government officer's comment about Australian agricultural businesses' undesirable experiences in supply chain collaboration indicated that in considering reasons for entering a supply chain, chain partners are often driven by self-interest and financial gain. When there are problems such as "poor infrastructure" or "various limitations to the way they set up", businesses may feel that the present collaboration fails to meet their expectations, and can exercise their internal agency to decide that it is better to "pull back" and "never come back". It is therefore important for supply chain members to exercise their collaborative agency to develop and maintain a shared understanding of the objectives and benefits of collaboration (Rye and Isaksson, 2018), including "having the right information at the right time". In other words, each individual or business entity should be made to realise that although there may be initial limitations in entering a supply chain collaboration, this trade-off between chain members is net-positive overall. They should also understand that building effective collaboration will need the investment of time, trust and resources. This is critical for minimising operational and relational risks, and building an effective collaboration infrastructure which can facilitate members' collaborative agency in the chain.

In line with the discussion on supply chain participation, an industry representative suggested that chain members should be aware of choosing the right people to collaborate with to make sure that things would go well in their team and network. S/he said:

They (businesses who are an importer in other countries) know more about their end-users than they know about the Australian end-users. So, if you put people in from them too early, you run great risks, and this goes back to the trade literacy example to wear. I've got some horror stories and there're a lot of things happen behind the scenes that most people aren't aware of, either because of somebody in the networks in action or poorly informed actions. It's a trade, delegations are great. We need them both ways. There're are too many of them happening in

isolation not enough collaboration, but you got to be ready to roll or close to ready to roll with the right people. Yeah, right learning curves for those that are still thinking about it and keen to progress in developing their capacity. But if they decided yesterday that they want to export, you don't put them in front of the trade mission tomorrow.

The industry representative might suggest that actors' internal and collaborative agency were critically important in partnership selection, and that the wrong selection of people would lead to putting the chain at "great risks" in the early stages of establishment. S/he might imply that members who intended to invite other people or parties to join the chain should not only show their internal agency but also perform their collaborative agency in considering the group's shared goals and other potential risks. In selecting partners for the chain, members should exercise their agency in examining a number of factors such as compatibility of value and culture, resource complementation, or trust (Hui *et al.*, 2015). These are important to avoid operational risks such as horrible "things happen behind the scenes" (as commented by the industry representative).

Strategies for Managing Collaboration Risks

The stakeholders then discussed different strategies for supply chain collaboration and by default provided evidence for the importance of collaborative and integral agency in using these strategies for managing risks in the collaboration. Building and operating the network were amongst the most important collaboration strategies considered by them. Enhancing collective leadership in the chain, where all members understand their role and capacity in contributing to the success of the collaboration, was also another strategy mentioned in the discussion. For the participants, in general, a collaboration of actors could work well when there was a well-informed and effective facilitator steering the group.

The industry representative, in discussing the issue of leadership, for instance, believed that chain members' understanding of how collaboration works and what it means to have consistent goals was necessary to deal with risks, otherwise there would be problems such as breaking deals or works undone "overnight". S/he thereby emphasised the importance of collaborative agency in supply chain risk management. As s/he commented:

So if we're focusing on export, not interstate sales, then everyone in the system of a supply chain collaboration needs to be supported in better understanding how it all works because there're a lot of risks supply that can make or break a deal overnight. And if everyone is not

on the same page, then they don't understand why they're their role in the process is actually a significant contribution to the success. [...] from the irrigation manager right up to the top of the tank.

The industry representative's discussion on supply chain leadership made it clear that as "there're a lot of risks" in supply chain collaboration in Australia's agricultural sector, it is important for chain actors to express their collaborative agency in understanding what it means by being "on the same page" and acknowledging all members' role, position and contribution in the team. This is consistent with collaborative leadership where all chain actors understand their contribution and act accordingly to deal with risks (Akbar *et al.*, 2021). It is hence suggested that supply chain collaboration can offer mutual efforts to resolve the managerial issues (Simatupang and Sridharan, 2002) through its members' collaborative agency in sharing (leadership) power, where all could have an important influence on the network's organisational goals and risk management infrastructure.

In discussing supply chain activities and trading culture beyond Australia, the researcher who was facilitating the discussion suggested that in being involved in the broader supply chain meant that chain members needed to learn to understand others' business, adapt to the latter's requirements, and mitigate relational risks. As s/he stated:

It's different for every business, every individual, every country that you're dealing with. As long as you understand it and adapt your business strategy to suit what's required to get the deal done. Then at least, you're making an informed decision. So Alpha 2 if the need is to have an informal arrangement and you understand what the risks are, and you're doing your level best to mitigate the risks elsewhere in your business. Then at least you're going into that trade with an understanding that if it comes off, we're sitting pretty, if it doesn't, at least we've got processes and other deals in place that will limit the pain.

