

Social Capital and Environmental Performance: An Investigation in the Kenyan Meat Supply Chain

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Abstract. *This paper aims to investigate the effect of social capital on environmental performance in the Kenyan informal meat supply chain. Social capital is categorized into three categories: structural capital, relational capital, and cognitive capital. The authors seek to understand which of the three dimensions of social capital influences environmental performance within the meat supply chain. The study was based on data collected using surveys from 85 abattoirs and 164 traders from four counties in Kenya: Nairobi, Kiambu, Machakos, and Kajiado. Statistical analysis was conducted using partial least squares structural equation modelling (PLS-SEM). The results also indicated a positive and significant relationship between structural social capital and environmental performance, while relational and cognitive capital had positive but insignificant relationships. The findings highlighted the disparities in the effect of social capital on environmental performance between formal and informal agri-food supply chains. To our knowledge, this finding presents a distinct contribution to social capital and environmental performance studies in informal buyer-supplier relationships in agri-foods. The study is one of the first to examine social capital and environmental performance in an informal agri-food supply chain with a focus on trader-abattoir relationships. The informal supply chain is an important context in which to examine the effects of social capital.*

Keywords: Environmental Performance, Supply Chain Management, Social capital, Agri-food.

Introduction

Environmental challenges in agri-food supply chains (AFSCs) have garnered attention recently due to rising consumer awareness regarding the environmental protection because AFSCs play a vital global role as they are essential for daily diets (Lin & Guan, 2023). Extant literature on agri-foods highlight two major environmental challenges: food loss and waste and greenhouse gas (GHG) emissions. Additionally, AFSCs are significant contributors to GHG emissions which are particularly concerning in Africa due to their impact on extreme weather conditions and droughts (Lin & Guan, 2023).

Studies highlight various factors that positively affect environmental performance: green innovation and green supply chain management (Seman et al., 2019) and social capital (Lee, 2015). However, in this study, we revisit social capital effect on environment performance for three reasons that haven't been considered in existing research.

First, only few studies have been conducted in this issue and less so in Africa. Social capital serves as a powerful solution to address challenges within an African community, such as the limited availability of extension services. Communities often organize themselves into social groups, leveraging social capital to access information, expertise, and resources (Bukachi et al., 2021). Additionally, social capital can solve some of the environmental challenges in Africa because of the relationships and networks in informal settings.

Second, this study adopted a supply chain perspective in examining social capital in AFSCs. Social capital has been studied extensively in African context to emphasize its importance, however the studies have operationalized social capital mostly into bonding and bridging dimensions, often emphasizing community collective action to address social issues such as access to healthcare and markets for small-scale farmers (Bukachi et al., 2021). However, these dimensions lack specificity to the supply chain context. Given the study's focus on the meat supply chain and its associated environmental issues, a more nuanced exploration of social capital is crucial.

Thirdly, while relational and structural capital improves supplier's environmental performance (Lee, 2015), we revisit the theory to examine two supply chain actors in the informal AFSC, traders and abattoirs that haven't been investigated. Traders link pastoralists to different markets in Kenya (Roba et al., 2018).

Nonetheless, there is a gap in examining social capital in informal supply chains in Africa as a viable context. To the best of our knowledge, this is the first study that explores the social capital dimensions on environmental performance in informal meat supply chains with traders as a focal supply chain actor. Furthermore, concerning environmental performance, while most previous studies have measured it in terms of energy and air emissions (Tuni et al., 2018), this study assesses it based on air emissions and emissions to land.

While environmental sustainability has gained relevance in agri-foods, a gap exists in understanding the meat supply chain in emerging countries. In recent times, the meat industry has garnered heightened attention due to its importance globally (Singh et al., 2018). However, cattle rearing, a significant contributor to GHG emissions, poses environmental challenges, particularly at the farm level (Singh et al., 2018). Furthermore, investigating the Kenyan meat supply chain adds to the existing discourse on environmental performance. This is important for various reasons.

Firstly, while there has been increased investment in the meat supply chain, it is largely populated with informal structures and markets (Roba et al., 2018). Lastly, from an environmental perspective, traders and pastoralists practicing open extensive rearing lack proper manure management, leading to high GHG emissions (Roba et al., 2018).

Thus, the study addresses one research question.

RQ 1 What's the direct effect of social capital on environmental performance?

