frontiers | Frontiers in Sustainable Food Systems

TYPE Original Research
PUBLISHED 22 May 2023
DOI 10.3389/fsufs.2023.1113819

OPEN ACCESS

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RECEIVED 01 December 2022
ACCEPTED 03 May 2023
PUBLISHED 22 May 2023

CITATION
Owot GM, Okello DM, Olido K and Odongo W (2023) Trust-supply chain performance relationships: unraveling the mediating role of transaction cost attributes in agribusiness SMEs. *Front. Sustain. Food Syst.* 7:1113819. doi: 10.3389/fsufs.2023.1113819

Trust-supply chain performance relationships: unraveling the mediating role of transaction cost attributes in agribusiness SMEs

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The mediation effect of transaction cost attributes on the trust-supply chain performance relationships has remained largely under-explored. Particularly, little is known about the mediating role of information sharing, uncertainty and transaction frequency on the trust-supply chain performance relationships in the agri-food sector. Based on the transaction cost theory, this study used logistic regression to investigate the mediating role of transaction cost attributes on the trust-supply chain performance relationships. Data were collected from 396 agribusiness small and medium-sized enterprises, i.e., farmers (n = 203) and traders (n = 193) in Northern Uganda. Analysis was performed using logistic regression in SPSS version 23 and Amos version 23. The results show that, while trust positively influences supply chain performance, information sharing is the only transaction cost attribute that mediates the relationship between trust and supply chain performance. Agribusiness managers, therefore, need to not only renew the effort of sharing accurate and timely information regarding the market's demand for specific volumes and quality of agricultural products and market trends and storage facilities but also utilize the information to become competitive and improve supply chain performance.

KEYWORDS

transaction cost attributes, mediation, trust, supply chain performance, agribusiness relationships, Uganda

1. Introduction

The influence of transaction cost attributes on the trust-supply chain performance is becoming a topic of enduring interest in business relationships of industries (Akbar and Tracogna, 2018; Khan et al., 2018). The interest is sparked by a growing concern about its strong link to profitability and competitiveness (Radosavljevic, 2016; Puška et al., 2018). Transaction cost refers to the cost of information search and negotiation and implementation of contracts (Mbapila et al., 2019). It raises critical issues of opportunistic behaviors (Williamson, 2005), due to gaps in information sharing, level of uncertainty, and the frequency of transaction (Chang et al., 2012). Several scholars have looked at transaction cost attributes, trust and supply chain performance in agro-industries, and service companies in developed countries (Khan et al., 2018; Negi et al., 2018; Bremer and Lindqvist, 2019; Rashid et al., 2022).

Carraresi (2016) and Kabbiri et al. (2017) argued that transaction cost attributes in formal companies in developed countries are likely to reduce cost because of advancement in technology and ease of access to market information. These views were shared by Reardon and Barrett (2000) who contend that the honoring of contractual obligations in formal companies especially in developed countries, lowers cost. With no consensus on the constructs that constitute transaction cost attributes, Allen (1991) argued that the use of different constructs in different contexts brings out interesting results. Previous studies have largely considered relationships in agri-food companies with professional managers of those companies selected as respondents (Puška et al., 2022; Rashid et al., 2022; Gajdić et al., 2023). Management strategies in companies and for professionals are different from those of agribusiness SMEs with varying literacy (Zhao et al., 2020; Gera et al., 2022). Thus, this study is in a developing country's context and contributes in the following ways.

First, transaction cost and trust and supply chain performance have been explored extensively in the agri-food sector (Agustin et al., 2018). However, there is limited literature on its mediating role with regard to commodity chains and market typologies for individual firms in developing countries (Chang et al., 2012; Colquitt et al., 2012; Puška and Stojanović, 2022). The issue related to the type of quality of the fresh commodity is critical for its consumption. The consumption of fresh commodities is affected by culture which differs in developed and developing countries (Kyriacou and Rouphael, 2018). For instance, genotypic quality which covers functional quality aspects currently lacks a consistent regulatory context, especially in developing countries (Vergari et al., 2010). Furthermore, individual business partners in agribusiness relationships in developing countries face serious challenges in access to market information. In addition, violation of contractual obligations is rampant due to the weak legal system to address contract bridging (Owot et al., 2022).

Second, researchers have mainly combined and assessed the influence of information sharing and uncertainty on supply chain performance in non-agri-food supply chain. It is important to unearth the extent to which these constructs impact the relationship between trust and supply chain performance in the agri-food sector. Additionally, research is yet to take into account perceived transaction frequency and combine it with information sharing and uncertainties as a mediating variable in explaining the trust-supply chain performance. The inclusion of transaction frequency might provide new insights into the mediating role of these constructs. Previous studies in an online context have treated transaction frequency as a contingency factor and demonstrated that it moderates the main effect (Chang et al., 2012). Lately, no known studies in the food sector, especially in the fresh and dry commodity chain have considered this factor as a mediator in the trust-supply chain performance relationships in developing countries.

Third, although several studies have examined the mediating role of transaction cost attributes on the link between trust and supply chain performance as an outcome variable, a number of them have concentrated on business-based performance (financial and sales quota). Limited studies have assessed the relationships involving transaction cost, trust, and attitude-based performance (commitment and satisfaction). The assessment of attitude-based performance is an important aspect of relationship quality that provide benefits to supply chain members and improve competitiveness (Odongo et al., 2016).

Drawing from the preceding arguments, the general objective of this study is to explicate the mediating role of transaction cost attributes on the relationship between trust and supply chain performance. Specifically, this study analyzes the relationship between predictor (trust), mediator (transaction cost attributes), and outcome variable (supply chain performance), to check if they meet Baron and Kenny's (1986) conditions for the test of mediation.

