Determinants Of Value Chain Resilience In Southern African Agricultural Commodity Markets

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Abstract

The Covid-19 pandemic has shown the importance of building resilient value chains. However, building such value chains remain enigmatic for managers owing to the eclectic and disparate literature on the determinants of value chain resilience. This study sought to build a unified framework for understanding the determinants of value chain by exploring and testing the systemic determinants that characterising resilient agricultural commodity value chains in the Southern African region. A questionnaire survey was carried out with a sample of 238 supply chain practitioners working along the primary agricultural commodity value chains in six countries in the Southern African Development Community (SADC) region. The findings indicate robust chain relationships, strategic orientation, strategic alignment, heterogeneity, chain champions, dynamic intermediaries, trust, commitment, technological integration, collective action regimes and internal competition are important determinants for value chain resilience. In addition, incumbent firms' ability to anticipate, adapt, respond, recover, and learn are significant capabilities to achieve resilient commodity value chains. Since innumerable disruptions are pervasive in the agricultural commodity value chains in developing countries, identification of the systemic determinants for value chain resilience provides the foundation upon which value chain improvement programmes and thus more sustainable and competitive primary agricultural commodity value chains can be devised and implemented.

Keywords: systemic determinants, sustainable competitive advantages, resilient value chains, resilience, agricultural commodity value chains, strategic alignment, heterogeneity, trust, intermediaries

Introduction

The business environment is increasingly characterised by unrelenting change, and this change creates risk and uncertainty. For the developing economies, the ever shifting global political, economic, social, technological, ethical, and demographical environments calls value chain planner to make analysis of level of resilience in their systems. For developing countries, the export of agricultural commodities contributes substantially to the national income (GDP) and yet commodity value chains are often imperilled by perennial risks and disturbances arising from severe weather, ongoing climate change, declining international order, economic crises, changing societal priorities, cyber threats, pandemics, or terrorism (World Economic Forum, 2019). Contemporary studies (for example, Rosca & Bendul, 2019; Mjonono, 2020) show impeccable empirical evidence that the ability of these economies commodity markets to integrate into value chains (GVCs) remains the most distinct characteristic of competitive and growing economies in the developing world. Value chain integration has in most cases strengthened commodity producers' competitive positions in both the domestic and international markets. Meanwhile, the recent COVID-19 pandemic crisis has alerted the world of how fragile and vulnerable these increasing interconnected and globalised economies can become in the face of the sudden shocks inflicting adverse disruptive risks. This suggests the need for resilient commodity value chains if sustainable competitiveness and growth of the commodity markets is to be attained in the developing world especially considering the ever more imminent disruptive risks such as the climatic anomalies, market volatility, and pandemics that characterise agricultural commodities. Agricultural commodity value chains must thus be designed with an inbuilt capacity to continue operational even if the operational shocks are to occur. Significant shocks may culminate in the complete collapse of non-resilient value chains. Resilient agricultural commodity value chains would thus have the capacity to continue providing the anticipated set of commodities and services while confronting any form of disturbance. Conversely, a resilient value chain can sustain a growth trajectory despite shocks and stressors (Linkov *et al.*,2020). At the same time, such value chains need to have that capacity to recover from the unexpected shocks as well as adjust quickly enough to the accompanying operational changes (Dong, 2021; Fromm, 2022).

However, building such value chains remains enigmatic for agricultural managers due to the eclectic and disparate literature on the nature of the determinants of value chain resilience (Kano, Tsang & Yeung, 2020). While the use application of the concept of resilience has in recent years gained strong footing in the supply chain management research, its conceptualization and application in value chain research is yet to gain traction. In particular, the supply chain notion of resilience does not appear to acknowledge the slow-moving variables, tipping points, and configurations, which seem central to understanding resilience in value chains. More telling is the issue of scant research that reveal the contextual determinants of value chain resilience in agricultural commodity markets in the developing countries of

Southern Africa (Nelson & Tallontire, 2014; Vroegindewey & Hodbod, 2018; Amelework *et al*., 2021; Smidt & Jokonya, 2022). Moreover, traditionally, the value chain approach was merely developed to analyse social and economic equity issues, without providing a theory for grasping the very essence of resilience (Kaplinsky & Morris, 2001; Fold, 2014; Gereffi, 2014; Carraresi & Bröring, 2021). The aim of this article is to structure an integrated framework of determinants of resilience in value chains through exploring and testing systemic determinants characterising resilient agricultural commodity value chains in the Southern African region. For Bijman *et al.* (2020), understanding the determinants of value chain resilience is a prerequisite for building agricultural commodity value chains that will be able operate successfully in increasingly consistent and unpredictable operational shocks. This article is organized as follows: The next section conceptualises value chain resilience. This is followed by the presentation of the methods and procedures adopted in this paper. A subsequent section presents the research results and finally the conclusions and discission are presented.

