Determinants of Livestock Prices in Ethiopian Pastoral Livestock Markets: Implications for Pastoral Marketing Strategies

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Abstract

The major objective of this paper is to identify determinants of market prices for cattle, sheep and goat in the export market value chain starting from pastoral markets to export abattoirs and live animal exporters. The study is based on the information generated through a formal survey conducted in the major pastoral livestock markets of Ethiopia with 128 collectors, small and big traders, feedlot operators, live animal and meat exporters. Hedonic price formation model was used to analyze the survey data. This study identified certain occasions such as Christian fasting, Muslim fasting, holidays and other times; time of a situation whether that specific month falls during ban time or not and season described as wet or dry season as important determinants of livestock price formation. Age group and body condition of the traded animals, buyer and seller types are also important observable attributes influencing formation of livestock prices.

Key Words: Livestock, price formation, hedonic model

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1. Introduction

Following the adoption of economic liberalization policies in early 90s and the better access to the international markets, the socio-economic situation of the livestock industry in Ethiopia has changed considerably. This is because markets for agricultural products are rapidly changing in the world with different market participants expanding rapidly and changing consumption behavior in many developing and developed countries towards high value agricultural products due to rising per capita income, migration, urbanization and globalization. These markets demand higher quality products with consistent supply which are largely available by large scale producers and processors and importers. In the face of this challenge, the government of Ethiopia has embarked on a policy of promotion and strong participation of the private sector in the livestock industry which in turn is expected to promote food security and foreign earnings from the sector.

To improve the competitiveness of live animals and meat export from Ethiopia, cost-effective marketing channels and coordinated supply chains which reduce the transaction costs among different actors along the supply chain are crucial. This will require not only the competitiveness of individual firms but also improving the efficiency of all its elements from production, to processing, handling, distribution, and marketing. However, there is little evidence for growing interests of strategic production of livestock for marketing. Information on economic aspects of livestock marketing, performance and structural characteristics of the market and competitive behavior of actors in the market chain is highly scanty. The central point in this process is to understand what factors determine formation of livestock prices. A focus on prices is important as prices are an important measure of livestock market performance and efficiency, an indicator of producer incentives and a basis of government revenues from livestock market related services (Jabbar and Ayele, 2003). Knowledge of these factors helps in developing strategies targeting development interventions that will enable improvement of the proportion of the total price of livestock that reaches pastoralists to motivate them for production of better quality animals and their marketing behavior. Understanding price formation allows insight into these issues, and also provides information critical for forecasting future trends. However, there has been very limited empirical information on determinants of market prices of livestock in Ethiopia. Only a few studies have been undertaken on the issue after Ethiopia's market

liberalization (Kebede and Brokken 1993; Getachew, 2002; Tilahun, 2004; Teressa, 2006) and most of these studies focused on highland livestock markets. The current knowledge on livestock pricing is poor and inadequate for designing pricing procedures, policies and institutions meant to improve the livestock marketing system (Solomon et al., 2003). In order to bridge this gap, this work is carried out in the major pastoral livestock markets of Ethiopia to empirically investigate formation of livestock market prices in the supply value chain of the meat and live animal export market of the country. The major objective of this paper is to identify determinants of market prices for cattle, sheep and goat in the export market value chain starting from pastoral markets to export abattoirs and live animal exporters.

This paper is organized into four parts. The first part provides the background of the paper and the second part is about the methodology used in data collection and analysis. The third part explains the results of the data analysis while the fourth part of the paper provides conclusions and implications of the paper for both policy and development interventions.

2. Methodology

2.1. Data and approach to market study

This paper is based on the information sourced through formal survey carried out in major pastoral livestock markets of Ethiopia, Borena (Harobeke, Yabello, Dubuluq, Moyale, and Negelle), Bale lowlands (Gindhir, Goro, and Melka Oda), East Harerge(Miesso) and Metahara. In each of the sample markets data was collected form livestock collectors, traders, feed lot operators, live animal exporters, and export abattoirs during September to December, 2007. During the trader survey, one hundred and twenty eight traders were interviewed. Forty eight of them composed of collectors, cooperatives and farmer groups were from the primary markets, and fifty nine traders containing small and big traders and frontier purchasing agent from the secondary markets. In addition to this, twenty two traders from the tertiary markets including feedlot operators, export abattoirs and live animal exporters were also surveyed.

