

Market channel choice decisions in Botswana's cattle markets

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Abstract

The purpose of this study is to analyse the downstream cattle supply chain and cattle farmers' marketing behaviour and decisions in Botswana. The study sheds some light on the existing question of why smallholder cattle farmers in Botswana make relatively little use of the Botswana meat commission livestock markets, the only entity allowed to export beef. A transaction cost approach (TCE) is applied to a survey of livestock farmers from three districts, which represent diverse agro-ecological zones of Botswana. Our analysis confirms the hypothesis that transaction costs in the form of information and search, negotiation and bargaining, and monitoring and enforcement costs play a significant role in influencing the downstream cattle supply chain and marketing behaviour of smallholder cattle farmers in Botswana. The study has potential policy implications that help policy-makers when designing policies that improve agricultural market structures and promote market participation.

Keywords: transaction costs, agricultural marketing, Botswana (JEL classification: D130, D120)

Introduction

Livestock production is the most important agricultural sector in Botswana and plays a significant role among rural livelihoods and the economy, contributing more than 80% to the agricultural gross domestic product (GDP). It is also a significant foreign exchange earner with direct linkages to domestic sectors, ranging from rural supply and urban demand of cattle to finance (Statistics Botswana 2015; van Engelen et al. 2013). Over the years, different stakeholders, including the government of Botswana, have put in place different measures in an attempt to improve the cattle industry: productivity-enhancing measures, infrastructural development and improving markets. Improvement of the livestock sector is viewed as one of the potential ways to increase rural household incomes, create sustainable jobs and investment opportunities for the rural population and drive economic diversification away from a mineral-dependent economy. Despite these policy efforts, there is evidence that beef productivity and profitability have been declining due to mismanagement and the inefficient operations of abattoirs, cattle marketing arrangements and farmers (Bahta and Baker 2015; Bahta and Malope 2014; Temoso et al. 2015). Even worse, despite the fact that Botswana beef

enjoys preferential market access in the European Union (EU), there has been a decline and stagnation in beef exports, to the extent that it has failed to fulfil its EU beef quota¹ (van Engelen et al. 2013).

Therefore, analysis of existing production and marketing structures, the role of transaction costs and existing partners is vital to understand farmers' constraints in cattle production and marketing, and expected to provide useful information on how to improve the system. However, so far most of the attention has focused mainly on the factors constraining production and farm productivity/profitability (e.g. Bahta and Malope 2014; Temoso et al. 2015) and little attempt has been made to investigate the constraints to cattle marketing in Botswana. Past studies that investigated the role of transaction costs in cattle market participation in Botswana include Nkhori (2004) and Mmopelwa and Seleka (2011). The studies found that high transaction costs, such as distance to market, market information and speed of payment, affect cattle marketing decisions (including choice of market outlets) of cattle farmers in Botswana. Producers' minimal level of sales is also associated with prevailing high transaction costs; for example, farmers often complain about inadequate animal transport, delays in issue of animal identification-related permits and slow payments (Bahta et al. 2013). However, the main drawback of such studies is that their analysis embedded transaction cost using only few proxy variables. Furthermore, these studies have neither investigated marketing outlets for cattle farmers nor examined the transaction costs associated in farmers' decision to sell their cattle in a particular marketing outlet.

Transaction costs are considered barriers to efficient participation of resource-poor smallholders in different markets (Randela et al. 2008; Woldie and Nuppenau 2009). Producers will not use a specific marketing channel when the value of using that market channel does not at least compensate the costs of doing so (Musemwa et al. 2008). In Botswana, cattle farmers who participate in the markets tend to sell their animals mainly to butcheries and the Botswana Meat Commission (BMC)². However, in recent times, more and more smallholder farmers are opting to sell to the local market rather than the BMC (Statistics Botswana 2014, 2015). This might reflect dissatisfaction by farmers with prices offered by the BMC (Jefferis 2005), and transaction costs associated with inaccessibility to markets and high costs of transport to the BMC collection points are some of the biggest challenges cattle producers in more remote areas face (Bahta and Malope 2014). The transaction costs that market channels impose on farmers are believed to affect such farmers' decisions in choosing a particular marketing channel (Woldie and Nuppenau 2009). Transaction costs are also expected to differ amongst households due to asymmetries in access to assets, market information, extension services and remunerative markets (Makhura 2001).