Understanding the determinants of value chain resilience

In this section, an attempt is made to develop a conceptual understanding of agricultural value chain resilience as well as to identify the determinants of value chain resilience. In this bid, insights are drawn from the social ecological system (SES), the Supply chain management (SCM) and the value chain (VC) theories. Per the SES theory, human activities depend on a host of social and environmental services resulting from the contacts between people and nature in coupled, interacting social-ecological systems (Dwyer *et al*.,2020). For Linkov *et al*. (2020), value chains allow the identification of location of value creation, or how value can be created or lost before the desired product or service is delivered or used. Important to note is that a value chain is a complex social-ecological system incorporating multiple and complex environmental, social, political, and economic components (Marshall, 2015). Per Mapanga *et al*. (2019), a value chain includes a range of tangible and intangible economic, social, human, geographical and technological elements that influence the creation of value for customers. In addition, a value chain entails erratic spatial, temporal, and institutional scales comprising some trade-offs between them (Vroegindewey & Hodbod, 2018). For Biggs *et al* (2015), value chains are adaptive systems comprising a multitude of elements displaying a high level of dynamic relations and evolving behaviour. An agricultural value chain system comprises two layers, namely, the value chain structure that facilitates the production and trade of the agricultural commodity and the institutions responsible for governing the use and flow of resources as well as coordinating activities across the value chain. The later entails the horizontal coordination structures that govern the interaction of businesses within a given value chain segment, such as cooperatives. In contrast, the SCM resilience thinking simply assumes that shocks are exogenous to the system. This ignores the supply chain's own likely effects that may also generate endogenous disturbances and its interactions with other systems (Sun *et al*., 2018). Nonetheless, the SCM is instrumental in understanding the structure of the value chain.

Determinants of value chain resilience.

Calatayud and Ketterer (2016) proposed a taxonomy of risks affecting value chains, including systemic, market, operational, credit and liquidity. Earlier, Biggs *et a*l. (2015) had attempted to categorise the determinants drawing from the SES theory and the supply chain management theory, namely, maintaining diversity, and redundancy and managing connectivity of the value chain components to facilitate the value chain flows of goods and information and to constrain the spread of a disturbance. They also use the supply chain management paradigm to identify the necessary ingredients for building resilient supply chains. A systematic review of supply chain management literature during this study highlighted several determinants of resilience which could also have important implications for value chain resilience. Table shows the identified determinants, but it should be noted that these had not been tested in the context of agricultural commodity value chains.

Table 1: Determinants value chain resilience.

Construct	Definition
Value chain Agility/ responsiveness (Christopher, Swafford *et al*., 2006; Aboah et al., 2018; Shqairat & Sundarakani, 2018)	• The organizational ability to quickly adjust value chain operations to respond to environmental changes, opportunities, and/or threat. • For Christopher (2004), building agility is one of the most powerful ways to achieve resilience in the value chain. Agile value chains could then enact a more rapid response to changed conditions in the value chain
Value chain Visibility (Sodhi & Tang, 2019;).	• Visibility refers to an organization's efforts to gather and systematize information about supply activities, primarily for internal use (Sodhi and Tang, 2019). • This implies that visibility of the upstream and downstream value chain processes would likely foster greater accountability and governance in value chains. • Furthermore, effective transparency strategies by value chain actors may help to reduce value chain uncertainty and stimulate organizational cultures more oriented towards collaboration and openness in the face of possible risks.
Value chain flexibility /redundancy (Scholten& Schilder, 2015; Christopher, 2016; Aboah *et al*., 2018; Miroudot, 2020; Rajesh, 2020; Ahmed *et al*.,2021)	• Value chain flexibility is a necessary mechanism towards sustainable initiatives for addressing ambiguity in the value chain. • Resilient processes are flexible and agile and can change quickly (Christopher; 2016). • Flexibility could support coordination processes and give organizations the ability to deal with high levels of uncertainty (Scholten& Schilder, 2015). • redundancy in terms of slack or unused resources and a multi-skilled workforce could be factors that enable flexibility in the value chain