The researcher, hence, pointed to the necessity of learning how formal and informal agreements work differently for different individuals and businesses in different countries. S/he might suggest that supply chains' collaborative agency in adapting their business strategies in dealing with cultural issues and responding to relational risks could be critical for the supply chains' competitive advantage and success. The widespread use of informal agreements in business partnerships can be seen as a strategy for mitigating risks beyond operational risks, but are also extended to relational issues (Zeng and Yen, 2017), especially when there are

differences in business culture of members who are involved in an international supply chain.

In line with the discussion on collaboration strategies, the stakeholders also indicated the impact of COVID-19 on supply chain operations. The industry representative believed that it was important for supply chains to manage their network and investment strategies in reflecting on and dealing with disruption risks. This is consistent with the importance of supply chain members' collaborative agency in making use of strategies to sustain or reorganise their collaboration in the face of disruption risks, which could be mediated through their sense-making and the chain's available resources (Sullivan *et al.*, 2012). As the industry participant commented:

But the challenge right now is there're a lot of things happening in isolation and regionalised, but for our supply chain networks to be sustainable into the long term and to meet what our trading partners' supply chains are doing. That's another critical factor. Is they're restructuring their supply chain networks and their agri industry investment strategies. During a COVID we need to align with our best trading partners systems as well? But if we don't do something collaboratively rather than in isolation, we will lose Cairns airport.

The stakeholders also mentioned the role of governments and industries in Australia in supporting and restructuring supply chains so they could respond to environmental uncertainties and disruption risks such as COVID-19. In supply chains, hence, the development of collaboration requires not only internal and collaborative agency (efforts by single or multiple chain members), but also integral agency (the connection between supply chain members and external entities). This collaboration process may, therefore, allow them to build a more holistic risk management approach in the supply chain.

In summary, the findings suggest that for the stakeholders participating in the workshop, successful risk management in supply chain collaboration should be based not only on the chain's infrastructure and planned strategies which facilitate risk management mechanisms, but also on the involvement of multiple forms of agency performed by actors associated with the supply chain. Each agency form has its own role in managing different kinds of risks in collaboration. According to the stakeholders: (1) internal agency is manifested in each single chain member's autonomy in utilising their capacity to calculate risks and rewards in joining a supply chain, (2) collaborative agency in taking action for their shared interests, purposes, and goals, is key for the effective management of exogenous and endogenous risks in the collaboration, and (3) integral agency or

connection with both chain members and entities external to the chain such as governments or industries was not less important in the face of disruption risks. The stakeholders, however, did not provide examples of passive agency in the workshop discussion.

5. DISCUSSION AND RECOMMENDATIONS

The findings highlight that internal agency, as an isolated pattern of decision-making performed by a single member (such as a firm, supplier or producer), may—to a certain extent—contribute to minimising “break-up” risks and other endogenous risks in supply chain collaboration. First, chain members should exert their agency in making decisions to attract people, and select good partnerships in building their collaboration, because as suggested by the industry representative, the wrong selection of people creates risks in the early stages of establishment. Second, when people have joined the collaboration, it is important to retain them in the network, help them understand the reason “why businesses want to go down that path as part of a collective group” and facilitate their collaborative agency as a responsible actor of the chain. In other words, members need to not only understand supply chain vulnerabilities but also see their incentives and rewarding outcomes in participating in the collaboration. This would contribute to managing and diminishing the situation that chain members face when there are unexpected issues during their collaboration, and then exercise their internal agency to depart the collaboration. For Revilla and Saenz (2017), however, successful decisions at the internal level might require joint decision-making and effective synchronisation of operations among independent chain actors.

Furthermore, it is revealed from the findings that collaborative agency among chain actors is key for effective risk management. Without collaborative agency, managerial efforts to deal with risks and uncertainties are unlikely to be effective (Revilla and Saenz, 2017). When chain partners perform their roles and responsibilities in accordance with the chain’s mutual practice and principles, they show their collaborative agency in involving in multiple risk management endeavours. These endeavours could be willingness to share information within the network or being able to learn and adapt to business and culture differences. This would allow them to build reliable risk-information sharing and risk-sharing mechanisms (Kleindorfer and Saad, 2005) and improve the chain’s responsive capacity to cope with exogenous and endogenous risks (Villena *et al.*, 2009). Their collaborative agency can also facilitate managerial efforts through dialogical leadership (Raelin, 2016; Simatupang and

Sridharan, 2002), given that risk judgments are often seen as a determinant of managerial choice (Revilla and Saenz, 2017). Chain leaders and members should understand that the collaborative engagement shared by all participants (van der Heijden and Cramer, 2017) is critical for effective risk management in their supply chain collaboration practice. Regarding leadership, risk management, and collaborative agency, it has been suggested—in a study on stakeholder collaboration models for exporting agricultural commodities—that the supply chain leader who often takes on risks should deserve a greater share of benefits from the collaboration (Akbar *et al.*, 2020). As such, consensus on the leadership role in terms of shared risks and benefits can be seen as a kind of collaborative agency among chain members, that can contribute to reducing endogenous collaboration risks in their supply chain.