Our study seeks to understand what factors influence farmers' decisions to choose a cattle marketing channel. Why is market participation so low in some market channels? What are some of the transaction costs that the smallholder cattle farmers in Botswana face? Specifically, the objective of this study is to investigate the role of transaction costs in determining market participation of smallholder cattle farmers in Botswana. This study provides an empirical basis for identifying options to increase the participation of smallholders in livestock markets in Botswana. Such analysis might help policy-makers when designing policies that promote market participation and hence improve agricultural development. Improvement of markets and market access could play a crucial role in improving agricultural development and reducing poverty and food insecurity (Ouma et al. 2010). According to Barrett (2008), empirical evidence indicates that interventions directed at improving facilitation of smallholder organization, reducing the costs of intermarket trade and improving access of poorer households to improved technologies and assets are crucial to stimulating market participation and reducing poverty among smallholder farmers.

In this study, we employ a transaction cost economics (TCE) approach to a cross sectional farm-level data³ as the TCE approach allows us to explain the use of two main cattle markets by livestock farmers in Botswana. Many studies (e.g. Alene et al. 2008; Makhura 2001) have used the usual transaction cost analysis, which is tailored to understand only why some farmers are net sellers, net buyers or autarky. Departing from such an approach, the current study is

1 Under the Economic Partnership Agreement (EPA) the EU has fully opened its market of half a billion people to almost all exports (except arms and ammunition) from SADC EPA partners, free of quotas and duties. For Botswana, this means quota-free export of beef to the EU (EU 2015).

2 The BMC is a government parastatal enterprise that has monopoly rights over the purchase of cattle for export and the sale of exported beef.

3 The Smallholder Livestock Competitiveness Project is an ACIAR-funded project implemented by the International Livestock Research Institute (ILRI) in partnership with the Botswana Ministry of Agriculture's Department of Agricultural Research.

a case of net seller households that face different transaction costs when accessing various market channels. In such a situation, the decision towards selling in a particular market channel is affected by the magnitude of the transaction costs the market outlet imposes on them. It is expected that producers will not use a particular channel when the cost of using that market outweighs the value it can possibly offer. The assertion is that in the absence of institutions that govern formal exchange, opportunistic behaviour of other chain actors is expected to raise transaction costs, which in turn leads to the imperfection of the cattle market: differential market prices. Therefore, measuring transaction costs in such a market is important from a policy perspective as reducing transaction costs means increasing the links between market channel actors, increased bargaining power and improved market access (Woldie and Nuppenau 2009).

The rest of the paper is organized as follows. Section two details the materials and methods that are used to model the transaction costs. A discussion of the results follows in Section three. The paper closes with a summary of the main findings and policy implications in Section 4.

Materials and methods

There is now a vast literature dealing with both the theory and empirical implications of TCE. Both the theoretical and empirical literature acknowledges that transaction costs are detrimental for the operational efficiency of both input and output markets. Transaction costs in the form of information costs, the costs associated with the search for trading partners, physical infrastructure and the ways institutions are formed, which includes enforcement of contracts, are all likely to influence marketing and supply decisions by households.

Studies that endeavoured to measure transaction costs in various markets include, among others, Hobbs (1997), Gong et al. (2006) and Woldie and Nuppenau (2009). For instance, Hobbs (1997) used a Tobit analysis approach to measure the importance of transaction costs and their effect on vertical coordination in the UK cattle industry. He identified the relative importance of transaction costs that affect farmers' decision to sell through live-ring auction and direct to packers. Likewise, Gong et al. (2006) recognized the importance of transaction costs in the market channel choice behaviour of beef farmers in China. Using a similar approach, Woldie and Nuppenau (2009) found that transaction costs in the form of information, negotiation and monitoring and enforcement costs are prevalent and influenced market channel choice of banana farmers in Ethiopia.