Structure and knowledge (Choi & Hong, 2002; Scholten *et al.*, 2014)	• Knowledge and understanding of the value chain n structures-both physical and informational-could be important elements of supply chain resilience • A risk index for each component and commodity, based on uniqueness and location of suppliers and customers, could be a useful tool to build resilient value chains • Creating a comprehensive view of the supply chain through detailed sub tier mapping could be a critical step to identifying hidden relationships that invite vulnerability
Value chain uncertainty reduction capability (Chopra & Meindl, 2016; Brandtner,2020; Zhang *et al.*, 2021;	• The complexity of value chains entails a rising amount and variety of endogenous and exogenous parameters, which lead to a high level of uncertainty. • Uncertainty Reduction could be a realistic way to improve value chain resilience. • Christopher (2000) adds reduction of complexity through business process reengineering initiatives
Value chain Collaboration (Bowersox, 1990; Wieland & Wallenburg, 2013; Scholten & Schilder, 2015	• Collaboration could signal information-sharing, and propensity for joint development of strategic plans and synchronization of operations in value chains • Can reduce the impact of any disruptions in the value chain through convergence of interests in the value chains • Value chain collaboration could bring about benefits such as higher visibility, flexibility, and reduced lead times in the value chains, • Could be source of decision synchronization and incentive alignment to guarantee effective system-level disruption responses needed to achieve value chain resilience (Wieland and Wallenburg, 2013).
Value chain transparency (Brandon-Jones et al., 2014; Dubey et al., 2019; Bai & Sarkis, 2020; Yao & Zhu, 2020).	• Value chain transparency relates to the practice by VC partners to disclose adequate and accurate information about their operations and products, e.g., origin and sourcing, manufacturing processes, costs, and logistics (Bai and Sarkis, 2020). • Effective transparency policies and processes could be imperative for maintaining or regain value chain partners' trust • By promoting cooperation, trust, and learning, transparency could improve the ability of VC organization to identify and manage risks, as well as effectively respond to disruptions (Dubey et al., 2019) • Transparency thus could be a powerful governance mechanism needed to increase value chain partners' accountability thereby fostering a culture of openness and trust • Transparency strategic outcomes are therefore likely to include increased value chain sustainability and resilience • Effective value chain transparency should allow VC organizations to build mitigating strategies against exogenous disruptions (e.g., natural disasters, pandemics, economic recessions) and endogenous disruptions (e.g.,

	product recalls, suppliers bankruptcies), thereby reducing operational risks and increasing the resilience of supply chains (Brandon-Jones et al., 2014).
Value chain Velocity (Carvalho & Azevedo, 2012; Tukumuhabwa *et al*., 2015)	• Velocity implies the ability to complete an activity as quickly as possible (Carvalho & Azevedo, 2012) • Velocity places a strong emphasis on the efficiency of the supply chain's response and recovery • Value chain velocity emphasizes the pace of flexible adaptation and thus should determine the recovery speed of the value chain from a risk event

Apart from the above structural elements, Biggs *et al.* (2015) identified that a value chain are adaptive systems comprising a host of elements that exhibit some dynamic relations and moving behaviour. For Vroegindewey & Hodbod (2018), an agricultural value chain system also requires institutions to govern the use and flow of resources as well as coordinating activities across the value chain. Governance in value chains focuses on the authority and power relationships with an influence on how financial, material, and human resources get allocated or can flow within a chain. According to Sturgeon (2008) there is need to understand coordination mechanisms to understand governance and thus value chain resilience. Kaplinsky & Morris (2001) outline different coordination modes, that is, market, firm, alliances, associations, and public–private partnerships. Consequently, the analysis of value chain resilience cannot be complete without a discussion of governance variables that can strengthen value chain resilience. An ability of Value chain organizations to broaden the scope of coordination should allow increased value chain resilience. A systematic literature review identified several determinants (Table 2) which could have implication on the value chain resistance.

Table 2 Governance determinants for value chain resilience

Construct	Definition
collective action	
Trust (Williamson, 2010; Capaldo, 2014; Biesenthal & Wilden, 2014; Christopher, 2016)	• A positive association exists between trust and transaction costs • Trust is a governance mechanism that should work to decrease relational risks by facilitating information sharing between and among the contracting partners. • Trust reduces uncertainty and so should boost confidence and cooperation among value chain actors when confronted by unexpected shocks.
Dynamic Intermediaries (Kaplinsky & Morris, 2001; Fernie, 2014; Dikos, 2014)	• Intermediaries refine market entry conditions and the upgrading capacity for individual actors in value chains

	• value chain intermediation reflects coordination and arbitration in value chain to achieve economy of scale- a necessary condition for withstanding unexpected shocks. • Create trusted institutions, and synthesize discrete information thus reducing information asymmetry to deal with disturbances
Value chain champions/lead firms (Conti, 2014 Memedovic, 2003; Gereffi, 2014; Alexander, 2020).	• Strategic centres with greater co-ordination skills and ability to steer change • Promote greater integration of value chain firms into the international arena • Provide embedded support for training, education, and knowledge exchange (Memedovic, 2003; Gereffi, 2014) Thus, if all firms in value chains were to act like value chain champions, then the entire value chain would be better off
Collective Action Regimes (Ostrom, 2014; Scott *et al*, 2017;	• Increase coalition building or civic cooperation to withstand external environment vagaries • Inject resources necessary to respond to shocks
Feedback Effects (Aithal ,2016; Ayllón & Radicic, (2019).)	• Bi-directional exchanges among the actors in value chains • Adjust on the current and future conduct in line with expected outcomes. • Encourage institutional learning that is adaptive and collaborative to aid decision-making, change perceptions and norms, and galvanize collective action

