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Farmers' Choice of Cattle Marketing Channels in Rural South Africa: A Transaction Cost Economics Perspective

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Abstract

This study empirically tests the hypotheses that information, negotiation, and monitoring costs influence the decision to sell to private buyers, speculators, or at the auction pens among smallholder farmers in KwaZulu-Natal, South Africa. Based on survey data, the results of a Multinomial Logit regression reveal that the probability of selling at the auction vs. selling at farm gate increases during the end-of-year festive season, indicating the scope of market uncertainty surrounding auctions. They also show that the probability of selling at the auction vs. selling to speculators increases with proximity to the auction marketplace and decreases with knowledge of the buyer, suggesting higher opportunity costs of time and efforts associated with selling at the auction, and considerable negotiation and monitoring costs incurred when selling to speculators. Other significant predictors of auction channel selection are volume supplied and farmer's age. This study concludes with some policy implications.

1. Introduction

Access to agricultural markets has considerable potential for rural development in developing and transition countries. In addition to the static welfare effect of trade according to the comparative advantage school of thought, welfare gains of market participation accrues from (i) larger-scale production opportunities in the face of exorbitant fixed production costs, (ii) technological change effects of regular market-based exchanges, and (iii) the associated total factor productivity growth (Barrett, 2008). However, agricultural markets in southern Africa continue to be characterized by multiple equilibria, with a high-level equilibrium associated with technological advance and access to private and public goods, coexisting with low-level equilibrium pertaining to smallholder farmers (Barrett, 2008).

The challenges to pro-smallholder market development are more pronounced in South Africa. The country's dual agricultural economy (i.e. largely small-scale, rain-fed farming systems coexisting with commercial, irrigated agricultural systems) has persisted, despite policies pledging to promote the integration of smallholder farmers in high-value market chains (van Schalkwyk et al., 2012). Research shows that the limited success of rural development policies is owed to supply-side challenges such as high transaction costs, high risk associated with new products, poor infrastructure, high price variability, and weak bargaining power of small-scale producers (Delgado, 1999; Obi et al., 2012; Ortmann and King, 2010). Empirical research in the livestock sub-sector contends that transaction costs cause smallholder farmers to self-select out of livestock markets, and this challenge is compounded by the incidence of non-commercial motives among ranchers (Groenewald and Jooste, 2012; Ndoro and Hitayezu, 2014; Ndoro et al., 2014, 2013).

Paradoxally, empirical livestock research devoted to the study of transaction costs themselves remains scanty. Case studies such as Musemwa et al. (2010), Nkosi and Kirsten, (1993), and Uchezuba et al. (2009) have documented the emergence of marketing channels for cattle producers in South Africa (including private buyers, butchers, speculators, and auctioneers). They showed that although the livestock extension policymakers view auctioneering as the most advanced form of cattle marketing and indeed cattle in the auction pens generally fetch better prices, private sales remain the most important form of cattle marketing in rural areas. This signals the incidence of frictions in market exchanges, the persistence of which can prevent farmers from allocating their market supplies to different outlets in order to secure optimal earnings (Woldie, 2010).

Notwithstanding the importance of their findings, the analysis of transaction costs in the aforementioned case studies was only descriptive. Measuring and testing the validity of hypotheses of transaction costs economics (TCE) for the understanding of livestock marketing channels selection among smallholder farmers in rural South Africa were largely ignored. Thus, currently there is very little information at the disposal of development policymakers about the factors defining the costs of transacting in the South Africa's rural livestock marketing and the appropriate strategies to alleviate them.

Against this backdrop, the objective of this study is to investigate marketing factors influencing smallholder farmers' selection of cattle marketing channels in communal production systems of KwaZulu-Natal (KZN). Inspired by the work of (Hobbs, 1997), this study empirically investigates the determinants based on TCE. Based on information about 408 cattle market transactions compiled from a survey of 230 farm households in thirteen communities of the Okhahlamba Local Municapility (OLM), the theoretical predictions of TCE are tested using a Multinomial Logit regression.

The paper is organized as follows. Section 2 gives an overview of the beef industry in South Africa and discusses some challenges for smallholder farmer integration. Section 3 highlights the empirical evidence in cattle marketing research. Section 4 describes the methodology used, including the data collected and the analytical framework. Section 5 reports and discusses the results of the econometric regression. The last section draws some concluding remarks.

2. Smallholder farmers in the South Africa's beef industry: an overview

A recent report on the beef value chain profile published by the Department of Agriculture, Forestry and Fisheries (Republic of South Africa, 2011) shows that 69% of the country's agricultural land is under extensive grazing by commercial, emerging and small-scale beef cattle farmers. It is estimated that approximately 8.2 million cattle is owned by 50,000 commercial farmers, while the remainder (5.6 million cattle) is owned 240,000 small-scale farmers and 3 million subsistence farmers.

The beef industry has evolved from a centrally-planned, highly regulated industry to one that is fully governed by market forces. The pre-deregulation era was marked by the distinction between controlled and uncontrolled areas, compulsory auctioneering of carcasses, the use of agency in

controlled areas, and the floor price system and quotas/permits. The deregulation process was concluded in 1997 with the enactment of the new Marketing of Agricultural Products Act and the abolishment of the Meat Board of South Africa (Groenewald and Jooste, 2012).