The study will contribute to existing literature on social capital and environmental performance by examining the relationship in informal meat supply chains, a novel context in supply chain management. The study primarily focuses on traders and abattoirs for two reasons. First and foremost, traders, as a focal point, play a central position in the meat supply chain, offering perspectives on both upstream and downstream activities (Roba et al., 2018). Secondly, abattoirs aren't keen in improving environmental performance in Kenya (Nation Newspaper, 2022). From a practical perspective, the study will assist Kenyan environmental regulators by directing and

regulating the meat supply chain actors because they currently struggle to do so, with 98 percent of the abattoirs unregulated (Nation Newspaper, 2022).

The structure of the paper is as follows. The second section provides an introduction to social capital and environmental performance within agri-food supply chain. Research method is presented in the subsequent section. The fourth section presents the findings and offers a detailed discussion and conclusion and limitations in the final section.

Literature Review

Social Capital and Environmental Performance

Social capital theory has gained prominence lately in supply chain management and it explains how information, trust and norms operate within a social network (Alghababsheh & Gallea, 2020). Numerous studies have looked at the performance benefits of social capital, such as operational performance (Alghababsheh & Gallea, 2020). However, it's important to note the benefits of social capital might not be globally applicable. Understanding the nature of buyer-supplier relationships can provide greater insights into the benefits of social capital. Most previous studies have focused on formal supply chains characterized by structure, technological integration and high coordination (Alghababsheh & Gallea, 2020). While these studies have highlighted that social capital positively affects suppliers' environmental performance in manufacturing industry, the AFSC remains a largely unexplored area (Lee, 2015). African AFSCs which are predominantly informal are known for low quality output, food safety risks, lack of accountability and lack of infrastructure in the supply chain (Obonyo et al., 2023).

Social capital in supply chain management is divided into three in most studies based on Nahapiet & Ghoshal, (1998) framework: structural capital, cognitive capital and relational capital. Structural capital (SC) pertains to the pattern of connections between supply chain actors, encompassing relationship ties and how they impact access to resources. Cognitive capital (CC) involves shared meanings and interpretations among actors (Nahapiet & Ghoshal, 1998). It represents the influence of mutual expectations and similar perceptions on how actors collaborate achieve mutual goals (Nahapiet & Ghoshal, 1998). Relational capital(RC) focuses on actor relationships that influence their behavior (Nahapiet & Ghoshal, 1998). In AFSC, social capital, fostered through frequent interactions, mutual trust and collaborative problem solving can improve environmental performance. These interactions and collaborations facilitate the communication of environmental sustainability goals, ultimately leading to adoption of environmentally friendly practices. This, in turn, can reduce carbon footprint and improve overall environmental performance in the supply chain.

Environmental performance entails the assessment of positive impacts of environmental management strategies, such as green supply chain management (GSCM) (Seman et al., 2019). The growing emphasis on environmental performance within the AFSC reflects potential consumers' increasing demand for products with less environmental impact. The consumers need to know that there is less environmental impact along the supply chain has led to the need to find solutions to the challenges being faced.

In their review, Tuni et al., (2018), concluded that most studies have measured environmental performance using four main components: reduction of water, solid wastes, air, a decrease in hazardous and harmful wastes and fewer environmental accidents. The study adopts the framework from Tuni et al., (2018) as a guiding model for investigation, with particular

attention directed towards emissions to air and land. The study aims to investigate the effects of all three dimensions of social capital on environmental performance in the Kenyan meat supply chain.

(Roba et al., 2018) mapped the Kenyan meat supply chain, which is categorized into distinct stages. The first stage is production, primarily involving the breeding and fattening of the cattle. Animals are reared until they reach the required size and age. Production is done mostly by pastoralists in rangelands. Following production is the trading stage. Traders serve as intermediaries connecting pastoralists to three different types of markets: primary, secondary and long-distance markets. Primary markets are closer to villagers and volumes are smaller while secondary markets are larger and further away from villages, prices are higher and competition is stiffer. The next stage involves the delivery of meat to abattoirs by traders from the different markets, where live animals are stunned slaughtered. The processed meat then moves to retailers who sell it in formal outlets like butcheries and supermarkets. Finally, consumers, as the end users of the meat complete the supply chain.

While these three dimensions have been studied in Western countries featuring distinct supply chain structures and actors, their application in African countries may yield different results, as each dimension of social capital could potentially affect the environmental performance differently. As supply chain actors, move towards green sustainability, the social capital may play a crucial role in influencing environmental performance, especially if these actors perceive benefits from it. The study proposes that:

H1_a Relational capital is positively related to environmental performance.

H1_b Cognitive capital is positively related to environmental performance.

H1_c Structural capital is positively related to environmental performance.