Generally, farmers sell all, a proportion or none of their cattle through a particular marketing channel. As mentioned above, this study considers cattle sales to the main cattle marketing channels, the BMC and butcheries, used by livestock farmers in Botswana. The question is how such decisions are made and which factors influence the marketing behaviour of farmers and their choice of a particular cattle marketing channel. The hypothesis is that the farmers' decision of whether to sell to butcheries or the BMC is influenced by the transaction costs and household and farm characteristics. Apart from these two market outlets, other marketing outlets in Botswana include feedlots and traders, which are not considered in this study since their contribution is almost negligible. Some farmers also sell their cattle to individual buyers; however, the place of transaction is unclear as individuals could mean neighbours and the transaction could involve an exchange of animals. Thus, the cattle sold to individuals are not considered in the analysis.

A two-limit Tobit model

To test the above hypothesis, a two limit Tobit model is used as specified in Maddala (1992) and Hobbs (1997). The two limit Tobit model can be presented as:

$$y_i^* = \beta' x_i + \varepsilon_i \quad (1)$$

Where: y_i^* = Latent Variable (unobserved values for values <0 and >1) representing the potential cattle sold through butcheries; X = vector of independent transaction cost and farmer characteristics variables; B = vector of unknown

variables; and ε_i = disturbance term assumed to be independently and normally distributed with zero mean and constant variance and $i=1,2,3 \dots n$.

Denoting y_i^* (the proportion of cattle sold through butcheries where the alternative is proportion-sold through BMC) as the observed dependant (censored) variable is:

$$y_i = \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ y_i^* & \text{if } 0 < y_i^* < 1 \\ 1 & \text{if } y_i^* \geq 1 \end{cases} \quad (2)$$

In the current study, the dependent variable represents a proportion of cattle sold through butcheries and the alternative is proportion-sold through BMC. The former transactions are mostly directed by price signals at the spot, whilst the latter, despite the possibility of offering higher prices, have various requirements for beef products in terms of weight and quality due to the downstream recipients (i.e. the EU export markets).

Following Hobbs (1997) and Gong et al. (2006), we divide the transaction costs into three categories: information, negotiation and monitoring costs. Information costs are those incurred in the search for information about products, prices, inputs and buyers and sellers by firms and individuals (Gong et al. 2006). Negotiation costs are related to the physical transaction and include negotiating, and writing contracts or paying for the services of an intermediary to the transaction (Gong et al. 2006). The last category of transaction costs arises after an exchange has been negotiated. According to Gong et al. (2006), this could involve monitoring the behaviour of a supplier or buyer to ensure that the terms of the pre-agreement of the transaction are satisfied. We also include household characteristics variables that could potentially satisfy the theoretical expectations in the analysis of beef cattle marketing behaviour.

Data and study area

To address the objective of this study we use a cross-sectional farm-level survey collected in partnership between the International Livestock Research Institute (ILRI), Botswana's Ministry of Agriculture and local authorities under the auspices of the Australian Centre for International Agricultural Research (ACIAR) funded research project Competitive smallholder livestock in Botswana. The survey was carried out among livestock farmers in three districts (Southeast, Chobe and Central) of Botswana, representing diverse agro-ecological zones of the country. A multi-stage cluster (area) sampling approach (Horppila and Peltonen 1992) was used to select a sample from the population. First, the Central district (Botswana's largest district) was divided into four sub-districts to account for the differences in farming system, ecology and soil type, to form six clusters. Then, within a cluster, extension areas⁴ were randomly selected from lists of all extension areas, taking into account the general distribution of cattle in the study area. Subsequent stages involved a random selection of crushes⁵ or sample of locations, from which a number of farmers were randomly selected. The summary statistics of the data are discussed in Section 4.1 (and more details can be found in Bahta et al. (2013).

Results and discussion

Summary statistics

Table 1 presents a summary of descriptive statistics on the surveyed households. Household heads were elderly (average age is 60.64) with rather low levels of education (mean = 5.45 years of schooling). Household heads are

⁴ Extension areas are areas within districts that are classified based on delivery of agricultural extension services.

