

# **Marketing Channel Selection by Cattle Farmers in China: A Transaction Cost Approach\***

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## **Introduction**

Fundamental changes are underway in China's food industry, changes that are altering traditional marketing relationships linking farmers, processors, retailers, wholesalers and consumers. Today's consumer, who demands an ever-widening variety of healthy, safe and conveniently prepared food, together with new available technology is driving the changes in the food market. Thus, the development of marketing ventures in the agri-food chain is a response to the changes. Such market organisations are between the extremes of open market trading and complete vertical integration.

An important feature of China's beef cattle industry has been the emergence of the partnership between abattoirs, restaurants and supermarkets. In recent years these partnerships have extended further up the supply chain to include producers and breeders. Though these partnerships account for a small proportion of beef production (roughly 15%), the momentum behind them is gathering and there is a growing acceptance that the partnership will develop in the long term.

Beef producers in China often have a number of marketing channels available when selling slaughter cattle. Typically, these include using a spot market, going directly to an abattoir, or going through a dealer. Farmers can choose to sell all, a proportion, or none of their cattle through any one of these channels. This case study aims to illustrate the factors that influence cattle farmers' marketing channel selection. It explains the reasons behind a shift from spot market to direct marketing.

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## Overview of the cattle beef industry in China

The majority of beef is produced in the provinces of *Henan* (1,008,000 tonnes), *Shandong* (807,000 tonnes), *Hebei* (869,000 tonnes), *Jilin* (510,000 tonnes) and *Anhui* (330,000 tonnes)<sup>5</sup>, with smaller production in the Southwestern region and the Northwestern region (Ministry of Agriculture 2006). Given China's large landmass, this means that the industry is widely dispersed and faced with problems associated with low density for product collection and long transportation distances.

The highest demand for beef arises from ethnic groups of the *Hui* (Muslim) religion and other minor ethnic religions. Accordingly, retail markets for beef are located in the major metropolitan centres (*Beijing, Shanghai and Guangzhou*). In these centres, there are significant dwelling with the *Hui* residents.

The number of slaughter cattle is measured as the number that are moved out-of-stock, which was 52.88 million in 2005. The beef of China used to be processed at traditional handwork sites, then state-owned and collectively-owned processing companies developed in the 1980s. Later, with the collapse and restructure of the state-owned processing companies, modern processing companies were built to meet the high quality requirements for meat. However, Chinese meat slaughter technology is still generally between traditional handwork and semi-mechanization. Based on data from the Chinese Meat Association, Deng (2004) showed that among the large-scale 2,500 abattoirs, only 15 are modern. Others even hold that the ratio of cattle processed in traditional handwork abattoirs is about 90% (ACIDRG1997). Cattle are sold by live-weight to the spot market or via middlemen, or by dead-weight to the abattoir. Meat processed in the traditional way always incurs high concerns related to hygiene and quality. Such situations will change with the introduction of modern processing companies, which usually procure cattle by orders or contracts complying with certain quality and weight standards.

## Transaction cost economics

Many economic factors affect an industry's vertical organisation. Both Coase (1937) and Williamson (1975) examined factors affecting the organisation of production systems in a market-hierarchy framework. In such a framework, the organisational criterion is minimisation of production and transaction costs. Williamson (1975, p. 233) suggested that the use of various administered vertical exchange arrangements is motivated by transaction costs and contends that transactions do not occur in a frictionless economic environment.

Transaction cost theory incorporates the concept of a firm as germane to its analysis, which differs from neo-classical economics analysis (Grover and Malhotra 2003). There are two major differences between transaction cost economics and neo-classical

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<sup>5</sup> These five provinces provided 51.8 per cent of total beef output in 2003.

economics. First, the transaction is the basic unit of analysis. The other basic change relates to different assumptions regarding human behaviour. Instead of a fully informed, utility maximizing, strictly logical, rational human being, Williamson introduces bounded rationality and opportunism. Williamson (1975) argued that to understand how the firm works and reacts, one has to understand all the different contracts written in an attempt to mitigate the effect of incomplete knowledge in a world of bounded rationality and opportunism.

Dissatisfaction with neo-classical economics, as well as old institutional economics (i.e. the American institutionalists such as Veblen, Mitchell and Commons), has led scholars to link transaction cost economics advocate to new institutional economics (NIE). Fahlbeck (1996) argued that the fundamental difference is that NIE underlines uncertainty to a larger extent than conventional equilibrium analysis. There are costs of using the market mechanism, which include the costs of discovering what prices should be, the costs of negotiating individual contracts for each exchange transaction and the costs of accurately specifying the details of a transaction in a long-term contract (Arrow 1970). Belief that transaction costs influence the choice and design of institutions and that factors like asset specificity, uncertainty, and complexity are important determinants of the relative merits of organisational alternatives is built on sound theoretical principles that have withstood rigorous empirical scrutiny (Masten 1996).