Methodology

Population and Sampling

The study adopts a quantitative approach. A survey instrument based on literature and discussions with industry officials was administered to the abattoirs and traders who supply them. The focus of the study was four counties. Nairobi and its three neighboring counties Kiambu, Kajiado and Machakos. A census was done of all the abattoirs in the counties with the ability to slaughter at least 5 cattle a day. The survey was administered to all 85 abattoirs in the four counties. Snowballing sampling was then used to identify the traders that supply the abattoirs. 170 traders were identified and only 164 agreed to the survey. The questionnaire was pre-tested in both scenarios to avoid conceptual bias and to improve content validity of items.

Data Collection

The data was collected through face-to-face surveys by trained research assistants. This method was chosen to improve the response rate and mitigate potential non-response bias. The surveys were carried out over a period of two months, specifically in January and February 2023. The face-to-face surveys were conducted for approximately 45 minutes to an hour each. The respondents were informed about the data collection of the study and consent was given. Data was collected from the traders and employees of the abattoirs using computer-assisted personal interviews. The interviews were done using a mobile app called Kobocollect.

Both non-response bias and common method bias was examined. Common method bias was assessed by checking the variance inflation factor(VIF). The results of VIF suggest that

common method bias is not a significant concern in this study. Non-response bias was analyzed by ensuring that there was no difference between early respondents and late respondents. There was no significant difference in time in obtaining responses, as research assistants ensured data was collected within a specific timeframe.

Measurement of Variables and Data Analysis

A survey was developed based on existing literature to measure the items. The questionnaire was pretested and a pilot study was conducted. The final survey was redesigned based on the feedback from the pilot. The survey was then administered by research assistants. Social capital variables were derived from extant literature. Structural capital, cognitive capital and relational capital measures were derived from (Li et al., 2014). Environmental performance is measured by four items slightly different from extant literature by Tuni et al., (2018) and adjusted to better align with the characteristics of the Kenyan informal meat supply chain. The measurement of environmental performance varies slightly in informal settings. Table I lists the constructs and measures used in the study. The same constructs and measures were adjusted accordingly to suit traders in their questionnaire.

The constructs were measured using a Likert scale with four levels from 1=not at all to 4=to a great extent. Partial least squares- structural equation model (PLS-SEM) was used to test the structural model because of its extensive use in supply chain management studies, due to its effectiveness with small sample sizes and data that do not meet the normal distribution assumptions (Baah et al., 2022). PLS-SEM is employed when the primary objective of the research is to provide explanations and estimates of target constructs (Hair Jr et al., 2014). PLS-SEM has been utilized in studies assessing GSCM and environmental sustainability in supply chains (Seman et al., 2019). The model's validity was assessed by examining loadings using confirmatory factor analysis, with items deemed acceptable if the loadings were equal or greater than 0.7. To test the internal consistency of the model, Cronbach's alpha and composite reliabilities of constructs were checked (Hair Jr et al., 2014). The average variance extracted (AVE) of the constructs was examined to assess convergent validity, with an AVE of 0.50 or higher considered acceptable. Multicollinearity was also checked, and variance inflation factor (VIF) numbers assessed.

Table I. Constructs and Measures used in the study

Construct	Measurement Code	Measures
Relational Capital	RSC1	Traders and we are concerned about the welfare or interests of each other when making important decisions.
	RSC2	Traders and we are willing to offer assistance and support to each other, even if the circumstance changes.
	RSC3	Traders and we share confidential information with each other
	RSC4	Traders and we do not have a close personal interaction
	RSC5	Traders and we are willing to invest in specific resources for each other, because we maintain a close relationship
Cognitive Capital	CSC6	Traders and we share the same vision
	CSC7	Traders and we share the same goals

Construct	Measurement Code	Measures
	CSC8	Traders and we do not share the same ambitions
	CSC9	Traders are similar to us in that we both are willing to change for the benefit of the relationship
Structural Capital	SSC10	Traders and we maintain close social relationships with each other
	SSC11	Traders and we do not have frequent and intensive interaction with each other
	SSC12	Traders and we did not obtain new interactions by the cooperation
Environmental	EPI	We produce biogas
	EP2	We have a proper waste management system
	EP3	We conduct environmental audit of our abattoir
	EP4	We don't have solid waste accumulation in the abattoir due to proper disposal

Source: Authors' own research.

Results

The first stage in PLS models involves evaluating and confirming the measurement model's validity and reliability. In the second phase, the hypothesised correlations are examined using path modelling. Confirmatory factor analysis(CFA) was conducted to examine the relationships between the constructs and their items. The technique helped to cut the list of things down to a manageable number for the given structures. To enhance validity and reliability of constructs, several items with factor loadings below 0.70 were eliminated after the initial CFA.