⁵ Normally the veterinary district offices keep lists of farmers by crushes. Thus, a list of farmers was provided by crushes for each extension area in the respective district/sub district.

the ones responsible for the coordination of the household activities, hence their age and education level are crucial factors in determining whether the household benefitted from the experience and knowledge of an elder person or has to base its decisions on risk-taking attitudes of younger farmers. About 85.34% of the households were male-headed, implying that female-headed households accounted for about 14.66% of the sample. Consistent with data from Statistics Botswana (2013), households tend to be small with a mean of 4.74 persons per household. Table I also indicates the farm households' access to communication and transportation facilities; about 65% and 73.28% of households owned radio and television, respectively. Surprisingly, about 91.38 % of the surveyed households had mobile phones. According to Saunders et al. (1994), some of the benefits accruing from the widespread adoption of information and communication technologies (ICTs) in developing countries include increasing knowledge of market information and improving coordination of transportation. On average, a household had access to about 8.39 ha of crop land and kept 31.84 cattle and a transport equipment worth BWP43 221.55.

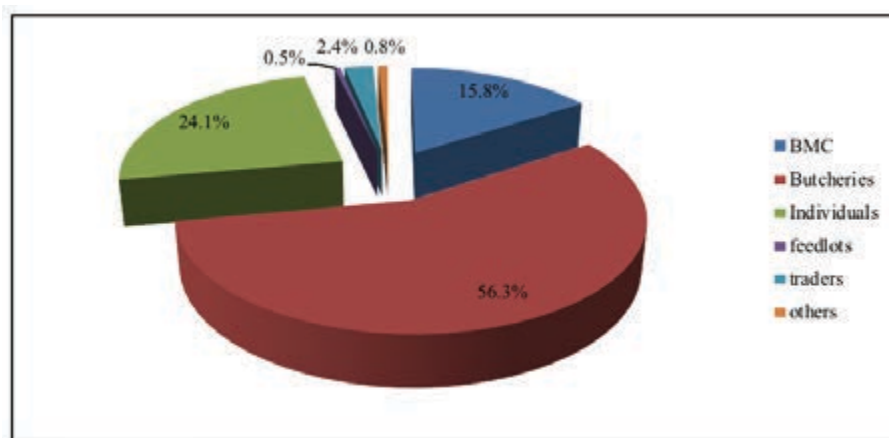
Table I. Socio-economic analysis of the farm households (N=241)

Variables	Mean	Std. Err.
Age of household head (years)	60.67	0.88
Gender (% male farmers)	85.34	0.02
Education of household head (years)	5.45	0.31
Household size	4.74	0.20
Value of transport equipment (pula)	43221.55	5995.92
Households with mobile phone (%)	91.38	0.02
Households with a TV (%)	73.28	0.03
Households with radio (%)	65.09	0.03
Value of beef cattle output (Pula per year)	11366.64	1002.42
Total crop land area (hectares)	8.39	1.32
Herd size (beef cattle equivalent ⁶)	31.84	2.80

Figure 1 depicts market channels used by the cattle farmers in the surveyed districts. About 56.3 % of the farmers sold their cattle to the butcheries, 24.1% to individual buyers and 15.8% to the BMC abattoirs, whilst the rest were sold to other markets (i.e. traders, feedlots and private slaughter slabs, retailers and supermarkets). These findings are consistent with the Statistics Botswana (2015) analysis, which shows that, compared to the 1980s, farmers in Botswana tend to sell more of their livestock to the local market than the export markets. Figure 2 shows the average cattle prices received from the market channels used by farmers. Despite most of the farmers selling their cattle to butcheries (see Figure 1), on average, the BMC offers relatively high prices (BWP 2,757.5 (Botswana pula) per adult cattle), followed by traders (BWP⁷ 2,737.5 per cattle), feedlots (BWP 2,533.33 per cattle) and butcheries (BWP 2,475.45 per cattle), respectively. Individual buyers and other market channels offered the lowest average price (BWP 2,000 per cattle).