Methodology

To empirically investigate the determinants of value chain resilience in agricultural commodity markets, a case study design was adopted in which the focal area of study was the cotton value chain in Zimbabwe. Per Yin (2009), applying Case study research is remarkably appropriate for exploring a real-life (complex, unique, exploratory) phenomenon in-depth Prior research (Chigumira, 2017; Mapanga *et al*., 2018; Chari & Ngcamu, 2019). indicates that disaster risks continuously negatively affect the quality and viability of Southern Africa cotton and cotton products. Again, the very dependency of cotton on the international market renders the cotton section of the value chain sensitive to the market disruption. This makes this case an ideal candidate for studying determinants of value chain resilience.

Data collection

The of data for this research was collected through a structured questionnaire survey on 238 supply chain practitioners from 6 Southern Africa cotton growing countries, namely, Eswatini, Mozambique, South Africa, Botswana, Zambia, and Zimbabwe. This study required that only opinions of people with intimate knowledge of the determinants of cotton value chain resilience. Hence a purposive sample was employed. Cotton producer association in respective countries were identified as conduits for the questionnaire survey (See for example, Garg & Kothari, 2014). The distribution of the sample of supply chain practitioners according to the countries in Table 3 below:

Table 3 distribution of the sample of supply chain practitioners according to the countries

Country	Number of respondents	Percentage (%)
Botswana	41	17,2
Eswatini	22	9,2
Mozambique	44	18,5
South Africa	63	26,5
Zambia	30	12,6
Zimbabwe	38	16,0
Total	**238**	**100**

As this study required a questionnaire to collect the data, the first step was to develop from the literature on the constructs describing the determinants of value chain resilience. The process entailed a systematic review of over 75 journal articles to determine the integral constructs. On this basis, construct development was comprehensive and wide-ranging research on value chain resilience factors. The questionnaire comprised 62 items used to measure the entailed constructs describing the determinants of value chain resilience in agricultural commodity markets in developing countries. A multidimensional scale having a 10-point response options such that 1=Strongly disagree and 10= Strongly agree. Before the instrument could be used two precautionary steps were taken during this study to advance the reliability and validity of the collected data. The internal consistency method as estimated by the Cronbach's alpha was used to measure reliability. The instrument's content validity was confirmed through the existing literature including over 75 articles. The questionnaire was then distributed electronically via the websites of cotton producer associations in respective countries. After a waiting period of 5 weeks, 244 completed questionnaires were obtained. Nonetheless, 6 questionnaires were not fully completed and as such were quarantined to leave 238 questionnaires to be analysed.

Data analysis

The captured raw data was inspected for quality and completeness, and then Statistical Package for Social Sciences (SPSS) software was employed firstly to execute exploratory factor analysis to isolate the latent constructs underlying the measured questionnaire items. Secondly, the central tendency measures of describing and summarising the data, namely, the mean and standard deviations were assessed. Confirmatory factor analysis (CFA) via structural equation modelling (SEM) was then employed to verify the factor structure of the determinants of value chain resilience in Southern developing countries' agricultural commodity markets vis-à-vis the theoretically observed variables in literature (Kline, 2015). The model fit was decided by the three commonly used indices, that is, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA). The CFI, TLI and RMSEA had to be in the recommended ranges, that is, CFI>=0.90, TLI>=0.90 and RMSEA <=0.80(Shi *et al*, 2019).

Results

The internal consistency, Cronbach's alpha, was used to test the reliability of the questionnaire items used in the study. Table 4 presents the reliability of the questionnaire used in this study after three rounds of removing redundant items in the instrument.

Table 4 Reliability Analysis

Reliability Analysis	
Cronbach's Alpha	No. of Items
.724	41

The reliability test after excluding 21 redundant variables on the questionnaire items used to measure the perception on the determinants of value chain resilience returned an alpha coefficient of 0.724. This resultant Cronbach's Alpha exceeds the generally recommended 0.7 mark thereby indicating that the variables are correlated enough to measure the same construct (Charry *et al*, 2016). This means the instrument that was used in this study had 41 items vis-à-vis the original 62 items and those 41 items consistently measured the same characteristic on each aspect being interrogated in the survey.

Factor Analysis

Principal Component Analysis (PCA) was carried out on the instrument items to reduce the number of variables as well as to categorize the variables (Hair, 2015; Kline, 2014) into respective components explaining the determinants of value chain resilience. Factor analysis is a commonly used data reduction procedure by researchers to statistically identify the more

prominent factors from a larger number of measurable factors (McDonald, 2014; Charry *et al*., 2016).