The rest of this study is structured as follows. Section 2 discusses conceptual framework and hypothesis development where the literature review on transaction cost attributes relative to the mediating role of the trust-supply chain performance relationships and propositions is formulated. In Sections 3, 4, the methodology and findings from the agribusiness SMEs using questionnaires are presented and interpreted based on propositions. Finally, Sections 5, 6 conclude the study with a discussion of the implications as well as its limitations and direction for future research.

2. Conceptual framework and hypothesis

This study explores the mediation effect(s) of transaction cost on the trust-supply chain performance relationships by applying the transaction cost theory (TCT). The reasoning in this theory is that mutualistic profitable firms strive for closer relationships with business partners (Coase, 1937; Williamson and Ghani, 2012; Rindfleisch, 2020). It is suggested that a reduction in transaction cost enables firms to make profits in business relationships (Anderson and Gatignon, 1986). Williamson (2005) considers information sharing, uncertainty, and transaction frequency as market transaction cost attributes. Previous scholars have observed that it is important to make a choice of business partner based on the expectation of meeting lower costs from uncertainty and negotiating contracts (Anderson and Narus, 1990; Williamson and Ghani, 2012; Capaldo and Giannoccaro, 2015).

Accordingly, TCT treats transaction cost as a resource that provides mutual profits to supply chain members (Barney, 1991). According to Martins et al. (2010), exchange partners such as farmers and traders may not maximize profits if they do not pay attention to supply and demand information, market uncertainty, and the frequency of transactions. One, therefore, requires anticipation of what will happen in the market based on the information shared to enhance negotiations and outsourcing of products (Tisdell, 2004). Performance is determined by the costs incurred by the business partners in agri-business relationships (Nyaga et al., 2010). This study hypothesizes that transaction cost mediates the relationship between trust and supply chain performance to provide superior performance benefits to individual supply chain members as well as supply chain as a whole. Therefore, the application of this theory will help advance

a deeper understanding of the mediation effect of transaction cost on the supply chain performance of agribusiness actors of smallholder farming.

2.1. Supply chain performance

Supply chain performance is defined as the overall improvement in business operational measures of an individual and the whole supply chain as a result of opportunities created by trust (Odongo et al., 2016; Gera et al., 2022).

Trust is considered important for competitiveness in supplier–buyer relationships through a reduction in transaction cost (Mottaleb and Rahut, 2018; Mbapila et al., 2019). In agribusiness, transaction cost influences operational measures such as financial performance and sales quota. A change in financial security and cash flow from agribusiness defines the financial performance of business actors (Wahdan and Emam, 2017; Martins et al., 2019). Similarly, a change in the quantity of specific sales goal explain whether or not sales quota is achieved by supply chain actors (Good and Stone, 1991).

2.2. Trust and transaction cost

Transaction cost is defined as expenses incurred in market exchange. These are widely suggested to include the cost of discovering market prices, storage, and transportation (Dyer and Singh, 1998; Ali et al., 2017). In this study, transaction cost was measured by information sharing, uncertainty, and transaction frequency. Information sharing is defined as the extent to which production, storage, and market (demand and supply) information are regularly and accurately shared (Dyer and Chu, 2003; Ghosh and Fedorowicz, 2008). Information sharing is suggested to optimize the benefits of supply chain relationship when trust is built (Walker et al., 2018). Uncertainty is defined as unquantifiable technological risk arising from supply, demand, technology, and price that eventually impact the overall cost, quality, and cycle time (Khan et al., 2018; Gokarn and Kuthambalayan, 2019). According to Van Der Vorst (2000), uncertainty is the inability of business partners to predict accurately the impact of decisions on performance. Fynes et al. (2008) argue that uncertainties are eliminated by trust in a business relationship. Transaction frequency refers to a buyer's total purchase frequency from a specific seller in a business relationship within a particular time period (Chang et al., 2012; Zhao et al., 2020). Trust should influence the expectation of exchange partners in a business relationship to scale up transaction frequency (Chang et al., 2012). It is hypothesized that:

H_{1a}: Trust will be positively related to information sharing.

H_{1b}: Trust will be negatively related to uncertainty.

H_{1c}: Trust will be positively related to transaction frequency.

2.3. Transaction cost and supply chain performance

Transaction costs are regarded as the cost incurred on access to complete information about all the market conditions by buyers and suppliers, uncertainty, and transaction frequency (Fischer, 2013; Jraisat et al., 2013). This cost in a contractual arrangement is bounded by rationality (Simon, 1957). Transaction costs are minimized by taking different forms of information sharing, having joint problem solving, and safeguarding against opportunistic behaviors (Williamson, 1981; Walker et al., 2018). In the e-supply chain, transaction costs are mainly environmental and technological uncertainty (Puška et al., 2022). Transaction costs such as uncertainty and transaction frequency were found to influence buyer–seller relationships (Zhao et al., 2020). When critical information is shared timely and regularly, it enables supply chain members to become efficient in negotiation and subsequently increases business returns (Walker et al., 2018). Furthermore, information sharing plays a primary role in outsourcing, providing benefits of collaboration and alliances (Min et al., 2005; Gajdić et al., 2023). Information sharing has been suggested to have a positive influence on supply chain performance in previous studies (Baihaqi and Sohal, 2013; Odongo et al., 2016; Owot et al., 2022). This study hypothesized that:

H_{2a}: Information sharing has a positive effect on supply chain performance.