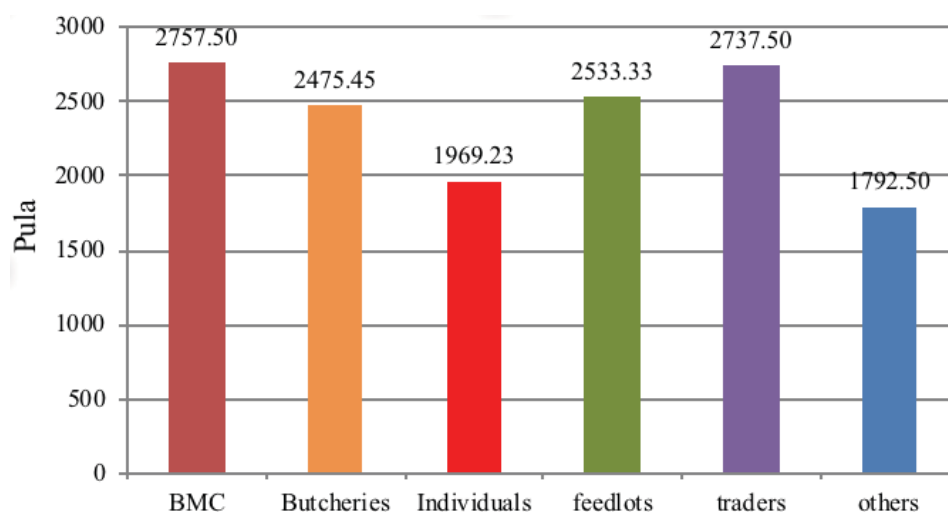
⁶ Beef cattle equivalents were computed by multiplying the number of cattle of various types by conversion factors. Following insights from discussions with the BMC, the conversion factors were calculated as the ratio of average slaughter weight of different cattle types to the average slaughter weight of a mature beef bull.

⁷ BWP is the Botswana currency with the rate to USD of BWP 1 = USD 0.1159 (First National Bank of Botswana (FNB) 2013).

Figure 1. Market channels used by cattle farmers in Botswana⁸

Based on Figures 1 and 2, we would expect a correlation between the price offered and the number of farmers selling to that market. That is, we would expect more farmers to sell their cattle to the BMC and traders than butcheries, since on average they offer better prices. However, inaccessibility to markets and high costs of transport to the BMC collection points are some of the biggest challenges that smallholder beef producers in more remote areas face (Bahta 2013; Bahta and Malope 2014). This means producers will not choose a specific market channel when the value of using that market channel does not at least compensate the costs of using it. This might explain why, despite BMC offering high prices, producers still choose markets such as butcheries (close proximity and lower transport costs, and there is a possibility for price negotiation and immediate payment, as compared to BMC abattoirs). The high transaction costs, such as negotiation costs and transport costs (distance to the market), payment delays and bargaining power that come with selling to the BMC abattoirs discourage farmers from accessing that market channel (Mmopelwa and Seleka 2011). Similarly, Bahta and Bauer (2007) have shown that among smallholder cattle producers in South Africa, distance to the market reduces market participation. Also, in order to sell to the BMC abattoirs, there are certain compliances that animals have to meet such as health status, cold dress mass (CDM), grade and other regulations that have been imposed by the EU countries (the BMC exports the majority of its produce to this market), hence high transaction costs.

Figure 2. Cattle average prices (BWP) by various buyers



⁸ Other market channels include private slaughter slabs, retailers and supermarkets.

Table 2 shows the descriptive results of information search or ex ante type of transaction costs. One aspect of information costs is related to search costs in finding market-specific information and potential buyers (Woldie and Nappenu 2009). On average about three fifths (60.58%) of the farmers in the study area had access to market information, a reason likely to be associated with a significant percentage of households having access to televisions and radios which could be their sources of market information. Table 3 also presents the length of time farmers had to wait for veterinary problems and the number of visits they received from a veterinary extension officer. Farmers had to wait for about nine days when they experienced veterinary problems, which is inconsistent with the annual number of visits they had received (average = 0.87) from a veterinary officer. As stated above, it is very common to see extension officers more preoccupied with the issuance of livestock movement permits (part of the livestock identification trading system (LITS)). This leaves extension officers with limited time for extension work such as assisting farmers in identifying diseases and curing/attending to sick animals, and introducing new technologies or organizational models for feed production and utilization. The problems of human and physical resources such as vehicles are exacerbated during foot-and-mouth disease (FMD) vaccination campaigns, during which extension officers are required to rotate between regions, leaving the extension offices unmanned.