Table II below reports the measurement model assessment results. Cronbach's alpha and composite reliability values were computed to assess the dependability of the constructs. Cronbach's alpha for the constructs ranged from 0.7 to 0.85 and composite reliability ratings ranged from 0.7 to 0.88. They were both above the threshold of 0.7, suggesting good reliability. A collection of indicators' convergent validity determines if they represent the same underlying construct. Convergent validity merely shows how closely the constructs that are supposed to be related are actually related. An average variance extracted (AVE) of 0.5 or greater denotes convergence validity (Baah et al., 2022). The AVE values of each of the constructs in our analysis are greater than this minimum.

Measurement Model Assessment

Table II. The measurement model output

Constructs and Items	Factors Loadings	VIFs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Cognitive Social Capital			0.818	0.877	0.717
CSC6	0.870	3.579			
CSC7	0.824	3.401			
CSC9	0.846	1.343			
Relational Social Capital			0.836	0.837	0.753
RSC1	0.885	2.64			

Constructs and Items	Factors Loadings	VIFs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
RSC2	0.888	2.635			
RSC5	0.829	1.542			
Structural Social Capital			0.700	0.700	0.757
SSC11	0.896	1.365			
SSC12	0.843	1.365			
Environmental Performance			0.842	0.845	0.680
EP1	0.781	1.631			
EP2	0.864	2.374			
EP3	0.853	2.328			
EP4	0.799	1.747			

Source: Authors' own research

Structural Model

This represents the relationships between constructs that were hypothesized. Figure I and tables III below reveal those relationships.

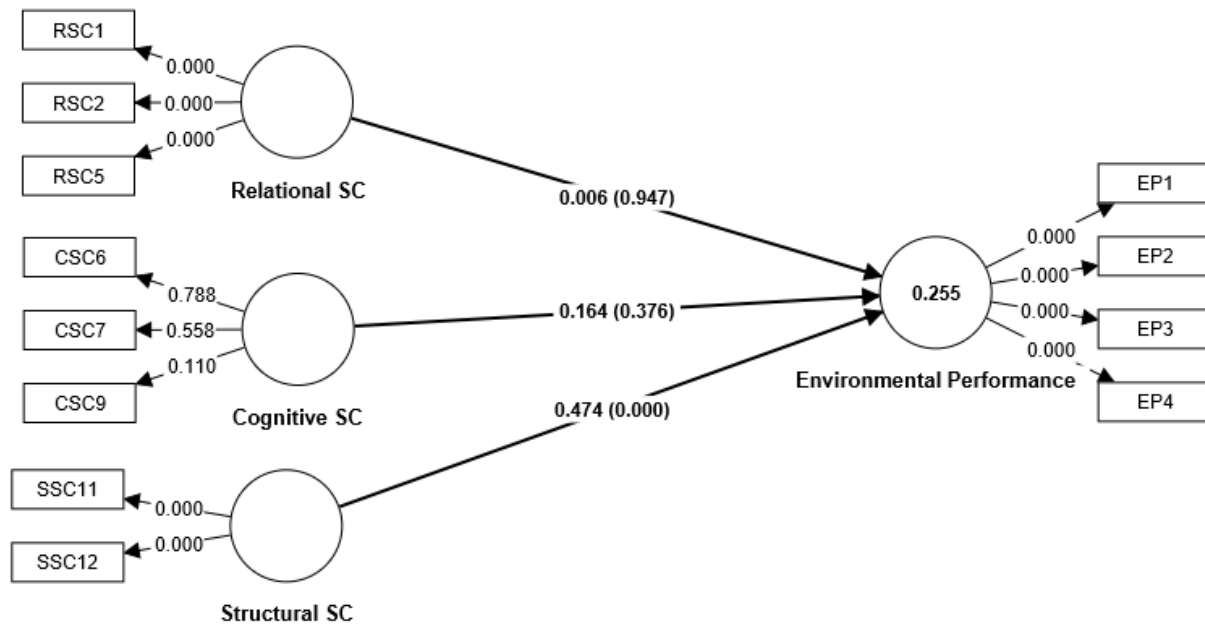


Figure I. Path Diagrams for social capital on environmental performance

Source: Authors' own research.

Hypothesis 1 was testing the direct relationship of social capital on environmental performance as depicted in Figure I. The results presented in Table III indicated that both relational capital ($H_{1a}=0.006$) and cognitive capital ($H_{1b}=0.164$) had direct positive relationships with environmental performance but they were not significant. Therefore, H_{1a} and H_{1b} were not supported. Structural capital ($H_{1c}=0.474$) had a significant direct relationship with environmental performance offering support to H_{1c} .