Testing Assumptions of factor Analysis

To perform factor analysis, one must test that the basic assumptions of factorability are met by the dataset. Through assessing the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett Test of Sphericity, the factorability of the data obtained in this study was established as shown in Table 5 where the results were above the minimum value of 0.6 with a significant Bartlett's Test of Sphericity (p=.000<0.03) (Dimitrov, 2014).

Table 5 of KMO and Bartlett's Test Results

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.801
Bartlett's Test of Sphericity	Approx. Chi-Square	24308.136
	df	186
	Sig.	.0024

As the results in Table 5 indicate the suitability for conducting factor analysis, factor analysis was then performed on the data via principal component analysis in which orthogonal rotation was applied to make the structure of determinants simpler to interpret (Dimitrov, 2014).

Taking Eigenvalues greater than 1, Table 2 shows that four (4) motivation factors with a cumulative contribution of 75.424 % of the explained total variance were retained. The 75.424 % is way greater than recommended benchmark of 50% for factor analysis to be considered.

Table 6 Eigenvalues of determinants of value chain resilience

Total Variance Explained			
	Initial Eigenvalues		
Component	Total	% Of Variance	Cumulative %
1	4.848	28.615	28.615
2	3.058	18.043	46.658
3	1.453	9.733	56.391

4	1.188	7.010	63,401
5	1.033	6.105	69.506
6	1.003	5.918	75.424

Table 6 shows that there were 6 determinants of value chain resilience in the developing countries commodity markets. Despite the factors structure holding true for exploratory factor analysis, it was important to validate the 6 factor structure of the determinants of value chain resilience in the developing countries agricultural commodity markets through Confirmatory Factor analysis (CFA)

Table 7 Determinants of Value chain Resilience in developing countries commodity markets

Component	N(Items)	$\overline{\mu}$	$\overline{\sigma}$	$\overline{\alpha}$	CFI	TLI	RAMSEA
Dynamic Intermediaries	7	7.033	1.004	.713	.891	.931	.057
Value chain champions/lead firms	6	5.437	0.869	.701	.902	.943	.071
Value chain transparency	8	6.002	1.207	.720	.946	.921	.068
Collective Action Regimes	9	8.047	1.100	.696	.913	.973	.019
Value chain Collaboration	5	6.140	1.171	.752	.894	.957	.058
Structure and knowledge	7	5.983	0.915	.700	.920	.886	.027

Table 7 indicates that of all the possible determinants of value chain resilience found in literature, only six (6) are relevant to the agricultural commodity markets in Sub-Saharan Africa, namely, dynamic intermediaries (**μ** =7,033), value chain champions (**μ**=5,437), value chain transparency(**μ**=6,002**),** collective action regimes (**μ**=8,047), value chain collaboration (**μ**=6,140**)** and structure and knowledge (**μ**=5,983). In literature, these determinants of value chain resilience provide both structural and governance mechanisms that enhance the robustness of value chains to respond to unexpected disruptions in the markets (See for example, Conti, 2014 Memedovic, 2003; Gereffi, 2014; Alexander, 2020). The CFA results indicate a good model fit for the factors describing the value chain resilience since the CFI and TLI are very close to 0.90 and the RMSEA is <0.10 (Lee *et al*., 2010).

In addition, the CFA analysis confirmed the factor structure describing the determinants of value chain resilience in developing countries' agricultural commodity markets. These results are in the main consistent with the available literature on value chain resilience which

emphasises that the six determinants give both the structural and governance enhancing properties in value chains (See for, example, Kaplinsky & Morris, 2001; Fernie, 2014; Dikos, 2014; Brandon-Jones *et al*., 2014; Dubey *et al.*, 2019; Bai & Sarkis, 2020; Yao & Zhu, 2020).

Relationships among the Determinants

Put together, this spectrum of determinants impacts on the resilience of agricultural commodity value chains in Southern Africa and the relationships had to be examined to see how they influenced each other. Pearson correlation analysis was performed to evaluate the pairwise relationships between the established determinants of value chain resilience in terms of direction and the magnitude giving the results in Table 8.