Table 2. Transaction costs: information and search (ex ante) (N=241)

Variables	Mean	Std. Err.
Market information (%)	60.58	0.032
Length of time waiting for help with veterinary problems (days)	9.49	2.271
Number of extension visits (days)	0.87	0.054

To fulfil the EU export requirements and maintain the much-needed EU market access, the major export destination for Botswana's meat, the government of Botswana introduced the LITS that uses rumen bolus, in 1999. This was an attempt to respond to the EU Council Directive as the country could not fulfil the requirement of the Directive using the traditional branding system. The bolus system was a complete departure from the traditional 'hot iron' branding and ear tagging that have little or no deterrence to cattle thieves (van Engelen et al. 2013). The LITS identifies animals using rumen boluses with embedded RFID microchips to trace animals throughout the production chain (Bowling et al. 2008). Furthermore, each rumen bolus is coded with the owner's name, a personal identification number, the brand on the animal, the position of the brand, the sex of the animal and the hide/coat colour of the animal. The location of the animal is uploaded to an extension officers' computer and stored on the central database in Gaborone.

Table 3. Bargaining and negotiation (during transaction)

Variables	Mean	Std. Err.
Time spent looking for buyers (days)	1.50	0.044
Farmer has dedicated buyers (%)	27.39	0.029
Distance to market (km)	58.77	4.271
Membership of organization (%)	19.09	0.025
Time spent on organization of boluses (days)	11.63	3.326
Time spent administering boluses (days)	2.99	1.723
Incidence of misreading boluses (%)	31.54	0.030
Provision of information about animals sold (days)	2.15	0.791

Accordingly, cattle sales permits must be obtained from area veterinary/extension officers to verify the origin and animal health background of cattle for sale. Permits are based on electronically reading each animal's bolus which, as mentioned above, serves as the main identifier under the export traceability aspects of the animal identification system. The findings from Table 3 show that farmers had to spend between 12 and three days organizing a bolus. The long period of time that farmers have to spend organizing boluses for their animals could be due to the unavailability of boluses in the markets and shortages during insertion. This was also a conclusion reached by a study carried by Oladele and Monkhei (2009).

Moreover, farmers had to wait for three days to administer boluses to get the sales permit and about 32% reported they had experienced an incidence of misreading boluses. This is consistent with Bahta et al. (2013), who reported the absence of the veterinary officer or technical problems with bolus-reading machines, which are often a major problem that lead farmers to wait for long periods (several months' delays were reported) to get the permits. The farmers selling to the BMC market had to wait on average about two days to get information on the animals they sold. For sales outside the BMC-mediated export systems, witnessing of sales by a village chief is legally sufficient and sales are based on mutual agreement with the buyer (Bahta et al. 2013). However, this represents a lower-priced sales channel (see Figures 1 and 2) and one subject to speculative purchasing when farmers are keen to sell for climatic reasons, or when household cash flow requires it.

Table 4. Transaction costs: monitoring and enforcement (*ex-post*) (N = 241)

Variables	Mean	Std. Err.
Cattle age as buyer's main quality requirement		
• Never	120	
• Sometimes	55	
• Always	66	
Speed of payment		
• Butchery	4.85	0.566
• BMC	14	1.464
Trust in buyer		
• Non-payment by a buyer is a risk (%)	6.64	0.016
Contract or agreement with a buyer (%)	41.91	0.031