Following the deregulation, the beef industry has been increasingly vertically integrated, driven by high population growth, income growth, urban migration, globalization, and their associated changes in lifestyles and consumer preferences (Coetzee et al., 2006; Groenewald and Jooste, 2012). This integration has been mainly marked with increasingly large feedlot companies owning their own abattoirs, abattoirs integrating towards the wholesale level, and wholesalers sourcing their cattle directly from farmers or feedlots on a bid and offer basis (Republic of South Africa, 2011).

Five major channels for livestock are currently available to smallholder farmers: auctions, speculators, butcheries, abattoirs, and private buyers (Musemwa et al., 2010). The auction, also known as dip tank sale, is scheduled by the livestock extension office. It is viewed as the most advanced institutional form of cattle marketing for smallholders in South Africa. Cattle in the auction pens often fetch better prices compared to those sold elsewhere. Although the speculators are the "principal" buyers at the auctions, they also do source their animals directly from farmers. Farmers do not incur any cost for dealing with speculators, as the transactions often take place at their homesteads. The speculators buy animals with the intention of reselling them to feedlots, abattoirs and butcheries with some profit margin. Butcheries also do buy their cattle directly from the farmers or at the auctions. Perhaps the most important form of cattle marketing is private sales (Musemwa et al., 2010; Nkosi and Kirsten, 1993). It takes place among neighbours and between neighbouring communities, mainly in the form barter or cash sales.

Case studies have shown that smallholder cattle farmers consider some aspects of transaction cost when choosing between these channels. For example, in the Lebowa region of the Limpopo province, Nkosi and Kirsten (1993) reported that farmers are generally dissatisfied with low prices at the auctions and speculators' disrepute (opportunism, dishonesty and disrespect). They further mentioned their preference for private sales owes to the ability to determine the price and the lack of marketing costs. In the Eastern Cape, Musemwa et al. (2007) highlighted that the majority of cattle farmers are mainly attracted by accessibility and reliability to sell at auctions.

The costs associated with such frictions in market exchanges can have profound implications for poverty alleviation in rural areas. As Woldie (2010) demonstrate, frictionless access to a wider

range of market outlets allows farmers to allocate their produce in such a way that they can optimize earnings under different risk scenarios. The information provided by the aforementioned studies, however, is simply descriptive (and therefore case-specific), and lacks any predictive power. To date, the importance of factors defining the transaction costs remains undocumented, and therefore little information about the necessary mitigation strategies is at the disposal of livestock policymakers. The TCA adopted by this study offers a more robust technique for investigating the effect of various indicators of transaction costs on the selection of market outlets.

3. Transaction cost approach (TCA) to cattle marketing channel choice: conceptual underpinning and empirical evidence

There are two strands of literature in marketing channel choice research (McNaughton, 1999): geographical research (mainly focusing on the spatial pattern of regionalization and internationalization of firms and their entry mode choices), and marketing literature. In the marketing literature, although there has been several approaches to the study of channel choice (including the financial, microeconomic, managerial and behavioral approaches), the TCA has been the most influential stream (McNaughton, 1999).

Unlike the neoclassical economics that assume frictionless market exchange, TCE argues that such exchanges are often fraught with transaction cost outlays that can cause market failure (Williamson, 1985). The empirical measurement of the transaction costs themselves is based on the seminal work of Coase (1937) positing that transacting within a firm (i.e. vertical integration) is a suitable alternative to hazardous marketing arrangements when the cost of transacting over market outweighs internal cost of management. Transacting over markets is often costly when market exchange requires a higher level of transaction-specific investments (asset specificity), and/or costs of writing contracts due to external uncertainties (Levy, 1985).

However, for both market integration and transaction costs, the difficulty in empirical measurement has been a major setback for empirical research. Although there have been alternative measurements of vertical integration in the literature (e.g. Levy [1985], Frank and Henderson [1992]), Hobbs (1997) argued that most studies rely on data from firms' accounting books or governments' surveys that can hardly measure the intricacies of transaction costs. In spite of this measurement challenges, Rindfleisch and Heide (1997) indicated that the application of TCE to

understanding market integration has been biased towards manufacturing firms, with little application to farm firms.

The application of the TCA to vertical coordination in cattle marketing research is scanty. Among the few, Hobbs (1997) shows that the high monitoring costs related to deadweight grade uncertainty as well as negotiation cost related to relationship with procurement officers prevented farmers in Scotland from selling directly to the packers, whereas higher uncertainty associated with nonsale and the negotiation cost related to time spent at the market prevented auction sales. In China, Gong et al. (2006) revealed that monitoring costs related to payment delays, as well as negation costs influenced the selection of processors and auction markets. In Namibia, Shiimi et al. (2012) suggested that access to market information and information technology drove the proportion of cattle sold through these markets. To the best of Authors' knowledge, there have been no similar investigations conducted among South African smallholder ranchers.

4. Methodology

4.1. Study area and data collection

This study was conducted in the KwaZulu-Natal (KZN) province of South Africa. It is estimated that KZN contributes 11 % to the total beef production (Republic of South Africa, 2011). The focus was on the Okhahlamba Local Municipality (OLM), a 344,000ha municipality in the uThukela District (see Figure 1). In this district, although only 22% of the economically active population engages in agriculture (Okhahlamba Local Municipality, 2012), around 55% of the households living on communal lands practice livestock farming, mainly consisting of cattle, goats and sheep (Elleboudt, 2012).