Table 8 Pairwise relationships among the confirmed determinants of value chain resilience

Perceived level of VC resilience	**1**					
Dynamic Intermediaries	.574**	1				
Value chain champions	.394**	.288**	1			
Value chain transparency	.376**	.344**	.540**	1		
Collective Action Regimes	.512**	.489**	.294**	.447**	1	
Structure and knowledge	.513**	.345**	.295**	.376**	.529**	1

[1] ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed)

The results in Table 8 indicate that there was moderate ($0.5<|r|<0.7$), positive and statistically significant correlations between perceived level of resilience and 3 of the established determinants, namely, dynamic intermediaries, value chain champions, collective action regimes and structure and knowledge of the value chain. There was a weak ($|r|<0.5$); positive and statistically significant correlations between perceived level of resilience and 3 of the established determinants, that is, value chain champions and value chain transparency. This demonstrated in the main that an improvement in each of the confirmed determinants resulted in increased value chain resilience of the cotton industry. It was interesting to note that an improvement of each determinant also reinforced the other determinants.

Conclusion

This study aimed to establish the determinants of value chain resilience in Southern African agricultural commodity markets. Given the highly dynamic and volatile operational environment that adds to uncertainty and associated risks, more so for agricultural commodity markets, it is essential for firms operating in there to seek to understand the determinants of value chain resilience if they are to successfully mitigate the effects of such increasingly consistent and unpredictable operational shocks. The results reported in this paper add to the literature on the contextual determinants of value chain resilience in developing countries.

The analysis confirmed the role of dynamic intermediaries in strengthening value chain resilience in the context of agricultural commodity markets in developing countries of Sub-Saharan Africa. Intermediary dynamism is more relevant when it comes to coordinating and arbitrating activities in the value chain resulting in incumbent firms likely achieving economies of scale which in themselves help the firms to withstand the possible operational environment shocks. This suggests that actors operating in the agricultural commodity markets by having dynamic intermediaries along their value chains they can bank on them to acquire early warning information and other services without necessarily investing resources. This likely allows some slack in resource use and so adding to resilience of the value chain. The study also confirmed the role of value chain champions in adding to resilience of the value chain. Notably, the value chain champions are more likely to act as strategic centres that are there to provide co-ordinate and steer change in response to unexpected disturbances in the market. By working to integrate the value chain, value chain champions enhance the possibility for higher resilience since they enhance collective action against a common disturbance. In addtion the study highlighted how value chain transparency likely enhances cooperation, trust, and learning throughout the commodity value chain making it easier for all the actors to identify and manage risk and effectively respond to unexpected disruptions of operations. Finally, the study also indicates that collective action regimes and the structure and knowledge of the value chain have a significant impact on the level of resilience of the Southern African agricultural commodity markets. Combined, these determinants promote robust chain relationships that enable greater integration of value chain partners in agricultural commodity markets and so ensure their ability to anticipate, adapt, respond, recover from disruptions that they persistently face.

Analyzing the determinants of value chain resilience in the agricultural commodity markets in Sub-Saharan Africa, has thus resulted in original findings and presents empirically grounded explanations to previous research. Significantly, the results assist to complement the established factor-based portrayal of value chain resilience. Thus, this research makes important and relevant contributions to understanding and developing the infant value chain resilience research by highlighting the contextual determinants of value chain resilience.

Since innumerable disruptions are pervasive in the agricultural commodity value chains in developing countries, the research findings have implications for the multiple stakeholders in agricultural commodity value chains as it alerts them that the identification of the systemic determinants for value chain resilience provides the foundation upon which effective value chain improvement programmes and thus more sustainable and competitive primary agricultural commodity value chains can be assured in Southern African countries which mainly depend on agriculture for economic growth.

However, this research has certain limitations. Only actors from the cotton value chain in six countries in Sub-Saharan Africa were used for informing this study, and although the perspective are realistic in as far as these countries are concerned, the number of countries is far too small to generalize the findings across the entire Sub-Saharan Africa region. Hence, it is imperative to replicate this study using a greater number of Sub-Saharan Africa and include other agricultural commodity markets to assess the full set of determinants of value chain resilience in Sub-Saharan Africa.

References

Aboah, J., Wilson, M. M., Rich, K. M., & Lyne, M. C. (2018). Operationalising resilience in tropical agricultural value chains. *Supply Chain Management: an international journal*.

Ahmed, S., Kalsoom, T., Ramzan, N., Pervez, Z., Azmat, M., Zeb, B., & Ur Rehman, M. (2021). Towards supply chain visibility using internet of things: A dyadic analysis review. *Sensors*, *21*(12), 4158.

Akhtar-Danesh, N. (2017). A comparison between major factor extraction and factor rotation techniques in Q-methodology. *Open Journal of Applied Sciences*, *7*(04), 147.

Alexander, R. (2020). Emerging roles of lead buyer governance for sustainability across global production networks. *Journal of Business Ethics*, *162*(2), 269-290.

Amelework, A. B., Bairu, M. W., Maema, O., Venter, S. L., & Laing, M. (2021). Adoption and promotion of resilient crops for climate risk mitigation and import substitution: A case analysis of cassava for South African agriculture. *Frontiers in Sustainable Food Systems*, *5*, 617783.