H_{2b}: Uncertainty has a negative effect on supply chain performance.

H_{2c}: Transaction frequency has a positive effect on supply chain performance.

2.4. Mediation effect of transaction cost

The influence of transaction cost on the relationship between trust and supply chain performance is well established in previous research (Odongo et al., 2016; Owot et al., 2022). Information sharing is viewed as a critical element for strengthening the achievement of common goals when trust is built by coordination and joint planning (Khan et al., 2018; Agarwal, 2019). Exchange partners who share complete information are considered to have an enabling environment for improvement in financial security by all exchange partners (Odongo et al., 2016). The existing literature has found information sharing a construct that lies in the heart of agribusiness relationship, influencing each exchange partner's trust toward one another (Khan et al., 2018), and supply chain performance in terms of competitiveness. Dominic and Theuvsen (2015) and Negi and Anand (2019) found that provision of market information by exchange partners brings confidence and trust and link them to markets with better outcomes of farmer-trader relations. Markets full of uncertainty create opportunism that eventually impacts the overall cost, quality, and cycle time (Khan et al., 2018; Gokarn and Kuthambalayan, 2019). Exchange partners who experience uncertainty tend to mistrust and predict inaccurately the impacts of decision on performance (Van Der Vorst, 2000; Fynes et al., 2008). No known study has assessed the mediating influence of transaction frequency on

buyer–supplier relationships. Against this background, this study hypothesizes that:

H_{3a}: Information sharing positively mediates the trust-supply chain relationships.

H_{3b}: Uncertainty negatively mediates the trust-supply chain relationships.

H_{3c}: Transaction frequency positively mediates the trust-supply chain relationships.

3. Methodology

3.1. Study context

Study respondents consist of literate, semi-literate, and illiterate farmers and traders dealing in tomatoe and soybean agribusiness. They were drawn from Lango and Acholi sub regions in Northern Uganda within the districts of Oyam, Kole, Gulu, Nwoya, and Omoro. Whereas, the selection of the two crops followed from the group of high-value crops (fresh and dry), contributing to income and livelihood through commercialization (Owot et al., 2022), the selection of the two regions was based on the fact that one of the districts from each of this region was elevated to city status in 2018. The emergence of the two cities has created a new level of aggregate demand for fresh and dry commodities.

3.2. Data collection

In this cross-sectional survey study, data were collected between September and November 2019 from farmers and traders using a structured questionnaire. Approximately 400 respondents were contacted to participate in the interviews. However, there were four respondents who chose not to complete the interviews on business emergencies. Hence, 396 questionnaires from 203 farmers and 193 traders were fully filled and qualified for analysis (Table 1).

Sampling began with identifying districts and sub-counties in which the respondents were located using two-stage sampling procedures, where in the first stage, five districts were selected, and in the second stage, 15 sub-counties got identified. After identifying the respondents' location, a purposive sampling technique was used to identify farmers participating in agribusiness in the two crops, specifically those who nominated the traders. Snowballing was used to follow and interview the nominated traders in the sub-counties, identified on the same questions given to farmers. The farmers and traders were selected based on their age (at least 18 years old), business age of at least 1 year of business relationships in soybean and tomatoe agribusinesses, and should have been engaged in an informal or contractual agribusiness relationship. These respondents constituted both the unit of inquiry and the unit of analysis. Farmers who met the inclusion criteria were purposively identified and asked to nominate traders with whom they are in a business relationship in a snowball sampling approach.

Roscoe (1975) suggests that for a study of an unknown population, the sample sizes have to be more than 300 and <500, applications for an utmost research, and it is believed to be appropriate for most behavioral research. Therefore, using Roscoe's rule of thumb, at a 5% level of significance, a sample of 203 farmers and 193 traders was selected to minimize sampling error and obtain statistical convergence. Table 1 indicates the category of respondents, and the sampling techniques used based on their relevance.

TABLE 1 Sample size determination.

Respondent categories	Type	Population	Sample size	Sampling techniques
Farmers	Individual farmer	Unknown	203	Purposive
Traders	Market trader	Unknown	193	Snowballing
Total		Unknown	396	

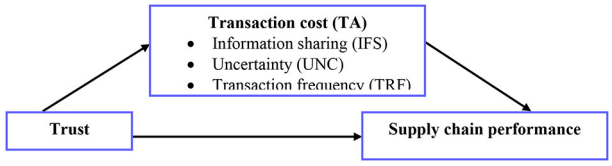

FIGURE 1
Conceptual framework. Source: Adapted and modified from Hayes (2009).

TABLE 2 Sample characteristics of respondents ($N = 396$).

Variable		Frequency	Percentage (%)
Gender	Male	244	61.6
	Female	152	38.4
Business partners	Farmers	203	51.3
	Traders	193	48.7
Age	<26 years	51	12.8
	26–35 years	152	38.4
	36–45 years	90	22.7
	46–55 years	65	16.4
	Over 55 years	38	9.7
Education status	Literate	43	10.9
	Semi-literate	170	42.9
	Illiterate	183	46.2
Years in Business	5 years or less	125	31.6
	6–10 years	159	40.2
	11–15 years	69	17.4
	More than 15 years	43	10.9

3.3. Measurement scaling

The variables in this study were operationalized. Transaction cost attributes were conceptualized based on the dimensions of

information sharing, transaction frequency, and uncertainty as adopted from previous scholars (Chang et al., 2012; Khan et al., 2018). To describe information sharing, eight items were selected. For uncertainty, eight items were chosen to capture the construct. Concerning transaction frequency, this construct was represented by six selected items. In addition, trust was conceptualized as benevolence, integrity, and competence (Sekhon et al., 2014; Xue et al., 2018; Franklin and Marshall, 2019). Seven, six, and four items were selected to measure benevolence, integrity, and competence, respectively. The dimensions of financial performance, sales quota, commitment, and satisfaction were adapted to measure supply chain performance (Bunte, 2006; Fearne et al., 2012; Chou and Chen, 2018; Qian et al., 2020). Therefore, in this study, the measures developed and used by scholars above were adapted to measure constructs of the outcome variables. Five, four, and seven items were selected to measure financial performance, sales quota, commitment, and satisfaction, respectively. Measurements of all items were anchored onto a five-point Likert scale starting from strongly agree (5), agree (4), not sure (3), and disagree (2) to strongly disagree (1).