Livestock extension agents play a major role in the transformation of the livestock sector in the area. The extension office located in the Bergville town is responsible for the development of livestock farmers' organizations, pastures, veterinary services, dip-tanks, and marketing facilities. Under the auspices of the Municipality's livestock extension office, around 31 dip tanks were constructed and are operational in the area (see Figure 1). All cattle farmers are members of the Dip-tank Users Associations (DUAs). The livestock extension office is also responsible for scheduling cattle auctions at Dukuza dip tank (see location on Figure 1).

Data were collected in two phases. The information gathered during the participatory rural appraisal phase was used to device a structured household survey questionnaire. A questionnaire was then pilot-tested and administered by trained field enumerators during the second phase, spanning from November, 2012 to February, 2013. Farm households were selected based on a two-stage random sampling technique. In the first stage, 12 out of 31 DUAs were randomly selected using the simple random selection technique. In the second stage, members of each pre-selected DUA were randomly sampled with probability proportional to size. In total, 230 heads of households owning cattle were interviewed.

Table 1 shows the household-level cattle marketing behaviour among the interviewed farm households. The households adopted four forms of marketing channels, including auction sales (35 %), private sales (50 %), speculators (14 %), and a mixture of auction and private sales. Table 2 gives details on the cattle marketing transactions among the surveyed areas. In total, about 408 cattle transactions by smallholder farmers conducted during the period of 2009 to 2011 were recorded. Community level off-take rates ranged from 5 to 18 %, with an overall average of 15 %. Hence, the sample was deemed representative of the general population of cattle farm households in South Africa.

4.2. Analytical framework

By far, the most widely used econometric technique in the channel choice literature (Bardhan et al., 2012; Jari and Fraser, 2009; Martey et al., 2012; Panda and Sreekumar, 2012) is the Multinomial Logit (MNL) model (Hausman and McFadden, 1984). Under this framework (see Anas [1983]), a farmer *i* from a population *i*= 1… *I* of individual decision-making farmers (with homogenous preferences) is assumed to face a choice set of *m*=1…*M* of discrete alternative markets channels. The utility of each alternative market channel for farmer *i* ($\hat{U}_m^i$) is assumed to be a linear function of the utility attribute of a particular market. Hence,

$$\hat{U}_m^i = \alpha_{0m} + \sum_{k=1}^{K} \alpha_k + X_{mk}^i + \varepsilon_m^i \qquad (1)$$

where $\overline{\alpha} = [\alpha_{o1}\alpha_{o2}...\alpha_{om}\alpha_1\alpha_2...\alpha_k]$ are the utility coefficient common to all farmers in the population; X_{mk}^i is the k^{th} attribute's value for market alternative channel *m* and farmer *i*; and $\overline{\varepsilon} = [\varepsilon_1\varepsilon_2...\varepsilon_m]$ is the vector of stochastic utility distributed over the population. Alternative-specific constants α_{om} measure the unspecified part of the utility for each market alternative.

The probability that farmer *i* selects market channel *c* over *m* alternative can be written as follows:

$$P_c^i = \Pr.\left[\hat{U}_c^i > \hat{U}_m^i; \forall m \neq c\right] \quad (2)$$

The derivation of the MNL model follows the assumption that ε_c^i is identically and independently distributed (IID) over the population and for each farmer based on the Gumbel distribution with the following cumulative distribution function:

$$\Pr.\left(\varepsilon_c^i \leq \varepsilon\right) = \exp\left(-\exp\left[-\left(\frac{\pi^2}{6\sigma^2}\right)^{1/2}\varepsilon\right]\right) \quad (3)$$

with zero mode and σ^2 variance for each alternative market channel *m*=1…*M*.

With this consideration, the MNL derives in the following form:

$$P_c^i = \frac{\exp\left\{\beta_{0c} + \sum_{k=1}^{K}\beta_k X_{ck}^i\right\}}{\sum_{m=1}^{M}\exp\left\{\beta_{0m} + \sum_{k=1}^{K}\beta_k X_{mk}^i\right\}} \quad (4)$$

where $\beta_{0c} = \left(\pi^2/6\sigma^2\right)^{1/2}\alpha_{0c}$ and $\beta_k = \left(\pi^2/6\sigma^2\right)^{1/2}\alpha_k$.

This model is estimated by maximizing the likelihood function that with respect to the estimable coefficients $\bar{\beta}$. Thus,

$$\underset{\bar{\beta}}{\text{Maximize}}\ \text{Log}\hat{\lambda} = \sum_i\sum_m \delta_m^i \log P_m^i(\bar{\beta}) \quad (5)$$

where $\delta_m^i = 1$ if farmer *i* selects alternative marketing channel *m*, $\delta_i^m = 0$ if he farmer *i* does not select alternative marketing channel *m*.