In addition, it is reiterated from the stakeholders' discussion that integral agency, that is, chain actors' capacity to connect with not only their chain members but also entities external to the supply chain (such as governments or other industries) is also significant to the chain's successful risk management. Central and local governments (in the case of Australia, for instance), although rarely directly involved in supply chains, can re-design and implement policies and regulations, or provide financial support to supply chains when necessary, that is important to help them to deal with environmental uncertainties and disruption risks such as the COVID-19 pandemic. When chain members and leaders are willing to exert their integral agency to connect with external entities, they would be able to provide a more coordinated response to and build more holistic capabilities to cope with various kinds of risks to maintain their supply chain collaboration in the face of disruption (Revilla and Saenz, 2017). Exercise of integral agency in connection with external entities, in addition, should be in terms of not only vertical collaboration (e.g. engagement with governments and other industries) but also horizontal collaboration (e.g. partnership between producers), that would be important to diminish endogenous risks. As we indicated in a recent study, for instance, combination of vertical and horizontal connection would allow supply chains to develop strategic (rather than opportunistic) collaboration where risk-sharing mechanisms are more effectively maintained (Akbar *et al.*, 2020).

6. CONCLUSION

This study has examined the issue of agency in managing exogenous and endogenous risks in ASCC, drawing on the perspectives of stakeholders

who have the knowledge and/or experience about supply chain collaboration in central and northern Queensland's agricultural sector. Given that there are multiple collaboration risks which agricultural supply chains in the regions often face (Babacan and McHugh, 2020), as aforementioned, agency performed by different chain actors is critical to put the chains' risk-management-in-planning into action, in order to build more effective supply chain collaborations in the regions.

The theoretical position on actor agency in managing risks in supply chains which we have developed is, however, relevant to not only agricultural supply chains in central and northern Queensland, but also other supply chain contexts. Our analysis highlighted the importance of actors' internal, collaborative and integral agency in minimising risks and uncertainties, as well as fostering collaboration practice. For Revilla and Saenz (2017), internal agency alone is not enough for chain members to deal with risks, and an inter-organisational orientation of utilising chain actors' agency (combining both their collaborative and integral agency) is the most appropriate to maintain the lowest level of disruption and risk in the chain's collaboration.

Given the complex involvement of these different forms of agency in supply chain activities, however, our above recommendations in relation to each agency form should be interpreted with caution. The discussion of findings also further reveals that supply chain members' positive internal, collaborative and integral agency can help the chain to be more effective in managing challenges, and this would be true for many networks and not just supply chain collaborations in the agricultural sector. However, given the high level of risks and uncertainties that agricultural supply chains are often exposed to compared with manufacturing supply chains (as previously discussed), the idea of actor agency is more crucial to effectively manage risks in this setting. As agricultural supply chains' business products have special characteristics such as seasonality, bulkiness, variability, or perishability, this makes their risk management much more pressing and complicated (Behzadi *et al.*, 2018). As such, risk management in agricultural supply chains requires not only relevant infrastructure and strategies, but also timely, prompt, proactive, and unified actions and collaboration by chain members. Members' exercise of weak or strong agency—that hinders or fosters risk-management-in-practice—hence, can have a more direct and immediate impact on the group's activities in agricultural supply chains than in other networks. More research on actor agency in ASCC, as well as on how chain members (especially those at the grassroots level) in this setting can be supported to develop stronger agency, needs to be conducted.

The present article has some limitations related to the study's context, research scope and the nature of data. First, the workshop discussion focused on agricultural supply chains in central and northern Queensland. Thus, the risk management strategies and agency suggested in this paper may not be translatable to other parts of Australia. Second, as the workshop mainly focused on perishable tropical fruits and vegetables, the risks mentioned by the stakeholders may be different from the risks which supply chains of other agricultural products often experience, so our conclusion and recommendations may not be generalisable. Third, as the empirical basis of the study is mainly taken from the workshop discussion, our data may not be sufficient to provide real-life examples to illustrate the arguments about agency in managing risks in ASCC. Our article, however, contributes new perspectives on different types of risks and the role of actor agency in managing risks, which can be re-applied in research on risk management in different kinds of collaboration and networks.

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