3.4. Reliability and validity of constructs

The results of composite reliability of the constructs provided by Cronbach's alpha meet the minimum threshold for adequate reliability (Fornell and Larcker, 1981). Furthermore, the study conducted a confirmatory factor analysis to determine the validity of the latent constructs. Accordingly, the measurement model provided a reasonably good fit ($\chi^2 = 32.996$, degrees of freedom = 24 and probability level = 0.104; CFI = 0.992; TLI = 0.989; IFI = 0.992; and RMSEA = 0.031) (see Figure 1). In addition, the study constructs met conditions recommended by Gerbing and Anderson (1988) that all factor loadings should be >0.50 for convergent validity. Discriminant validity was assessed through a comparison of variance between the constructs and average variance extracted (AVE) for each individual construct (Fornell and Larcker, 1981). The conditions for discriminant validity recommended by Gerbing and Anderson (1988), for the diagonal elements, representing the square roots of the AVE for each construct to be greater than each of the off-diagonal elements in the rows and columns corresponding to it were met. The results demonstrate sufficient discriminant validity between factors.

3.5. Descriptive analysis and parametric assumptions

Data were analyzed in SPSS version 23. Upon collection, data were captured in SPSS for preliminary analysis. These included missing data screening and checking for outliers, normality, multicollinearity, and homogeneity parametric assumptions. Frequencies run did not show that missing values were a problem. In addition, the box plots did not reveal the existence of outliers. Concerning the normality of data, the histogram was bell-shaped, and most observations on the P-P plots fell along a straight line. Multicollinearity was tested using the variance inflation factor (VIF) and tolerance level, which provided values within acceptable limits (VIF < 4 and tolerance > 0.2) to conclude that multicollinearity was not a problem. Homogeneity parametric assumptions were checked using Levante's test (Field, 2005). The results revealed that Levante's test for all variables was not significant at $P > 0.05$, which indicates that variances were stable at all levels. Hair et al. (2013) argued that the presence of both outliers and missing data may affect multivariate analysis when poorly managed. With most of the preconditions for multivariate analysis met, the key hypothesis of mediation was tested using bootstrapping structural equation modeling in Amos based on Baron and Kenny (1986) and Rashid et al. (2022).

4. Results

4.1. Population characteristics

The results in Table 2 revealed that 62% of the farmers and traders were male while 38% were female. Of these respondents, 51% were farmers while approximately 49% were traders. Furthermore, the results also showed that the majority (38.4%) of the respondents were in the 26–35 age range, while 22.7% were in the 36–45 age range. On the aspect of education status, the findings revealed that 46.2% were illiterate and 42.9% were semi-literate. Moreover, the results indicated that 40.2% of the respondents were in agribusiness for a period of 6–10 years, followed by those who were in business for 5 years or less at 31.6%.

4.2. Relationship between trust and transaction cost

To model the relationship between trust and transaction cost, a regression model was run to determine the influence on each transaction cost attribute (information sharing, uncertainty, and transaction frequency). Table 3 presents that the path from trust to information sharing was positive and statistically significant (b = 0.57, S.E = 0.04, $P \leq 0.001$), providing support for H_{1a}.

4.3. Effect of transaction cost on supply chain performance

The effects of information sharing, transaction frequency, and uncertainty on supply chain performance were found to be positive for the first two constructs and negative, respectively (see Table 4). The influence of information sharing (b = 0.7284, S.E = 0.1440, $p < 0.01$), uncertainty ($b = -0.3741$, S.E = 0.3028, $p < 0.1$), and transaction frequency (b = 0.3741, S.E = 0.1855, $p < 0.05$) on supply chain performance (SCP) was significant. Thus, hypotheses H_{2a}, H_{2b}, and H_{2c} were supported.

TABLE 3 Relationship between trust and transaction cost.

H	Variables	Coefficient	S. E	*R*	*t*	*P*	Level
H_{1a}	Trust vs. information sharing	0.57	0.04	0.63	155.81	0.00	Sig
H_{1b}	Trust vs. uncertainty	−0.04	0.02	0.81	−1.59	0.11	Not sig
H_{1c}	Trust vs. transaction frequency	0.05	0.04	0.07	1.44	0.15	Sig

$N = 396$, $p < 0.01$; Not.sig, Not significant; Sig, Significant.

TABLE 4 Effect of information sharing, uncertainty, and transaction frequency on SCP.

H	Model	Coefficient	S. E	Z	P	LLCI	ULCI	Level
	Constant	−3.13	1.28	−2.45	0.01	−5.64	−0.62	
	Trust	0.76	0.14	5.32	0.00	0.48	1.05	
H_{2a}	IFS	0.72	0.16	4.57	0.00	0.42	1.04	Sig
H_{2b}	UNC	−0.58	0.30	−1.92	0.06	−1.17	0.01	Sig
H_{2c}	TRF	0.37	0.19	2.02	0.04	0.01	0.74	Sig

$N = 396$, $p < 0.01$, McFadden < 0.5, CoxSnell < 0.5, Nagekrk < 0.5; Sig, Significant.