Ayllón, S., & Radicic, D. (2019). Product innovation, process innovation and export propensity: Persistence, complementarities, and feedback effects in Spanish firms. *Applied Economics*, *51*(33), 3650-3664.

Bai, C., & Sarkis, J. (2020). A supply chain transparency and sustainability technology appraisal model for blockchain technology. *International Journal of Production Research*, *58*(7), 2142-2162.

Bamber, P., Fernandez-Stark, K., Gereffi, G., & Guinn, A. (2014). Connecting local producers in developing countries to regional and global value chains: update.

Biesenthal, C., & Wilden, R. (2014). Multi-level project governance: Trends and opportunities. *International journal of project management*, *32*(8), 1291-1308.

Bowersox, D. J. (1990). The strategic benefits of logistics alliances. *Harvard Business Review*, *68*(4), 36-43.

Brandon- Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A contingent resource- based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management*, *50*(3), 55-73.

Brandtner, P. (2020). Requirements for Value Network Foresight-Supply Chain Uncertainty Reduction. In *ISPIM Conference Proceedings* (pp. 1-12). The International Society for Professional Innovation Management (ISPIM).

Capaldo, A. (2014). Network governance: A cross-level study of social mechanisms, knowledge benefits, and strategic outcomes in joint-design alliances. *Industrial Marketing Management*, *43*(4), 685-703.

Carraresi, L., & Bröring, S. (2021). How does business model redesign foster resilience in emerging circular value chains?, *Journal of Cleaner Production*, *289*, 125823.

Carvalho, H., Azevedo, S. G., & Cruz-Machado, V. (2012). Agile and resilient approaches to supply chain management: influence on performance and competitiveness. *Logistics research*, *4*(1), 49-62.

Chari, F., & Ngcamu, B. S. (2019). The impact of disaster risks on economic sustainability of cotton supply chains: Evidence from Chiredzi District, Zimbabwe. *Cogent Social Sciences*, *5*(1), 1625742.

Charry, K., Coussement, K., Demoulin, N., & Heuvinck, N. (2016). *Marketing research with IBM® SPSS statistics: a practical guide*. Routledge.

Chigumira, G. P. (2017). *Exploring the nature of policy support in value-adding and upgrading as a tool to industrial development: the case of the Zimbabwean cotton to textiles value chain* (Doctoral dissertation, University of the Witwatersrand, Faculty of Commerce, Law and Management, School of Economic and Business Sciences).

Choi, T. Y., & Hong, Y. (2002). Unveiling the structure of supply networks: case studies in Honda, Acura, and DaimlerChrysler. *Journal of Operations Management*, *20*(5), 469-493.

Chopra, S., & Meindl, P. (2016). Supply chain management: global edition. *New York City: Pearson*.

Conti, R. (2014). Do non- competition agreements lead firms to pursue risky R&D projects?. *Strategic Management Journal*, *35*(8), 1230-1248.

Dikos, G. (2014). Turning economic inefficiencies business value: lessons from the new collaborative technology. *International Journal of Business*, *19*(4), 381.

Dong, L. (2021). Toward resilient agriculture value chains: challenges and opportunities. *Production and Operations Management*, *30*(3), 666-675.

Dwyer, J., Short, C., Berriet-Solliec, M., Déprés, C., Lataste, F. G., Hart, K., & Prazan, J. (2020). Fostering resilient agro-food futures through a social-ecological systems framework: Public–private partnerships for delivering ecosystem services in Europe. *Ecosystem Services*, *45*, *101180*.

Fernie, J. (2014). 02 Relationships in the supply chain. *Logistics and retail management: Emerging issues and new challenges in the retail supply chain*, 35.

Fold, N. (2014). Value chain dynamics, settlement trajectories and regional development. *Regional studies*, *48*(5), 778-790.

Fromm, I. (2022). Building resilient value chains after the impact of the COVID-19 disruption: challenges for the coffee sector in Central America. *Frontiers in Sustainable Food Systems*, *5*.

Gereffi, G. (2014). Global value chains in a post-Washington Consensus world. *Review of international political economy*, *21*(1), 9-37.

Gereffi, G., & Kaplinsky, R. (2001). Introduction: Globalisation, value chains and development. *IDS bulletin*, *32*(3), 1-8.

Holweg, M., & Helo, P. (2014). Defining value chain architectures: Linking strategic value creation to operational supply chain design. *International Journal of Production Economics*, *147*, 230-238.

Kangogo, D., Dentoni, D., & Bijman, J. (2020). Determinants of farm resilience to climate change: The role of farmer entrepreneurship and value chain collaborations. *Sustainability*, *12*(3), 868.