The first-order condition for the unconstrained optimization involves the following equations:

$$\frac{\partial \log\hat{\lambda}}{\partial\bar{\beta}} = \sum_i\sum_m \delta_m^i\left[\frac{\partial P_m^i(\bar{\beta})/\partial\bar{\beta}}{P_m^i(\bar{\beta})}\right] = 0 \quad (6)$$

where

$$\frac{\partial P_m^i(\bar{\beta})}{\partial\beta_k} = P_m^i(\bar{\beta})X_{mk}^i - P_m^i(\bar{\beta})\sum_c P_c^i(\bar{\beta})X_{ck}^i; \quad k = 1...K \quad (7)$$

$$\frac{\partial P_m^i(\bar{\beta})}{\partial \beta_{0m}} = P_m^i(\bar{\beta})\left[1 - P_m^i(\bar{\beta})\right]; \quad m = 1...M \tag{8}$$

Substituting (7) and (8) into (6):

$$\frac{\partial \log \lambda}{\partial \bar{\beta}} = \sum_i \sum_m P_m^i(\bar{\beta}) X_{mk}^i - \sum_i \sum_m \delta_m^i X_{mk}^i = 0; \quad k = 1...K \tag{9}$$

and

$$\frac{\partial \log \lambda}{\partial \beta_{0m}} = \sum_i P_m^i(\bar{\beta}) - \sum_i \delta_m^i; \quad m = 1...M \tag{10}$$

where $\sum_i \sum_m \delta_m^i X_{mk}^i \equiv \bar{X}_k$ and $\sum_i \delta_m^i = \overset{0}{N}_m$ reflect the aggregate value of k^{th} market channel attribute over the sample and the observed frequencies of farmers choosing each of the *m* marketing channel alternatives, respectively.

All the elements of $\bar{\beta}$ are obtained by solving *K*+*J* equations in (9) and (10) simultaneously. This is what constitutes a MNL model of market channel choices with *K* generic attributes and a set of alternative-specific constants, all but one which are identified.

4.3. Study area and data collection

The hypothesis to be tested is that transaction costs affect the selection of cattle marketing channels by smallholder farmers. After dropping the marketing mix due to lack of enough observations, the outcome variable (MARKCHAN) captured three channels of cattle marketing, i.e. PRIVATE, SPECULATOR, and AUCTION. The former two represents farm gate sales, whereas the latter serves as the reference channel in the model. Following previous reports such as Gong et al. (2006), Hobbs (1997) and Shiimi et al. (2012), transaction cost factors (i.e. the predictors) are categorised into three major classes: information, negotiation, and enforcement costs, to which producer characteristics are added as control factors (Hobbs, 1997). The empirical model is specified as the following equations:

$$\ln\left(\frac{\Pr(\text{MARKCHAN} = \text{PRIVATE})}{\Pr(\text{MARKCHAN} = \text{AUCTION})}\right) = \beta_{10} + \beta_{11}(\text{PRICEINFO}) + \beta_{12}(\text{SEASONSALE}) + \beta_{13}(\text{DISTDUKUZA})$$
$$+ \beta_{14}(\text{KNOWBUYER}) + \beta_{15}(\text{CATTLEINCRANK}) + \beta_{16}(\text{EXPDAMAGE})$$
$$+ \beta_{17}(\text{TRUSTBUYER}) + \beta_{18}(\text{TOTSOLD}) + \beta_{19}(\text{BODYCOND}) + \beta_{110}(\text{AGEHH})$$
$$+ \beta_{111}(\text{OLCMEMB}) + \beta_{112}(\text{EDUCATION}) + \beta_{113}(\text{OWNVEHIC})$$

(11)

$$\ln\left(\frac{\Pr(\text{MARKCHAN} = \text{SPECULATOR})}{\Pr(\text{MARKCHAN} = \text{AUCTION})}\right) = \beta_{20} + \beta_{21}(\text{PRICEINFO}) + \beta_{22}(\text{SEASONSALE}) + \beta_{23}(\text{DISTDUKUZA})$$

$$+ \beta_{24}(\text{KNOWBUYER}) + \beta_{25}(\text{CATTLEINCRANK}) + \beta_{26}(\text{EXPDAMAGE})$$

$$+ \beta_{27}(\text{TRUSTBUYER}) + \beta_{28}(\text{TOTSOLD}) + \beta_{29}(\text{BODYCOND}) + \beta_{210}(\text{AGEHH})$$

$$+ \beta_{211}(\text{OLCMEMB}) + \beta_{212}(\text{EDUCATION}) + \beta_{213}(\text{OWNVEHIC})$$

(12)

where β's are the parameters to be estimated.

Each predictor, as described in Table 3, is selected for the MNL regression based on the significance of its contribution across all outcome categories in the model, i.e. the Log-Likelihood ratio (LR) test for independent variables (Wooldridge, 2002).

Information about prevailing market price (PRICEINFO) captures price discovery (or price information) costs. It is commonly argued that the cost of accessing price information depends on the extent to which market information is readily available to farmers (Gong et al., 2006; Hobbs, 1997; Shiimi et al., 2012). Therefore, a positive effect of availability of price information on market channel selection was expected, particularly for selling to private buyers vs. selling at the auction. Table 3 shows that on average, each interviewed farmer had little to no market information at the time of sale transaction.