Table 4 shows the variables that reflect transaction costs with regard to monitoring and enforcement (*ex-post*). Cattle unsold due to age affected the enforcement costs, with an average of about three cattle being unsold due to this factor. For the variable that cattle age was considered to be the main quality requirement by the buyer, it was assessed whether the buyer never considered cattle age or considered it sometimes, or whether the age was always considered as the main quality requirement. Accordingly, from the 241 survey respondents who participated in the market and sold cattle, almost half (120 farmers) said cattle age was not the main quality requirement that buyers look for. Similarly, about an equal proportion, 55 farmers and 66 farmers, responded that buyers look for age of the cattle as the main quality requirement sometimes and always, respectively. Table 4 also shows that only 27.39% of the farmers who participated in cattle markets indicated that they had dedicated buyers. This is consistent with findings in Table 4 that farmers had to spend on average about a day and a half looking for a potential buyer. Farmers had to wait two weeks (about 14 days) to get paid once they had sold their cattle to the BMC. This could be one of the factors that discourage farmers who can sell their cattle to butcheries that pay during the transaction or, as reported in Table 4, with an average of four days.

Some transaction costs are implicit and difficult to observe but also play an important role in determining the method sellers select to market cattle. Such Implicit costs are related to the level of trust between an individual buyer and seller when they complete individual transactions (Bailey and Hunnicutt 2002). The trust variables that are considered for this study are related to availability of a contract or agreement during transaction and the rate or risk of non-payment by a buyer once a transaction has been made. About 41.9% of farmers reported that they had signed a contract or agreement with the buyer when selling their cattle. Consequently, only about 7% viewed non-payment by a buyer as a risk.

Econometric results

Parameter estimates of the Tobit model (equation 1) are found in Table 6 and provide some useful insights on the determinants of choice of cattle market channels. The overall result suggests that the proportion of cattle sold

through butcheries versus those sold to the BMC⁹ is influenced by transaction costs related to information and search, bargaining and negotiations, and enforcement and monitoring costs. Although computing marginal effects could give more insight into the magnitude of the effects of the statistically significant transaction cost variables on the proportion of cattle sold through butcheries, this was not possible in this study due to the presence of some zero values of the observed transaction cost and household characteristics variables.

Among the information costs variables, the coefficient of price information was found to have a negative effect on the proportion of cattle sales through the marketing channel of butcheries. It can also be interpreted as having knowledge on price information of alternative markets; thus the BMC, as it commonly disseminates market information to farmers, reduces the proportion of cattle sold through butcheries. This suggests that the greater availability of market information at the butcheries than at the BMC enables farmers to check on the spot prices they receive vis-à-vis the prevailing market prices, hence, the best price that compensates transaction costs incurred. This helps farmers not to receive prices lower than the ones they normally know, as they may decide to seek out alternative market outlets and in the future may negotiate more forcefully or try to improve the quality and presentation of their produce (Woldie and Nuppenau 2011). Information cost can also be estimated by the number of extension visits a farmer received in the past 12 months. Our results show that the variable of extension visits had a positive influence on market participation in butcheries. This implies that farmers in our study may be relying on extension officers to attain timely and reliable market price information which then increases their bargaining power during a transaction. This, with the support of well-developed price-transmission mechanisms such as radio and television which the majority of the farmers (a third of our respondents) have access to, increases their ability to discover market price information.

Table 5. Empirical results (N = 241)

Variables	MLE (Tobit)	Standard error
Farmer have price information	-0.06**	0.0285
Extension visits in the last 12 months	1.06*	0.6559
Time spent transacting: time spent looking for buyers and arranging sales	-0.04	0.5508
Adequate number of buyers	0.97	1.3123
Distance to commonly used market	-0.02***	0.0082
Membership in any farm group	-0.70	0.9433
Transaction delay: incidence of misreading of boluses	-1.81**	0.9410
Grade uncertainty: buyers look for age as a quality attribute	-1.36*	0.9014
Speed of payment	0.47***	0.2185
Trustworthiness (incidence of non-payment by buyers)	2.59**	1.3042
Existence of formal contracts	1.32	1.1710
Herd size	-0.01	0.0095
Farmer's education	-0.12	0.2343
Farmer's age	-0.01	0.0319

Negotiation costs appear to also play an important role in market selection among the cattle smallholders in Botswana. Incidence of misreading of boluses and distance to commonly used market negatively influence the proportion of cattle sold to the market. A long distance to the commonly used market by farmers showed a negative effect on the proportion of sales through butcheries. These commonly used markets are usually where the butcheries and BMC buy cattle after they have gone through all inspections by the veterinary officials and police officers certifying cattle ownership. The animal identification-related issues are also found to significantly increase transaction costs in participating in markets, particularly the BMC cattle market channel. This might explain why farmers in Botswana have been opting for the butcheries rather than BMC since the latter imposes more quality requirements.