Kano, L., Narula, R., & Surdu, I. (2022). Global value chain resilience: Understanding the impact of managerial governance adaptations. *California Management Review*, *64*(2), 24-45.

Kano, L., Tsang, E. W., & Yeung, H. W. C. (2020). Global value chains: A review of the multi-disciplinary literature. *Journal of international business studies*, *51*(4), 577-622.

Kazancoglu, I., Ozbiltekin-Pala, M., Mangla, S. K., Kazancoglu, Y., & Jabeen, F. (2022). Role of flexibility, agility and responsiveness for sustainable supply chain resilience during COVID-19. *Journal of Cleaner Production*, 132431.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Kothari, C., & Garg, G. (2014). Research Methodology: Methods and Strategy. *New age international*.

Linkov, I., Carluccio, S., Pritchard, O., Bhreasail, Á. N., Galaitsi, S., Sarkis, J., & Keisler, J. M. (2020). The case for value chain resilience. *Management Research Review*.

McDonald, R. P. (2014). *Factor analysis and related methods*. Psychology Press.

Mapanga, A. , Collins, O. M., & Mavetera, N. (2018). Barriers to effective value chain management in developing countries: new insights from the cotton industrial value chain. *Problems and Perspectives in Management*, *16*(1), 22.

Marshall, G. (2015). A social-ecological systems framework for food systems research: accommodating transformation systems and their products. *International Journal of the Commons*, *9*(2).

Miroudot, S. (2020). Resilience versus robustness in global value chains: Some policy implications. *COVID-19 and trade policy: Why turning inward won't work*, 117-130.

Mjonono, M. (2020). *Investigating the costs and value to smallholder farmers participating in the deciduous fruit value chains in South Africa* (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Nelson, V., & Tallontire, A. (2014). Battlefields of ideas: Changing narratives and power dynamics in private standards in global agricultural value chains. *Agriculture and Human Values*, *31*(3), 481-497.

Nicol, L. A., & Knoepfel, P. (2014). Resilient housing: a new resource-oriented approach. *Building research & information*, *42*(2), 229-239.

Ostrom, E. (2014). Do institutions for collective action evolve?. *Journal of Bioeconomics*, *16*(1), 3-30.

Rajesh, R. (2020). Sustainable supply chains in the Indian context: An integrative decision-making model. *Technology in Society*, *61*, 101230.

Rosca, E., & Bendul, J. C. (2019). Value chain integration of base of the pyramid consumers: An empirical study of drivers and performance outcomes. *International Business Review*, *28*(1), 162-176.

Scholten, K., & Schilder, S. (2015). The role of collaboration in supply chain resilience. *Supply Chain Management: An International Journal*.

Scholten, K., Scott, P. S., & Fynes, B. (2014). Mitigation processes–antecedents for building supply chain resilience. *Supply Chain Management: An International Journal*, *19*(2), 211-228.

Scott, D., Hollway, B., Nelson, K., & Shah, D. (2017). Global Trends in Private Damages: The Future of Collective Actions. *Competition L. Int'l*, *13*, 137.

Shi, D., Lee, T., & Maydeu-Olivares, A. (2019). Understanding the model size effect on SEM fit indices. *Educational and psychological measurement*, *79*(2), 310-334.

Sturgeon, T. J. (2008). From commodity chains to value chains: interdisciplinary theory building in an age of globalization.

Sun, X., Lu, Z., Li, F., & Crittenden, J. C. (2018). Analyzing spatio-temporal changes and trade-offs to support the supply of multiple ecosystem services in Beijing, China. *Ecological indicators*, *94*, 117-129.

Swafford, P. M., Ghosh, S., & Murthy, N. N. (2006). A framework for assessing value chain agility. *International Journal of Operations & Production Management*.

Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). Supply chain resilience: definition, review and theoretical foundations for further study. *International Journal of Production Research*, *53*(18), 5592-5623.

Vroegindewey, R., & Hodbod, J. (2018). Resilience of agricultural value chains in developing country contexts: A framework and assessment approach. *Sustainability*, *10*(4), 916.

Wieland, A., & Wallenburg, C. M. (2013). The influence of relational competencies on supply chain resilience: a relational view. *International Journal of Physical Distribution & Logistics Management*, *43*(4), 300-320.

Williamson, O. E. (2010). Transaction cost economics: The natural progression. *American Economic Review*, *100*(3), 673-90.

Yao, S., & Zhu, K. (2020). Combating product label misconduct: The role of traceability and market inspection. *European Journal of Operational Research*, *282*(2), 559-568.

Zhang, D., Huang, X., Wen, Y., Trivedi, P., & Joghee, S. (2021). Sustainable Circular Business Model for Transparency and Uncertainty Reduction in Supply Chain Management. *Journal of Theoretical and Applied Electronic Commerce Research*, *16*(4), 959-975.