The season during which the sale transaction took place (SEASONSALE) is a dummy variable capturing sales transacted in December or otherwise. It serves as an indicator of price and market uncertainty in the model. According to Hobbs (1997), price or market uncertainty is heightened if the farmer is not sure about the number of buyers that will turn up at the marketplace. To the extent that the demand for beef peaks during the end-of-year festive season, this variable was expected to influence the choice of marketing channel. Table 3 shows that most of the recorded sale transactions did not take place during the festive month of December.

Distance to the auction (DISTDUKUZA) indicates the transportation cost that is specific to the auction market, and therefore the opportunity cost of farmers' time and efforts to organize the cattle transportation to the auction. A *priori* expectation was a positive effect of this variable on the

choice of farm gate sales vs. auction. Table 3 shows that in the sample, the average distance to the dip tank was about 20km.

Knowledge of the buyer (KNOWBUYER) captures the *a priori* knowledge of the buyer during cattle sale transactions. It is common argument that a (good) relationship with the buyer in a certain channel reduces the cost negotiating sales, and therefore may lead to positive channel selection outcome (Hobbs, 1997). Therefore, a positive influence of this variable was expected on the choice of farm gate channels. Table 3 points out lower levels of knowledge of the buyers among the surveyed households.

The importance of cattle incomes in the household (CATTLEINCRANK) indicates the degree of specialization, thereby capturing the household's supply elasticity to new market information discovery, hence, the bargaining power. As Bellemare and Barrett (2006) contend, (pre)committed households have lower levels of flexibility in market transactions, giving more market power to the traders (buyers). Therefore, a negative influence on the choice of farm gate sales was expected. Table 3 shows that cattle (sales) was on average the third most important income earner in the household, reflecting the importance of non-commercial motives among surveyed households.

Experience with damages (EXPDAMAGE) captures the importance of monitoring costs incurred when a farmer is trying to minimize skin and horn damages during marketing, so as to avoid potential sellers discounting the price they are willing to pay (Hobbs, 1997). Therefore, to the extent that such risks are inherently associated with auction sales (i.e. market transportation), it was expected that such experience could discourage selection of this channel. Table 3 shows that experience with such incidents was minimal among surveyed households.

Trust in buyers (TRUSTBUYER) captures the opportunity costs of mobilizing producer's time and efforts against the grading and pricing information asymmetry problem between buyers and sellers. Lack of sellers' involvement during the grading and price setting process may create an incentive for the buyer to act opportunistically (Hobbs, 1997). Hence, it was expected to influence positively in the choice of farm gate sale. Information in Table 3 shows that the level of trust between farmers and buyers was considerably higher in the sample.

With regard to producer characteristics serving as control variables in the model, the volume supplied (TOTSOLD) and body condition score (BODYCOND)[1] influences the willingness of buyers to deal directly with the seller, attracted by economies of scales (Hobbs, 1997). Therefore, these variables were meant to control for the related gains in bargaining power. Age of head of the household (AGEHH) indicates the managerial capital of the farm firm, and therefore the level of internal uncertainty. Membership in OLC (OLCMEMB) is an indicator of access to social capital. It was meant to control for the overall role played by local institutions in places to minimize the incidence transaction costs in cattle marketing.

Education of the household head (EDUCATION) indicates the role played by human capital in minimizing transaction costs. As Bywaters and Mlodkowski (2012) and Pingali et al. (2005) argue, education reduces the cost of searching for information as well as the time taken to process and act on such information. Vehicle ownership (OWNVEHIC) serves as an indicator of household wealth in the model. As Fafchamps and Hill (2005) demonstrate, wealthier farmers have high opportunity cost of time, due to high income (i.e. their leisure is a normal good) and productive capitals, and this can particularly affect the effect of distance on market channel choice.

4. Results and discussions

The results of the MNL model are shown in Table 5. The correlation matrix in Table 4 shows that multicollinearity among selected independent variables was not a serious problem in the data. To test the assumption of independence of irrelevant alternative (IIA) in the MNL model, the study employed a classical procedure consisting of using a generalization of the MNL called the nested Logit model (Hausman and McFadden, 1984). Using a restricted choice set based on the deletion of AUCTION or SPECULATOR alternative, significant changes in the estimated coefficients were not observed. This result was verified using the suest-based Hausman test (Long and Freese, 2006), based on which the null hypothesis of IIA could not be rejected. These diagnostics give credence to the results of MNL model in Table 5.

Regarding information costs, the coefficient of season of sale is negative and significant for both alternative outcomes. Selling during the December festive month is associated with a 18.8% and 13.0% decrease in the probability of selling to private buyers and speculators versus selling at the auction, respectively. To the extent that the increase in demand for beef towards the end-of-year festive season induces increased number of buyers turning up at the auction and auction scheduling,

[1] Body condition score (BCS) is based on the Scottish scoring system (Lowman et al., 1976; Roche et al., 2004).

this finding suggests that selling at the auction is associated with seasonality-related market uncertainty. If a farmer is not sure about the numbers of buyers turning up at the auction barns, he/she may perceive a higher risk of uncompetitive price formation. This perception could considerably reduce his/her willingness to incur the cost of cattle transportation to the auction pens. This finding confirms the view that, by marketing cattle in different times of the year, producers reduce the effect of market seasonality and mitigate the risk of selling in a bad market (Feuz et al., 2013).