2.2. Analytical model

It is generally hypothesized that any good is valued for its utility generating attributes where purchasers evaluate product quality attributes when making a purchase decision (Rosen, 1974). Hence, the observed market price is the sum of the implicit prices paid for each quality attributes. However, in most empirical studies, the observed price may reflect not only consumer preferences but also attributes of buyers and sellers (Parker and Zilberman, 1993; Gezahegn et al., 2006). Therefore, the market price of different types of livestock is the sum of the prices purchasers are willing to pay for each characteristic that enhances utility and the characteristics of markets, sellers and buyers.

For this study, an implicit or hedonic price model based on Analysis of Covariance (AnCov) is used to relate the observed price of livestock to the quality parameters and the characteristics of markets, sellers and buyers. The hedonic price function for different type of livestock can be described as a function of qualitative and quantitative variables as:

$$P = \boldsymbol{f}(X, Z) + e;$$

where, P is the observed price of livestock

X is the set of discrete (qualitative) factors

Z is a set of covariates (quantitative factors)

e is the error term

The STATA 10 Analysis of covariance procedure was used to estimate the regression parameters. The hedonic price function is defined only for positive values of price (P), which is quite all right as livestock prices are always positive. When all the attributes of livestock are absent, one expects purchaser not to pay anything for it. Hence, the regression is estimated with a zero intercept term. In this format, the coefficient of the covariates represents a constant percentage change in value of P due to a unit change in the value of Z. On the other hand, the estimated parameters of the qualitative characteristics measure the impact of the presence or absence of the attribute. After adjusting for the effects of all other factors and covariates, the model hence estimated the price differences between categories with in a factor.

3. Results and Discussion

The summary statistics of the variables used in the shoat and cattle price formation model are provided in Table 1. Of the 2,823 recorded shoat transactions used in the hedonic price formation model, 1,246 were sheep and 1,577 were goat. There were 1,511 recorded transactions of cattle in the model. Four types of models are fitted: pooled model for entire shoat, and specific models each for sheep, goat, and cattle. Initially, the entire sample of shoat transactions was analyzed using sheep and goat as a factor, and significant price differences were observed between sheep and goat. However, because certain attributes of the two (sheep and goat) are quite different where their effects could not be properly captured in the overall equation, separate regressions were estimated for sheep and goat. From the graph of the monthly nominal price data (Figures 1 and 2), it can be observed that during a given year, there were peaks and troughs with different amplitude in shoat and cattle price oscillations.

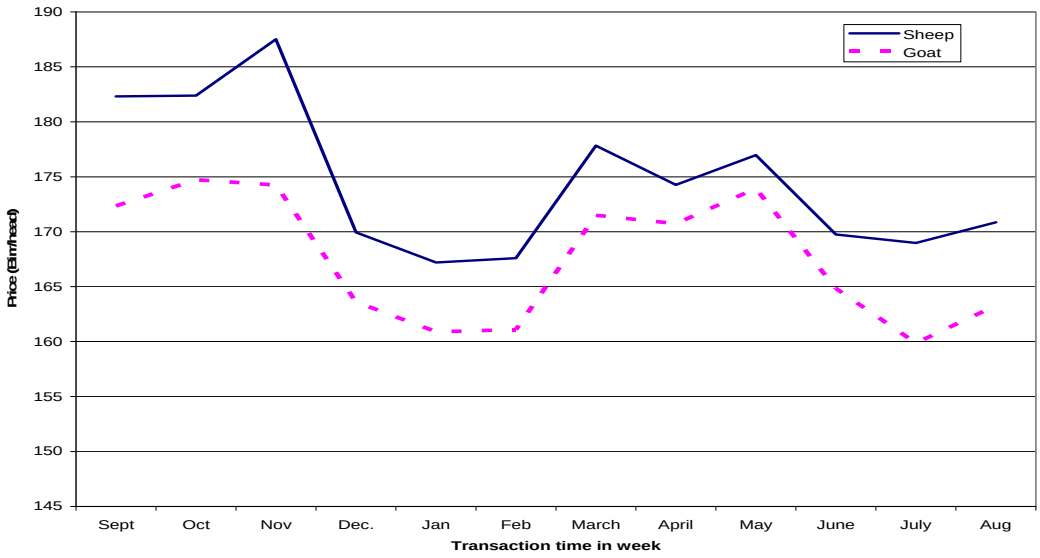

Figure 1: Average monthly nominal price of sheep and goat, 2006/07
Source: Own survey