Table III. Direct Path Analysis.

Hypothesis	Path	Coefficient	Supported
H _{1a}	Relational Social Capital -> Environmental Performance	0.006	No
H _{1b}	Cognitive Social Capital -> Environmental Performance	0.164	No
H _{1c}	Structural Social Capital -> Environmental Performance	0.474***	Yes

Source: Authors' own research.

Discussion

With regards to the informal Kenyan meat supply chain, it is dominated by small scale pastoralists who have limited market access and animal traders who act as intermediaries connecting pastoralists with abattoirs (Obonyo et al., 2023). This unique context has yielded interesting results. Firstly, the study revealed that only structural capital had a positive and significant effect on environmental performance. This aligns partially with extant literature on social capital (Lee, 2015). Specifically, improvements in structural capital between abattoir and trader were linked to improvements to the environment. Regarding structural capital, a small network size, shorter geographical distance, and increased interpersonal contact can improve resilience during drought and environmental performance. In essence, in informal supply chains, as the frequency and depth of interactions increase, the environmental challenges are more likely to be discussed and addressed, resulting in environmental improvements. This makes sense given that many transactions in Africa are one-off spot markets, as traders often transport live animals over long distances to the abattoirs. The relative importance of the three dimensions emphasizes that supply chain actors in the meat supply chain should focus on structural capital.

In most studies, the benefits of structural capital tend to be more pronounced when combined with either cognitive or relational capital (Alghababsheh & Galleary, 2020). Therefore, the finding that only structural capital was significant in this study is inconsistent with broader literature. Cognitive capital insignificance may be attributed to the absence of a shared vision and common goals among supply chain actors, particularly a unified commitment to reduce pollution along the supply chain. Hence, managers should aim to ensure that there is a shared philosophy and common goals among the actors. Likewise, relational capital was found to be insignificant, possibly due to a lack of trust, friendship and mutual respect between the actors aligning with (Obonyo et al., 2023). Cognitive and relational capital insignificance could be due to the transactional nature of the relationships within the spot markets. Theoretically, understanding the level of social capital and the interaction of its three dimensions within a specific context is critical for enhancing environmental performance. This understanding allows for the prioritization of structural capital, especially within the unique supply chain structure involving different actors.

Conclusions

The study makes a significant contribution to body of knowledge in social capital and environmental performance by examining effect of social capital on environmental performance in buyer-supplier relationships in informal AFSCs. Notably, in informal AFSCs, the study identifies structural capital as the only significant dimension that has an influence on environmental performance, which differs from what is observed in formal supply chains (see Alghababsheh & Galleary, 2020).

This difference underscores why the results deviate from those in other agri-food studies, contributing to the expansion of existing literature that predominantly addresses formal agri-food

supply chains. By breaking down the dimensions of social capital, the study provides valuable insights for abattoirs and traders. To enhance environmental performance in the meat supply chain, supply chain actors should consider improving the frequency and strength of their interactions, possibly through the adoption of technology facilitating easier communications between abattoirs and traders. Abattoirs and traders can prioritize investments and interventions that strengthen structural capital to foster sustainable and environmentally conscious practices. This key insight implies that, in the realm of informal AFSCs, fostering and enhancing structural capital can be a targeted strategy for mitigating air and land emissions, offering practical guidance for abattoirs and traders operating in this context.

However, the study has a number of limitations, which could serve as avenues of further research. Firstly, the study was done in Kenya, and the findings may not be applicable to other countries or regions. To enhance the external validity of the results, future research could replicate similar studies in diverse geographical contexts, taking into account cultural and regulatory differences. Secondly, the research focused on meat supply chains and it would be beneficial to replicate similar studies in other AFSCs to enhance generalizability of findings. Future research should consider exploring a variety of AFSCs to capture the specific nuances that may influence the relationship between social capital and environmental performance. Thirdly, while cross-sectional studies are valuable in capturing a snapshot of a population at a specific point in time, it is crucial to acknowledge the inherent limitations of this research design. The cross-sectional approach may not fully capture the dynamic nature of certain phenomena. Factors such as social, economic, or environmental variables that fluctuate over time might not be adequately represented in a single snapshot. Future studies could investigate the two variables through a longitudinal study to gain a more comprehensive understanding. Lastly, the study concentrated on the population of abattoirs and traders and therefore future studies could expand the scope to include other actors within the supply chain or investigate the entire supply chain to gain a more comprehensive understanding. Investigating the viewpoints of other supply chain actors, such as pastoralists, could offer a more comprehensive understanding of the complex dynamics at play in informal AFSCs and their impact on environmental performance.

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