With regard to negotiation cost factors, Table 5 shows that the coefficient of distance to auction marketplace is only significant for the choice between selling to speculator or at the auction. As expected, this result suggests that as distances between the communities and auction marketplaces increases, cattle farmers selling at auctions face higher opportunity costs of time and efforts to transport cattle if they can sell directly to speculators. These findings corroborates the findings of Musemwa et al. (2007) showing that accessibility and reliability constitute major appeals for auction sales among smallholder cattle farmers.

Expectedly, the coefficient of buyer knowledge turned out to be positive and significant for marketing with speculator. As the marginal effect suggests, this variable is a major predictor of marketing with speculators in the model. Other factors remaining unchanged, *a priori* knowledge of a prospective buyer increases the probability of selling to speculator vs. selling at the auction by 17.2%. This finding suggests that relationship with speculators decreases the cost of negotiating sales. This finding indicates the extent to which farmers selling to speculators face higher negation costs. If farmers' knowledge about the buyer is based on the previous sale transactions, this finding can also portray the incidence of monitoring costs. As Dorward and Omamo (2009) document, repeated interaction is one of the mechanisms to ensure compliance in vertical coordination, as the prospect of continuing gains from future transaction may create incentives for not behaving opportunistically.

Some producer characteristics (i.e. control factors) also turn out to be significant in the model. Contrary to the *a priori* expectation, the volume supplied has a significant effect on selling at the auction versus farm gate sale. *Ceteris paribus*, adding one animal to the supply volume increases the probability of selling at the auction vs. private sales and speculator by 5.5% and 1.3%, respectively. A plausible explanation is that, since the objective of transaction cost minimization goes hand in hand with production cost minimization, channel volume is an important factor

(McNaughton, 1999). Farmers are able to spread transaction costs inherent in a market channel over the number of units sold as the channel volume increase. This constitutes the link between TCE and neoclassical microeconomics (McNaughton, 1999).

Lastly, the results show a significantly negative coefficient of farmer's age on the choice of speculator and private sale channels vs. dip tank sale. This result indicates that older and experienced farmers are not likely to sell at farm gate when they can sell to the auction. In line with the theoretical expectation, this result infers that as cattle farmers get more managerial and marketing skills through experience, they gain ability to coordinate market transaction at much lesser cost. This result therefore indicates higher cost of transaction associated with marketing at the dip tank sales.

5. Conclusion

The TCE offer key insights through which smallholder farmers' relationship to different marketing channels can be understood. Unlike the previous studies that provide descriptive, case-specific information about various transaction costs faced by smallholder ranchers in the different parts of rural South Africa, the objective of this study was to test more rigorously the hypotheses of TCE. The theoretical predictions about the effects of information, negotiation, and monitoring costs on ranchers' decision of whether to sell their cattle to private buyers, speculators, or at the auction were tested based on primary data collected from 230 farm households in 13 communities of the Okhahlamba Local Municipality.

The MNL estimation results unveiled some unique insights into cattle marketing behaviour, but generally arrived at similar conclusion with previous studies. With regard to information costs, the results suggested that market uncertainty during off-peak season push smallholder farmers to self-select out of livestock auctions. They also showed that farmers selling to speculators face considerable challenges related to low bargaining power, while those who participate in dip tank sales face higher opportunity costs of time and efforts to transport their cattle. Lastly, the results indicated that farmers spread auction-specific transaction costs over the number of units sold as the channel volume increase, and they gain the ability to coordinate market transaction at much lesser cost through experience. Overall, the incidence of transaction cost was found to be more pronounced among farmers who market their cattle with auctioneers and speculators. These findings therefore vindicates the view that private sale is the simplest form of cattle marketing in rural South Africa (Musemwa et al., 2007; Nkosi and Kirsten, 1993).

The failure to reject the TCE hypotheses has important implications for the livestock marketing policy in South Africa. The livestock extension strategists should explicitly take into account the transaction costs of marketing. The market uncertainty and higher negotiation costs associated with cattle auctioneering signify the need for exploring the feasibility of alternative types of cattle auctioneering that mitigate the transportation costs and reduce the probability of nonsale. The video auction, for example, provides an alternative option that allows larger segments of prospective buyers to participate during the auctioneering process (thus allowing the auction price to be a better reflection of the market value), while the producer obtains a "forward" price before transporting his cattle at the auction pens. This also requires concurrent efforts to improve the cattle body condition using strategies such as communal feedlots (e.g. the Custom Feeding Program in the Eastern Cape) in order to reduce the gap between farmers' expected prices and bided prices.

The incidence of negotiation and monitoring costs associated with selling to speculators requires the development of institutional environments through which market coordination and smooth enforcing mechanisms can thrive. Dynamic incentives in the form of trust-based relational exchanges offer an appropriate means for eschewing the scope of opportunism among the itinerant speculators. This consideration is even more appropriate for communities with limited access to legal recourse (Masuku et al., 2007). The custodians of the livestock extension policy will have to devise platforms such as agricultural/livestock shows and field days to facilitate the formation of bonding and bridging social capital among key industry stakeholders (farmers, speculators, auctioneers, butchers, feedlot companies etc). Moreover, the livestock extension program needs to facilitate the emergence of an effective reputation mechanism among speculators through transaction information recording and sharing.