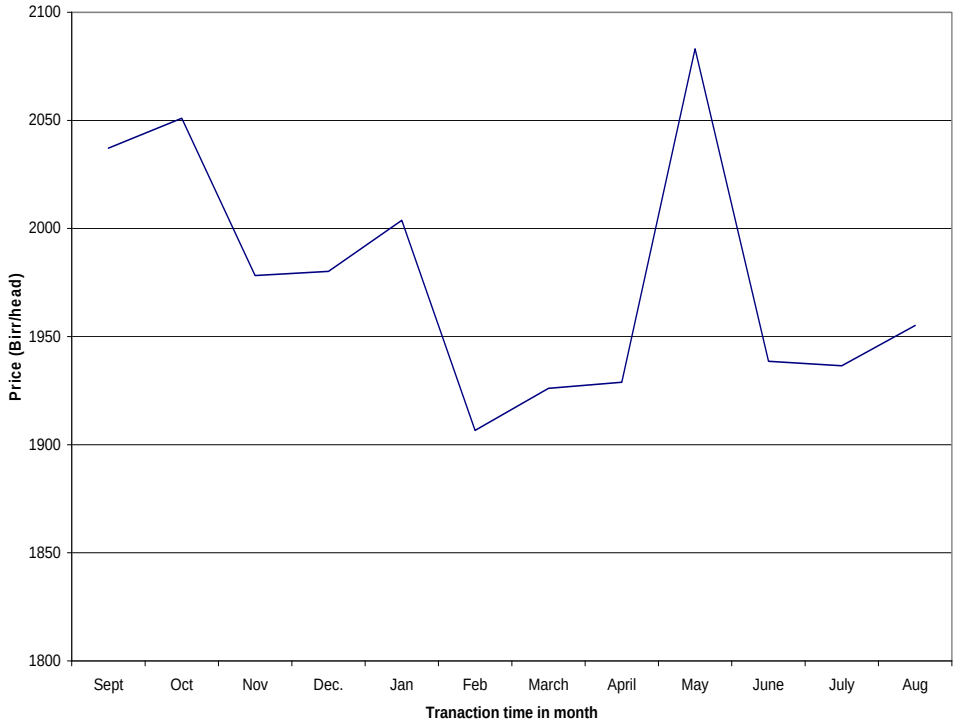

Figure 2: Average monthly nominal price of cattle, 2006/07

Source: Own survey

Prices usually build up toward a peak or down (Figures 1 and 2) based on the influence of different factors. In this paper, factors influencing the formation of livestock prices are classified into two major categories, attributes related to market actors and those related to animal condition and factors influencing them. The effect of these attributes in the formation of prices for sheep, goat, and cattle is analyzed using a hedonic price formation model and the result is presented in Table 2. As indicated in the Table, the explanatory power of the models was relatively good for the pooled shoat as a whole and separately for sheep, goat, and cattle. The pooled model for shoat and cattle show that about 55% and 65% of shoat and cattle price variation, respectively, explained by the respective model variables. The resulting coefficients generally had the expected signs and in fact the F-statistics were quite high and significant for all the models. The combination of the above measures suggests goodness of fit of the models where price variation in case of sheep, goat and cattle were explained by the variables specified in the respective models.