4.4. Mediating effects of transaction cost attributes

To understand the mediation effects of transaction cost attributes, i.e., information sharing, uncertainty, and transaction frequency on the trust-supply chain performance relationships, the test of mediation was performed using non-parametric bootstrapping. The results show that only information sharing (0.26, 0.64) mediated the relationship between trust and supply chain performance (SCP). This provides support for hypothesis H_{3a} (see Table 5).

5. Discussion

The general agreement in supply chain management is that transaction cost attributes in formal companies in developed countries lower cost and improve competitiveness. Sparked by a growing concern about the low level of income and livelihood of smallholder farmers in developing countries, the need to engage in business relationships with better performance outcomes is becoming critical. This study investigated the mediating role of transaction cost attributes on the relationship between trust and supply chain performance. This study found that trust increases supply chain performance and information sharing and information sharing and transaction frequency increase supply chain performance. Furthermore, uncertainty reduces supply chain performance. As far as mediation is concerned, information sharing mediates the relationship between trust and supply chain performance.

The results from the multiple regression model show that trust increases information sharing. This is in agreement with previous studies (Odongo et al., 2016; Franklin and Oehmke, 2019; Na et al., 2019). This suggests that by increasing the ability of sharing useful information among farmers and traders, trust is built, and supply chain members become more transparent and accountable to each other. This view was shared by Khan et al. (2018), who pointed out that trust is built easily with honesty in sharing of information regarding market price and the taking of actions that reduces costs. Accordingly, whereas past studies provided empirical support for supply chain performance in developed countries in a non-agri-food context, this study extends this to agri-food small and medium enterprises in agribusiness relationships in developing country's context.

Regarding mediation effects, farmers and traders perceived information sharing to increase the influence of trust on trust-supply chain performance relationships. This finding is consistent with previous studies (Alaarj et al., 2016; Walker et al., 2018), which reported mediation of information sharing on trust-supply chain performance relationships. This suggests that trust simply sets a foundation for superior supply chain performance, while it is through information sharing that the value of trust is fully realized in the supply chain performance of supply chain actors. This suggests that failure to timely and accurately share market information may bring problems. The absence of information sharing may make supply chain members become unwilling to trust business partners on issues related to investment and market decisions. Consequently, they may seek market information from outside the relationships (other farmers, middlemen, or processors), which weakens the relationships and reduces competitiveness. Information sharing is important for lowering the cost of information search, understanding expectations, increasing the rate of innovations, and enhancing the competence of business partners. In Uganda's context, market information is for linking farmers to markets with better prices with good profit margins. Consequently, agribusiness SMEs would prefer to engage in business relationships with a higher likelihood of access to market information by the chain members, hence better income and supply chain performance.

6. Conclusion

In the context of agribusiness supply chains in developing countries, this study links trust with supply chain performance, providing the mediation effect of information sharing among

TABLE 5 The mediation effect of transaction cost attributes.

H		Effect	BootSE	BootLLCI	BootULCI	Level
	Total	0.46	0.10	0.29	0.69	
H_{3a}	IFS	0.42	0.09	0.26	0.63	Sig
H_{3b}	UNC	0.02	0.02	−0.01	0.08	Not sig
H_{3c}	TRF	0.02	0.02	−0.01	0.06	Not sig

Direct effect effect = 0.77, S.E = 0.14, $p < 0.01$, $Z = 5.32$; Not sig, Not significant; Sig, significant.

farmers and traders. The results revealed that trust among farmers and traders has a positive relationship with supply chain performance and information sharing when entered into the trust- supply chain performance relationships played an important role in mediating the relationships. The practical implication of these findings is that sharing accurate and timely information among farmers and traders who have trust would improve the supply chain performance of chain members than simply building trust.

The literature suggests the mediating role of all transaction cost attributes (transaction frequency, uncertainty, and information sharing), seen in all formal organizations in the context of the service sector or manufacturing industry. However, the emergence from the data that there is only one attribute (information sharing) with a significant mediation effect implies that its mediating role could vary by the level of formality in the relationships and trust dimensions. The literature suggests that information sharing mediating the trust-supply chain relationship may be questioned in the context of a formal company when trust is understood from its dimensions in agri-food relationship. The study highlights the practical difficulties in using the mediating influence of information sharing in giving superior performance when trust is a block concept. Therefore, the analysis of the mediating role of information sharing should consider breaking trust into integrity, benevolence, and competence. Future studies may generate more detailed information when the mediating role of information sharing on SCP among SMEs is considered in formal organizations. Most agribusiness SMEs interviewed were in less formal agribusiness relationship, and perception could vary based on the status of registration and the level of formality involved in agribusiness relationships. This study proposes that future research could replicate this design in a formal organization but using dimensions of trust to understand more insights into the mediating role of information sharing.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Gulu University Research and Ethics Committee (GUREC). The patients/participants provided their written informed consent to participate in this study.

Author contributions

GO collected the data and statistically analyzed it and wrote the manuscript. GO and DO interpreted the content of the output. WO and KO were instrumental in reading and approving the final manuscript. All authors participated in the formulation of overarching research aims and objectives, including the responsibility for management and coordination of the research activity planning and execution. All authors contributed to the article and approved the submitted version.