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Tables and Figures

Table 1. Household-level cattle marketing patterns among surveyed households

Community	Number of interviewed households	Number of households per marketing channel				Total
		Auction	Private buyers	Speculators	Auction and private buyers	
Hambrook	19	4	4	0	0	8
Potchini	11	2	1	3	0	6
Woodford	15	2	2	1	0	5
Mafhefheteni	12	0	6	2	0	8
Rookdale	6	1	2	1	0	4
Nokopela	16	1	8	0	0	9
Gqomu	18	5	7	3	0	15
Gqomu-B	3	1	0	1	0	2
Mzimukulu	20	3	4	2	0	9
Intumbane	22	7	8	0	1	16
Olivia	33	4	5	3	0	12
Ogade	27	7	1	0	0	8
Moyeni	28	2	8	0	1	11
Total	230	39	56	16	2	113

Table 2. Description of cattle marketing transaction among surveyed households

Community/dip tank	Number of interviewed households	Total number of cattle heads owned	Number of cattle heads sold	Off-take rate
Hambrook	19	142	21	0.14
Potchini	11	132	14	0.10
Woodford	15	133	51	0.38
Mafhefheteni	12	178	10	0.05
Rookdale	6	56	21	0.37
Nokopela	16	159	15	0.09
Gqomu	18	325	68	0.20
Gqomu-B	3	65	8	0.12
Mzimukulu	20	264	22	0.08
Intumbane	22	353	71	0.20
Olivia	33	349	40	0.11
Ogade	27	298	20	0.06
Moyeni	28	249	47	0.18
Total	230	2703	408	0.15

Table 3. Descriptive Statistics for Independent Variables

Variable	Description	Mean	Std. Dev.	Min	Max	Expected sign
Information costs						
PRICEINFO	1= I was not aware of the prevailing market price at all; 2= I had very little information about the prevailing market price, 3= I was somehow aware of the prevailing market price; 4= I was fully aware of the prevailing market price	2.741	1.554	1	4	+/?
SEASONSALE	1 = cattle sold in December; 0 = otherwise	0.101	0.079	0	1	–
Negotiation costs						
DISTDUKUZA	Shortest road distance (km) from the community's dip-tank to the Dukuza dip tank auction (measured usingGPS devices)	20.909	13.466	0	51.8	+
KNOWBUYER	1= knew the buyer ; 0= otherwise	0.141	0.110	0	1	+
CATTLEINCRANK	The rank of income from cattle sales in the household's income portfolio	3.369	1.765	1	5	–
Monitoring costs						
EXPDAMAGE	1 = experienced bruising and horn damages during transportation and handling at the market place; 0= otherwise	0.106	0.933	0	1	+
TRUSTBUYER	0= no trust in buyers in matters of grading and pricing; 1= somehow trust buyers; 2= total trust in buyers.	1.619	0.617	0	2	+
Farmer characteristics (i.e. control variables)						
TOTSOLD	Total number of cattle heads sold since 2009	1.773	4.275	0	40	+
BODYCOND	Body condition score for sold cattle. 1=very flat, 2=flat, 3=medium, 4=round, 5=very round	3.194	1.259	1	5	+
AGEHH	Age (in years) of the head of household	57.524	12.156	28	83	–
OLCMEMB	1= membership in Okhahlamba Livestock Cooperative; 0=otherwise	0.791	0.407	0	1	–
EDUCATION	0= no education, 1=primary/adult basic education, 2=secondary, 3=matriculated, 4=tertiary	1.239	0.798	0	4	+
OWNVEHIC	1= own a vehicle; 0=otherwise	0.356	0.480	0	1	+

Note: the number of observations is n =113.

Table 4. Correlation Matrix for Independent Variables Used in the Empirical Model

	PRICE INFO	SEASON SALE	DIST DUKUZA	KNOW BUYER	CATTLE INCRANK	DAM AGE	TRUST BUYER	TOT SOLD	BODY COND	AGE HH	OLC MEMB	EDU CATION	OWN VEHIC
PRICE INFO	1.0000												
SEASON SALE	0.029	1.000											
DIST DUKUZA	-0.037	-0.105	1.000										
KNOW BUYER	-0.116	0.040	-0.059	1.000									
CATTLE INCRANK	0.118	0.038	-0.149	0.081	1.000								
DAMAGE	0.014	0.020	0.183	0.104	-0.082	1.000							
TRUST BUYER	0.019	0.058	0.043	0.043	0.025	0.119	1.000						
TOT SOLD	0.060	0.044	-0.114	0.118	0.076	0.074	0.050	1.000					
BODY COND	-0.011	0.076	-0.449	0.075	0.103	0.011	-0.038	0.014	1.000				
AGE HH	-0.122	-0.013	-0.033	-0.015	-0.124	-0.049	-0.19	-0.179	0.013	1.000			
OLC MEMB	-0.209	0.008	-0.001	0.041	0.026	-0.161	-0.032	-0.256	0.033	0.086	1.000		
EDUC ATION	0.220	0.062	-0.083	-0.111	0.063	-0.085	0.068	0.101	0.166	-0.311	0.000	1.000	
OWN VEHIC	0.051	-0.020	-0.023	-0.147	0.012	0.040	0.247	0.192	-0.078	0.076	-0.077	0.231	1.000