Table 1: Determinants of sheep, goat and cattle prices

Factors and covariate		Shoat						cattle	
		Overall		Sheep		Goat			
		Price margin.	Std. Err.	Price margin.	Std. Err.	Price margin.	Std. Err.	Price margin.	Std. Err.
Constant		205.33	11.44***	171.1	13.79***	253.37	9.34***	2760.53	124.00**
Factors									
Buyer	Export abattoirs	0		0		0			
	Live animal exporter							0	
	Purchasing agent	4.36	5.71	-71.24	8.74***	-27.24	7.26***	-146.72	86.18*
	Coop	-32.35	6.25***	-20.5	9.51**	-55.56	7.93***	-858.62	85.91***
	Collector	1.14	6.42	-58.25	9.78***	-25.33	8.12***	-388.59	65.25***
	Small traders	-21.18	5.79***	-34.35	8.79***	-47.7	7.35***	-433.61	60.70***
	Big trader	-12.14	5.47**	-44.99	8.48***	-37.32	6.86***	-290.53	55.36***
	Live animal exporter	-20.11	7.37***	-3.63	10.03	-36.84	10.92***	0	
	Feed lot operators	0		0		0		-261.36	53.11***
Occasions	Christian fasting	-1.12	2.28	-3.62	3.38	-0.1	2.88	11.34	137.45
	Muslim fasting	11.26	5.79**	10.49	9.52	9.98	6.86	38.44	37.31
	Holidays	1.83	2.68	3.57	3.92	1.45	3.42	-33.56	31.77
Situation	Normal time	0		0		0		0	
	Ban time	-12.79	1.59***	-13	2.34***	-10.28	2.02***	-98.88	38.13***
Season	Wet season	0		0		0		0	
	Dry season	-6.48	1.48***	-8.54	2.19***	-5.67	1.89***	-85.52	21.62***
Year bought	2007	0		0		0		0	
	2006	-30.09	3.22***	-28.12	5.24***	-30.66	3.84***	-368.76	58.50***
Age group	Immature							0	
	Mature	71.04	2.00***	92.04	3.27***	66.67	2.48***	1298.83	68.99***
	Young	0		0		0		618.73	68.64***
Body condition	Thin	0		0				0	
	Moderate	28.75	9.20***	12.86	9.75	0		45.25	50.4
	Fat	52.02	9.36***	66.3	9.76***	7.44	3.74**	192.19	63.66***
Sellers	Feed lot operators							0	
	Pastoralist	5.16	5	-11.93	7.47	17.58	6.42***	-1084.81	76.92***
	Collector	6.57	4.82	-8.88	7.21	19.35	6.21***	-1112.73	77.84***
	Small trader	-0.31	3.63	-12.6	6.15**	4.81	4.3	-1151.51	71.81***
	Big trader	0		0		0		-830.6	72.65***
	Cooperatives	-17.73	3.75***	-32.64	6.17***	-10.73	4.45**		
	Purchasing agent	6.2	5.38	11.08	7.43	8.35	7.73		

*** p<0.01, **p<0.05 and *p<0.1

Table 1: Determinants of sheep, goat and cattle prices…continued.

Factors and covariate		Shoat						cattle	
		Overall		Sheep		Goat			
		Price margin.	Std. Err.	Price margin.	Std. Err.	Price margin.	Std. Err.	Price margin.	Std. Err.
Access to market information	No	0		0		0		0	
	Yes	-6.17	2.29***	-1.86	3.29	-9.71	2.97***	-189.87	46.21***
Relationship	Friend/acquaintance	0		0		0		0	
	No relation	-41.1	3.88***	-37.82	5.42***	-40.75	5.21***	-24.79	39.18
Transaction frequency	Long standing customer	0		0		0		0	
	New customer	4.99	2.07**	-1.77	2.86	10.03	2.87***	-68.98	30.14**
Mode of payments	Credit/advance	0		0		0		0	
	Cash	-10.46	2.89***	-5.98	4.35	-14.34	3.66***	-12.97	31.74*
Covariate	No. of source markets	-2.26	0.40***	-0.73	0.59	-3.48	0.51***	-29.34	8.03***
R^2		0.5547		0.6108		0.5691		0.6538	
Adjusted R^2		0.5506		0.6028		0.5624		0.6479	
F-statistic		133.98***		76.59***		85.41***		112.16***	

*** p<0.01, **p<0.05 and *p<0.1

Discussions on determinates of livestock market prices in the following sections of the paper are based on the results displayed in this Table.