Funding

The study was supported by Building Stronger Universities Project -Phase three (BSUIII) funded by the Danish Government (Grant Number: 2021 BSU3-GU).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsufs.2023.1113819/full#supplementary-material

References

Agarwal, P. (2019). "Redefining Banking and Financial Industry through the application of Computational Intelligence," in *2019 Advances in Science and Engineering Technology International Conferences. ASET 2019.*

Agustin, W., Dania, P., Xing, K., and Amer, Y. (2018). Collaboration behavioural factors for sustainable agri-food supply chains: a systematic review. *J. Clean. Prod.* 186, 851–864. doi: 10.1016/j.jclepro.2018.03.148

Akbar, Y. H., and Tracogna, A. (2018). The sharing economy and the future of the hotel industry: transaction cost theory and platform economics. *Int. J. Hosp. Manage.* 71, 91–101. doi: 10.1016/j.ijhm.2017.12.004

Alaarj, S., Abidin-Mohamed, Z., and Bustamam, U. S. B. A. (2016). Mediating role of trust on the effects of knowledge management capabilities on organizational performance. *Procedia Soc. Behav. Sci.* 235, 729–738. doi: 10.1016/j.sbspro.2016.11.074

Ali, M. H., Zhan, Y., Alam, S. S., and Ying Kei Tse, K. H. T. (2017). Industrial management & data systems article information. *Indust. Manag. Data Syst.* 117, 1589–1611.

Allen, D. W. (1991). What are transaction costs?. *Res. Law Econom.* 14, 1–18.

Anderson, E., and Gatignon, H. (1986). Modes of forengn entry: a transaction cost analysis and propositions. *Clim. Change* 9, 123–128.

Anderson, J. C., and Narus, J. A. (1990). A model of distributor firm and manufacturing firm working relationships. *J. Mark.* 54, 42–58. doi: 10.1177/002224299005400103

Baihaqi, I., and Sohal, A. S. (2013). The impact of information sharing in supply chains on organisational performance: an empirical study. *Prod. Plann. Cont.* 24, 743–758.

Barney, J. (1991). Firm resources and sustained competitive advantage. *J. Manage.* 17, 99–120. doi: 10.1177/014920639101700108

Baron, R. M., and Kenny, D. A. (1986). The moderator mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Pers. Soc. Psychol.* 51, 1173–1182. doi: 10.1037/0022-3514.51.6.1173

Bremer, C., and Lindqvist, C. -P. (2019). *FruitChain Revolution? - Trustworthiness of information along the physical fruit supply chain for Swedish actors importing fresh fruit from outside Europe and how Blockchain provides potential solutions (MSc. Desertation).* School of Business, Economics and Law, University of Gothenburg, Gothenburg, Sweden.

Bunte, F. H. J. (2006). "Pricing and performance in agri-food supply chains," in *Quantifying the Agri-Food Supply Chain: Proceedings of the Frontis Workshop on Quantifying the Agri-Food Supply Chain,* eds C. J. M. Ondersteijn, J. H. M. Wijnands, R. B. M. Huirne, and O. van Kooten (Wageningen: Springer), 37–45.

Capaldo, A., and Giannoccaro, I. (2015). How does trust affect performance in the supply chain? The moderating role of interdependence. *Int. J. Prod. Econ.* 166, 36–49. doi: 10.1016/j.ijpe.2015.04.008

Carraresi, L. (2016). Can strategic capabilities affect performance? Application of RBV to small food businesses. *Agribusiness* 32, 416–436. doi: 10.1002/agr.21451

Chang, H. H., Lai, M., and Hsu, C. (2012). Recovery of online service: perceived justice and transaction frequency. *Comput. Human Behav.* 28, 2199–2208. doi: 10.1016/j.chb.2012.06.027

Chou, S., and Chen, C. W. (2018). The influences of relational benefits on repurchase intention in service contexts: the roles of gratitude, trust and commitment. *J. Bus. Indust. Mark.* 33, 680–692. doi: 10.1108/JBIM-08-2017-0187

Coase, R. H. (1937). Some notes on monopoly price. *Rev. Econ. Stud.* 5, 17–31. doi: 10.2307/2967577

Colquitt, J. A., Lepine, J. A., Piccolo, R. F., Zapata, C. P., and Rich, B. L. (2012). Explaining the justice – performance relationship: trust as exchange deepener or trust as uncertainty reducer? *J. Appl. Psychol.* 97, 1–15. doi: 10.1037/a0025208

Dominic, T., and Theuvsen, L. (2015). *Agribusiness firm resources and performance: The mediating role of strategic management practices RTG 1666 Global Food Transformation of Global Agri-Food Systems: Georg-August-University of Göttingen Global Food Discussion Papers The Mediating Role of Str*, 64p.

Dyer, J. H., and Chu, W. (2003). *The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan , and Korea*. Organization science, 14, 57–68.

Dyer, J. H., and Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Acad. Manag. Rev.* 23, 660–679.

Fearne, A., Yawson, D., Buxton, A., and Tait, J. (2012). *Measuring Fairness in Supply Chain Trading Relationships: Methodology Guide*. London: International Institute for Environment and Development/Oxfam.

Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary? *Psychol. Methods* 10, 444–467. doi: 10.1037/1082-989X.10.4.444

Fischer, C. (2013). Trust and communication in European agri-food chains. *Supply Chain Manage.* 18, 208–218. doi: 10.1108/13598541311318836

Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables. *J. Mark. Res.* XVIII, 39–50. doi: 10.1177/002224378101800104

Franklin, D., and Marshall, R. (2019). Adding co-creation as an antecedent condition leading to trust in business-to-business relationships. *Indust. Mark. Manage.* 77, 170–181. doi: 10.1016/j.indmarman.2018.10.002

Franklin, K., and Oehmke, J. (2019). Building African agribusiness through trust and accountability. *J. Agribusiness Dev. Emerg. Econ.* 9, 22–43. doi: 10.1108/JADEE-01-2018-0005

Fynes, B., de Búrca, S., and Mangan, J. (2008). The effect of relationship characteristics on relationship quality and performance. *Int. J. Prod. Econ.* 11, 56–69. doi: 10.1016/j.ijpe.2006.11.019

Gajdić, D., Kotzab, H., and Petijak, K. (2023). Collaboration , trust and performance in agri-food supply chains: a bibiliometric analysis. *Br. Food J.* 125,752–778. doi: 10.1108/BFJ-07-2021-0723

Gera, R., Yadav, R., Khera, G.S., Saxena, A., Chadia, P., Dixit, S., and Yuliya Sergeevna, L.,(2022). A systematic literature review of supply chain management practices and performances. *Mater. Today Proc.* 69, 624–632. doi: 10.1016/j.matpr.2022.10.203

Gerbing, D. W., and Anderson, J. C. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *J. Mark. Res.* 25, 186. doi: 10.1177/002224378802500207

Ghosh, A., and Fedorowicz, J. (2008). The role of trust in supply chain governance. *Business Process Manag. J.* 14, 453–470. doi: 10.1108/14637150810888019

Gokarn, S., and Kuthambalayan, T. S. (2019). Creating sustainable fresh produce supply chains by managing uncertainties. *J. Clean. Prod.* 207, 908–919. doi: 10.1016/j.jclepro.2018.10.072

Good, D. J., and Stone, R. W. (1991). How sales quotas are developed. *Indust. Market. Manag.* 20, 51–55. doi: 10.1016/0019-8501(91)90041-D

Hair, J. F., Ringle, C. M., and Sarstedt, M. (2013). Partial least squares structural equation modeling: rigorous applications, better results and higher acceptance. *Long Range Plann.* 46, 1–12. doi: 10.1016/j.lrp.2013.01.001

Hayes, A. F. (2009). Beyond Baron and Kenny: statistical mediation analysis in the new millennium. *Commun. Monogr.* 76, 408–420. doi: 10.1080/03637750903310360

Jraisat, L., Gotsi, M., and Bourlakis, M. (2013). Drivers of information sharing and export performance in the Jordanian agri-food export supply chain: A qualitative study. *Int. Market. Rev.* 30, 323–356. doi: 10.1108/IMR-03-2012-0056

Kabbiri, R., Dora, M., Kumar, V., Elepu, G., and Gellynck, X. (2017). Mobile phone adoption in agri-food sector: are farmers in Sub-Saharan Africa connected? *Technol. Forecast. Soc. Change* 131, 253–261. doi: 10.1016/j.techfore.2017.12.010

Khan, M., Hussain, M., Papastathopoulos, A., and Manikas, I. (2018). Trust, information sharing and uncertainty: an empirical investigation into their impact on sustainability in service supply chains in the United Arab Emirates. *Sustain. Dev.* 26, 870–878. doi: 10.1002/sd.1856

Kyriacou, M. C., and Rouphael, Y. (2018). Towards a new definition of quality for fresh fruits and vegetables. *Sci. Hortic.* 234, 463–469. doi: 10.1016/j.scienta.2017.09.046

Martins, A., Ramalho, N., and Morin, E. (2010). A comprehensive meta-analysis of the relationship between Emotional Intelligence and health. *Pers. Individ. Dif.* 49, 554–564. doi: 10.1016/j.paid.2010.05.029

Martins, F. S., Lucato, W. C., and Da Silva, D. (2019). Can diversification explain financial performance in agribusiness co-operatives? *British Food J.* 121, 546–560. doi: 10.1108/BFJ-03-2018-0156

Mbapila, S. J., Lazaro, E. A., and Karantininis, K. (2019). Institutions, production and transaction costs in the value chain of organic tomatoes and sweet peppers in tourist hotels, Unguja and Arusha. *Cogent Food Agricult.* 5, 1–22. doi: 10.1080/23311932.2019.1631581

Min, S., Roath, A. S., Daugherty, P. J., Genchev, S. E., Chen, H., Arndt, A. D., et al. (2005). Supply chain collaboration: what's happening? *Int. J. Logist. Manag.* 16, 237–256.

Mottaleb, K. A., and Rahut, D.B. (2018). Cereal consumption and marketing responses by rural smallholders under rising cereal prices. *J. Agribusiness Develop. Emerg. Econom.* 8, 461–479. doi: 10.1108/JADEE-09-2017-0088

Na, Y. K., Kang, S., and Jeong, H. Y. (2019). The effect of market orientation on performance of sharing economy business: Focusing on marketing innovation and sustainable competitive advantage. *Sustainability.* 11, 729.