⁹ Although a significant number of farmers sold their cattle to individual traders, such farmers are included in the econometric analysis only if they sold their cattle to butcheries or the BMC.

With regard to monitoring and enforcement costs, speed of payment and incidence of non-payment by buyers had a positive influence on market participation. Accordingly, the coefficients of speed of payment and incidence of non-payment by buyers (trustworthiness) increased the cattle transactions through butcheries. This implies that farmers incurred fewer monitoring and enforcement transaction costs when selling to the butcheries than to the BMC. As mentioned above, farmers had to wait two weeks to get paid once they had made transaction to the BMC. Payments from the BMC sometimes go beyond two weeks when financial circumstances do not allow farmers to be paid within the scheduled time. This could be one of the factors that discourage farmers from selling their cattle to the BMC, particularly at times when farmers are desperately looking for money to cover their household expenses.

Grade uncertainty (i.e. the risk that cattle sold directly to the BMC may not grade as expected) negatively influences proportion of cattle transactions through butcheries. This is consistent with the findings of Bahta et al. (2013), who identified the factors which lead farmers to access distant markets in search of better prices as lack of awareness and information about the quality requirements of markets such as the BMC. This also leads to the reluctance of farmers to sell young animals or weaners when BMC agents collect animals from farms.

The three household characteristics variables—herd size, level of education and age – do not have a significant effect on market channel participation. All three variables have negative coefficients, which suggests that a one-unit increase in each of the variables would have a negative effect on the butcheries market channel. For example, a one-unit increase in herd size is expected to decrease the proportion sold through butcheries by 1%. There would be a corresponding increase in proportion sold to farmers' participation in the BMC market channel.

Conclusion and implications

This study has attempted to analyse the downstream cattle supply chain and cattle farmers' marketing behaviour and decisions by employing TCE. The application of the TCE approach allowed us to explain the factors that influence the downstream cattle supply chain and marketing decisions by analysing cattle sales to butcheries and the BMC, the two main cattle markets used by livestock farmers in Botswana. Market participation decisions and transaction costs are found to be interrelated. Our empirical results shed some light on the existing question of why smallholder cattle farmers in Botswana make relatively little use of BMC livestock markets (the only entity allowed to export beef).

Our analysis confirms the hypothesis that transaction costs play a significant role in influencing the marketing behaviour of smallholder cattle farmers in Botswana. The results suggest that availability of market or price information reduces, while extension visits increase, the proportion of cattle sales through butcheries. This might be helped by the fact that farmers attain timely and reliable market price information from extension officers and the information disseminated via such means as radio and television, which a majority of the farmers (one third of our respondents) have access to. The implications of these results are that the institutions that attempt to reduce information costs may have to provide farmers with price information of other alternative market channels. This then increases their ability to discover market price information and negotiate better. Furthermore, the study confirms that the marketing environment does still impose a number of negotiation and bargaining costs, especially transaction delays, distance to the nearest market and monitoring costs (grade uncertainty) on farmers.

The negotiation, bargaining and monitoring and enforcement costs may prove more difficult to change; therefore, particular measures should be directed to addressing these transaction costs. To reduce the monitoring and enforcement costs, the BMC may consider fast-tracking payments to farmers, which in the long term may boost the trust between farmers and the BMC. Improvement of vertical integration between the two sectors will go a long way in helping Botswana efficiently use the lucrative EU market. Government policies that minimize the transaction costs of trading between cattle farmers and the BMC would also be very important in increasing market participation in that channel and improving the downstream cattle supply chain targeted for export, which is well known for its high supply fluctuations.

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