Table 5. Multinomial Logit Estimation Results

Reference category: AUCTION	PRIVATE			SPECULATOR		
Variable	Coefficient	Marginal Effect	p value	Coefficient	Marginal Effect	p value
Information costs						
PRICEINFO	0.182	0.035	0.598	0.051	-0.008	0.877
SEASONSALE	-0.990	-0.188	0.009	-1.576	-0.130	0.010
Negotiation costs						
DISTDUKUZA	0.003	0.007	0.737	0.049	0.006	0.068
KNOWBUYER	2.531	0.211	0.132	3.005	0.172	0.002
CATTLEINCRANK	0.102	0.010	0.554	0.181	0.024	0.391
Monitoring costs						
EXPDAMAGE	-0.750	-0.124	0.401	-1.058	-0.032	0.503
TRUSTBUYER	-0.069	-0.071	0.800	0.622	0.074	0.286
Farmer characteristics (i.e. control variables)						
TOTSOLD	-0.213	-0.055	0.001	-0.101	0.013	0.085
BODYCOND	-0.630	-0.130	0.191	-0.925	-0.033	0.202
AGEHH	-0.071	-0.009	0.049	-0.025	-0.011	0.002
OLCMEMB	-0.808	-0.121	0.256	-1.221	-0.092	0.226
EDUCATION	0.241	-0.008	0.645	0.465	0.040	0.303
OWNVEHIC	0.338	0.186	0.114	0.129	-0.053	0.887

Note: the number of observations is n=113, LR χ^2 =51.66, p> χ^2=0.003

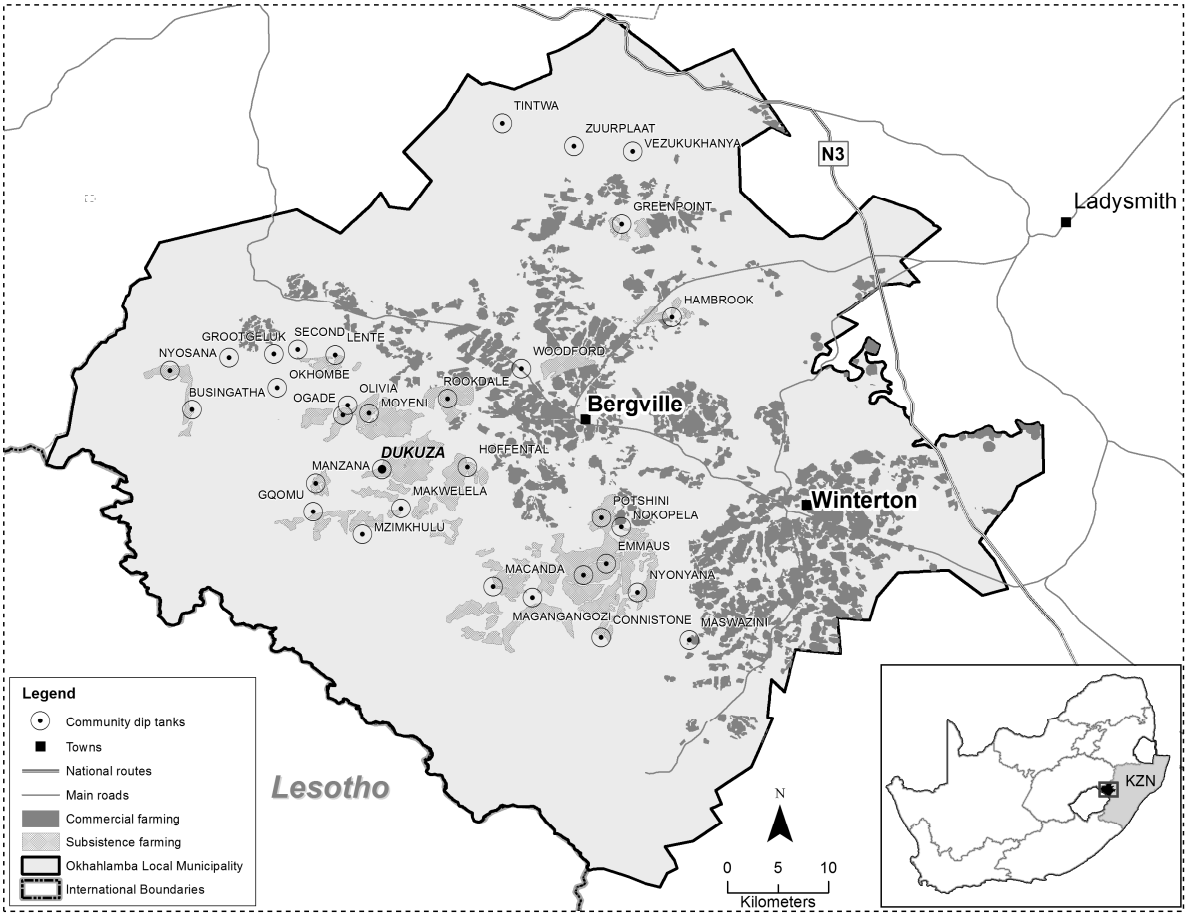

Figure 1. Land use map of the Okhahlamba Local Municipality showing dip tanks
Source: Authors - based on land cover dataset provided by the Ezemvelo KwaZulu-Natal Wildlife (http://www.bgis.sanbi.org/kzn/landcover.asp).