3.1. Attributes related to market actors as determinants of price formation

Buyer type

Shoat for export markets are mainly exported through export abattoirs and these actors get supplies from other market participants. Therefore, export abattoirs are used as the base for comparison of prices for other market actors since prices would be expected to be lower in other market actors at least to the assumption of marketing margin and transaction costs between export abattoirs and each of other market players. Other things being equal, for both sheep and goat, export abattoirs paid significantly higher prices compared to other market actors in the supply chains. Live shoat exporters paid lower prices but the differences were not significant in case of sheep. In case of cattle the important actors involved in live cattle exports are

cooperatives, collectors, small traders, big traders, feed lot operators and exporters with their agents. However, live animal exporters are relatively considered as end market actors in the in-country value chain. Therefore, live cattle exporters are taken as base for comparison of prices among these participants. The result indicated that, other things being equal, prices paid by the different type of traders involved in the supply chain is significantly lower compared to prices paid by the live cattle exporters.

Type of Livestock Sellers

The regression model has tested how prices might vary depending on the type of livestock sellers. After controlling other factors, the result shows that significantly lower prices are offered by cooperatives and small traders in case of sheep; cooperatives and collectors in case of goat; and pastoralist, collectors, small and big traders in case of cattle. The lower price offered by cooperatives in shoat markets seem to contradict with the principles of cooperatives to protect the interest of its members and stabilize market prices. However, this result shows the problems related to members organized as cooperatives of pastoralists in pastoral areas. Though their name indicates that they are pastoralists and government support is rendered with this assumption, most of the multipurpose livestock trading cooperatives are organizations of petty traders of livestock. These group of people are dwellers of small urban centers around pastoral areas and they are organized in cooperatives to get more bargaining power to negotiate prices both with pastoralists and their buyers.

Buyer's Access to Market Information

Access to domestic market information is very important for setting prices in livestock markets. Since the market information system is not well developed in pastoral areas, information kept as secret in order to make use of the ignorance of competitors and sellers as an advantage. Of the total shoat and cattle transactions, 66% and 80% respectively were transacted by those who have access to domestic market information. Along this the result indicated that traders who have access to information about the domestic market paid significantly lower prices in both shoat and cattle markets than those who don't have any.

Occasions

Occasion refer to whether the transactions take place during Christian or Muslim fasting, periods of festivals, and normal time of the year. As expected, the model result shows reverse in price pattern during Christian and Muslim fasting times in which prices are highest during the later. This is attributed to the high meat demand in Middle East countries during Muslim fasting times. The depressed price during Christian fating periods is because of the lent in which followers are restricted from animal products. Though prices are higher during holiday festivals, it does not have international implication as that of the rises during the Muslim fasting periods. The highest prices are observed when Ramadan fasting overlaps with wet seasons of the year.

Number of markets operated

Price competitiveness is particularly important to the export market. The study found that traders spent relatively lower prices if they operate and sourced the livestock from larger number of markets. This may show that as the number of source markets for livestock increases, the average price is significantly reduced, particularly for goats and cattle.

Mode of payment

In current livestock marketing system, one serious problem that is negatively affecting the functioning of the livestock supply is transaction of livestock among the different actors in the supply chain in credit contract where the terms are not usually respected in due time. There are cases where complete defaulting might happen causing the death of business as a consequence. It might be in this regard that mode of payments is considered as an important factor for determining price of livestock. As hypothesized, the results of the regression model confirm the fact that there is a significant price penalty for transaction carried out in credit terms than those operated in cash. Prices are higher for credit transaction than cash payment.

Relationships between buyers and sellers

About 95% of shoat and 88% of cattle transactions were carried out with traders having no relationship with the sellers; while the remaining 5 and 12% of shoat and cattle transaction were managed through acquaintance and friendship. The model result shows that prices are relatively lower when buyers and sellers do not have any prior friendship or acquaintances. This is because of the softness (Shyness) that buyers feel to strongly negotiate with a person whom they have some sort of social relation in order to maintain their loyalty.