Negi, D. S., Birthal, P. S., Roy, D., and Khan, T. (2018). Farmers' choice of market channels and producer prices in India: role of transportation and communication networks. *Food Policy* 81, 106–121. doi: 10.1016/j.foodpol.2018.10.008

Negi, S., and Anand, N. (2019). Wholesalers perspectives on mango supply chain efficiency in India. *J. Agribusiness Dev. Emerg. Econ.* 9, 175–200. doi: 10.1108/JADEE-02-2018-0032

Nyaga, G. N., Whipple, J. M., and Lynch, D. F. (2010). Examining supply chain relationships: do buyer and supplier perspectives on collaborative relationships differ? *J. Operat. Manage.* 28, 101–114. doi: 10.1016/j.jom.2009.07.005

Odongo, W., Dora, M., Molnar, A., Ongeng, D., and Gellynck, X. (2016). Performance perceptions among supply chain members: a triadic assessment of the influence of supply chain relationship quality on supply chain performance. *Br. Food J.* 118, 1783–1799. doi: 10.1108/BFJ-10-2015-0357

Owot, G. M., Olido, K., Okello, D. M., and Odongo, W. (2022). Farmer-trader relationships in the context of developing countries: a dyadic analysis to understand variations in trust perceptions. *J. Agribusiness Develop. Emerg. Econom.* doi: 10.1108/JADEE-11-2021-0303. [Epub ahead of print].

Puška, A., Maksimović, A., and Stojanović, I. (2018). Improving organizational learning by sharing information through innovative supply chain in agro-food companies from Bosnia and Herzegovina. *Operat. Res. Eng. Sci.: Theor. Appl.* 1, 76–90.

Puška, A., Maksimović, A., and Stojanović, I. (2022). Improving organsiastional learning by sharing information through innovative supply chain in agro-food companies from Bosnia and Herzegovina. *Operat. Res. Eng. Sci. Theory Applic.* 1, 1. doi: 10.31181/oresta19012010175p

Puška, A., and Stojanović, I. (2022). Fuzzy multi-criteria analyses on green supplier selectioion in an agri-food company. *J. Inteligence Dec.* 1, 2–16. doi: 10.56578/jimd010102

Qian, C., Seuring, S., and Wagner, R. (2020). A review of inter-firm relationship quality in supply chains. *J. Bus. Indust. Mark.* 36, 2187–2200. doi: 10.1108/JBIM-05-2019-0199

Radosavljevic, K. (2016). Enhancing agri-competitiveness: a cost-benefit analysis of raspberry production on a family farm. *Ekonomika Preduzeca* 64, 492–498. doi: 10.5937/ekopre1608492R

Rashid, A., Baber Ali, S., Rasheed, R., Amirah, N.A., and Ngah, A.H. (2022). A paradign of bloackchain and supply chain performance : a mediated model using structural equation modelling. *Cybernetics.* doi: 10.1108/K-04-2022-0543

Reardon, T., and Barrett, C. B. (2000). Agroindustrialization, globalization, and international development: An overview of issues, patterns, and determinants. *Agricult. Econ.* 23, 195–205. doi: 10.1111/j.1574-0862.2000.tb00272.x

Rindfleisch, A. (2020). Transaction cost theory: past, present and future. *AMS Rev.* 10, 85–97. doi: 10.1007/s13162-019-00151-x

Roscoe, J. T. (1975). *Fundamental Research Statistics for the Behavioural Sciences, 2nd Edn*. New York, NY: Holt Rinehart & Winston.

Sekhon, H., Ennew, C., Kharouf, H., and Devlin, J. (2014). Trustworthiness and trust: influences and implications. *J. Mark. Manage.* 30, 409–430. doi: 10.1080/0267257X.2013.842609

Simon, H. A. (1957). Models of Man; Social and Rational. Washington, DC: Wiley

Tisdell, C. (2004). Transaction costs and bounded rationality- implications for public adminstration and economic policy. *Econom. Theor. Appl. Issue.* 27, 1–24.

van der Vorst, J. G. A. J. (2000). *Effective food supply chains: generating, modelling and evaluating supply chain scenarios* (PhD Thesis). Wageningen University, Wageningen, Netherlands.

Vergari, F., Tibuzzi, A., Basile, G. (2010). "An overview of the functional food market: From marketing issues and commercial players to future demand from life in space," in *Advances in Experimental Medicine and Biology, vol 698*, eds M. T. Giardi, G. Rea, and B. Berra (Boston, MA: Springer). doi: 10.1007/978-1-4419-7347-4_23

Wahdan, M. A., and Emam, M. A. (2017). The impact of supply chain management on financial performance and responsibility accounting agribusiness case from Egypt. *Account. Finan. Res.* 6, 136. doi: 10.5430/afr.v6n2p136

Walker, R. A., Stucka, T., Mikulcak, F., and Sebudde, R. K. (2018). *Uganda Economic Update: Developing the Agri-Food System for Inclusive Growth*. Washington, DC: The World Bank.

Williamson, O., and Ghani, T. (2012). Transaction cost economics and its uses in marketing. *J. Acad. Mark. Sci.* 40, 74–85. doi: 10.1007/s11747-011-0268-z

Williamson, O. E. (1981). The economics of organization: the transaction cost approach. *Am. J. Sociol.* 87, 548–577. doi: 10.1086/227496

Williamson, O. E. (2005). "Transaction cost economics," in *Handbook of New Institutional Economics*, eds C. Menard and M. M. Shirley (Boston, MA: Springer). doi: 10.1007/0-387-25092-1_4

Xue, J., Lu, S., Shi, B., and Yang, X. (2018). Applying complexity theory to explain partner cooperation: The role of transaction cost-related factors and elements of relational exchanges. *Canad. J. Admin. Sci./Revue Canadienne des Sciences de l'Administration.* 35, 488–500.

Zhao, G., Hormazabal, J. H., Elgueta, S., Manzur, P., Liu, S., Chen, H., et al. (2020). The management of operations the impact of knowledge governance mechanisms on supply chain performance: empirical evidence from the agri-food industry. *Prod. Plan. Control* 32, 1313–1336. doi: 10.1080/09537287.2020.1809023