Transaction Frequency

About 60% of shoat and 27% of cattle transactions were handled by traders having longstanding customers. The balances were transacted with new customers, indicating the relatively good impersonal nature of cattle markets relative to the shoat market. Other things being equal, prices are significantly lower in those transactions carried out with new customers compared to transactions made with longstanding relationship. This may be an incentive approach to attract new customers and begin to establish relationship and develop trusted contracts.

3.2. Attributes related to animal condition and factors influencing them

Body Condition

The regression model also confirms the strong positive association between body condition and price in all sheep, goat and cattle markets. The results of the price formation models indicated that buyers paid significantly higher premium for shoat and cattle with excellent body condition. The effect of dry season on prices due to its impact on supply and quality might indicate the potential to benefit from higher prices through temporal arbitrage using waiting grounds with due emphasis together the complementarities of feeds and water.

Age group

Prices are highest for matured animals for all the three types of animals (sheep, goat, and cattle) relative to the immature and young. This is associated with the live weight of animals which is the major criteria considered by export abattoirs for sheep and goat. Young and immature animals can not attain the required live weight (15-30 kg in most of the cases). For cattle, it is related to the feed conversion capacity of animals at this age. Feedlots and live animal exporters need good finishers that would attain the required live weight with in a very short time needed for quarantine procedure. Thus, mature animals fetch higher prices compared to the other two categories.

Seasons

The seasonal patterns in availability of livestock significantly affect the local prices. In our model such patterns were captured using different factors with different categories, representing the supply and demand effects. In the regression model, the wet season corresponds to the rainy season having relatively enough supply of feed to the livestock; the dry season to the contrary is the situation where there is shortage of feed and water and the time where producers are forced to take their livestock to the market. The result shows a clear pattern of decreasing prices as one move away from the wet season. Compared to the wet season, both shoat and cattle prices are significantly lower during the dry season. These price differences might be expected due to supply feature where shortage of feed and water force producer to sell their livestock in dry seasons. This might increase the supply of livestock in the market; and quality factors where the problem of feed and water might also be associated with the body condition of the animal.

Year of transaction

One important market trend observed in livestock market is that both shoat and cattle prices have increased continuously during the last few years. This was captured using the year the livestock traded as a factor to compare the prevailing prices during the different years. Hence, compared to

the price of livestock during the year 2007, and keeping other factors constant, the price of sheep, goat and cattle were significantly lower during the previous years, 2006. This was quite logical in that the global food prices are dramatically increasing in general and the demand for meat and its associated prices in particular are showing the same trend.

Import Bans by major importing countries

The seasonal pattern associated with demand effects could also be explained by the imposition of import ban on meat and live animals by major importing countries due to various reasons. The model clearly shows the price fall in a situation where there is an import ban as compared to the normal time. Assuming other attributes being controlled, the price of sheep, goat and cattle are significantly lower during banning time compared to prices that prevailed during the normal times.

4. Conclusions and Implications

Prices usually build up toward a peak or down to a certain occasion such as Christian fasting, Muslim fasting, holidays and other times; time of a situation whether that specific month falls during ban time or not and season described as wet or dry season. Age group and body condition of the traded animals are important observable attributes of the animal reflected in the observed price.

Though pastoral livestock traders cooperatives are established to protect the interest of their members, price of livestock was fund to be lower when producers sell their animals to cooperatives. This is basically because of the composition of members most of which are petty traders than producers. Thus, due care should be taken when establishing pastoral cooperatives in order to boost the proportion of final livestock prices obtained by producers and motivate them for improvements in their production system.

A significant influence of seasons is another issue needing due attention. Livestock prices are depressed during dry seasons as compared to the wet seasons. This is because pastoralists can

not feed them during these seasons due to lack of forage conservation systems in these areas. Thus, the extension system should teach pastoralists to conserve the available feed resources to use them in dry seasons.

Livestock prices are highest during Muslim fasting periods relative to other occasions. There is a need to aware producers to target their breeding and feeding practices to such important times when they can get rewarding prices for their animals. Body condition and age of animals are important factors affecting livestock prices. Thus, there should be a proper market information system that updates producers with these requirements so that they will try to tune their marketing activities accordingly.

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