There are many ways to investigate transaction costs. According to Clemons et al. (1993) transaction costs can generally be represented in terms of two major components: co-ordination costs and transaction risk. Co-ordination costs are the cost of exchanging information and incorporating that information into the decision process. Transaction risk includes the risk that other parties in the transaction will shirk their agreed upon responsibilities. This study largely adopts the classification based on Hobbs (1996), who divided them into three: information costs, negotiation costs, and monitoring (enforcement) costs. Information costs represent the costs in the search for information about products, prices, inputs and buyers or sellers by firms and individuals. Negotiation costs arise from the physical act of the transaction, such as negotiating and writing contracts (costs in terms of managerial expertise, the hiring of lawyers, etc.), or paying for the services of an intermediary to the transaction (such as an auctioneer or a broker). Monitoring or enforcement costs arise after an exchange has been negotiated. This may involve monitoring the quality of goods from a supplier or monitoring the behaviour of a supplier or buyer to ensure that all the pre-agreed terms of the transaction are met. Also included are the costs of legally enforcing a broken contract should the need arise.

Transaction cost theoretical advances beginning in the 1970s spurred a profusion of empirical research that continues unabated (Masten 1996). Many researchers claimed that transaction cost economics is an empirically successful story (Blois 1996; Menard and Klein 2001). “The research that must be performed to estimate the exogenous parameters and to test the theory” is underway (Masten 1996, p 44). Moreover, there are a number of case studies in the transaction cost literature. Frank

and Henderson (1992) examined the causal relationships between coordination and transaction costs in the US food manufacturing industries. The results relating the vertical coordination index to the proxies confirm the significant relationships between vertical coordination and transaction costs. Hobbs (1997) analysed the UK beef industry. She demonstrated a method for measuring the importance of transaction costs on slaughter cattle marketing between live-weight and dead-weight channels. A Tobit model was used to show that four transaction costs and three producer characteristic variables were important in influencing the producer's choice of a vertical coordination method. Sang (2003) studied the vertical coordination in China's vegetable industry. The conjoint analysis confirmed that food processors prefer dealing with larger commercial farms for lower transaction costs, while assuring food quality and safety.

Transaction cost analysis is useful, although there are some limitations. Williamson (1985, p. 390) highlights the measurement problems of transaction costs. He concludes that transaction costs can be compared between two different structures, but hardly measured. Unlike the accounting costs of production, it is difficult to measure transaction costs. Apart from that, some writers criticize Williamson's theory for its static limitations. They claim it is not useful in analysing processes or evolution, since it does not include time (Kay 1992; Langlois 1988; Noordehaven 1994; Nooteboom 1992). Much of this critique is certainly relevant, as argued by Fahlbeck (1996), but explaining and analysing the process or structural change was not the main purpose of the transaction cost theory, but instead the emphasis was on awareness of existing positive transaction costs.

## **Logit analysis: survey design**

As discussed above, measuring transaction costs is not easy, as the costs are not collected directly by public agencies or by private firms. In order to test the transaction cost based arguments related to the shift in beef/cattle marketing channels, a household survey was conducted on cattle producers using a structured questionnaire. A survey of finished cattle producers provided the primary data. The survey was conducted between January and December 2004 with 151 respondents, who were surveyed in the Inner Mongolia Autonomous region, *Anhui* province and *Shandong* province.

The general hypothesis upon which this analysis is based is that a farmer's choice of cattle marketing channel is influenced by a number of transaction cost variables, but may also be influenced by the socio-economic characteristics of the farmer or the farm.

The dependent variable in this study is the odd value of cattle marketed through market and middlemen versus selling directly to meat processors or restaurants. The former choice by producers can be regarded as the spot market channel, where

transactions are basically directed by price signals. In contrast, direct marketing involves specifying the product more tightly, because the downstream recipients (such as meat processors, retailers, and restaurants) will have various requirements for the beef/cattle products, in terms of quality or safety. From the perspective of downstream recipients, quality and safety issues are valuable, but difficult to control, if they source them from the spot market. Therefore, direct sale can be regarded as a transaction cost saving option.

The independent variables in this study may be divided into four groups (see Table 1). The first group includes *price fluctuation*, *information access*, and *quality inspection*. This group of variables reflects the information costs of cattle farmers, which are expected to be a major problem for individual cattle producers. The more time and energy spent on searching for market information, the higher the information costs. *Price fluctuation* is a 3-grade ordinal variable, reflecting the changes in transactional prices between cattle farmers and their next linkage trade partners. *Market information access* is a 5-grade ordinal variable, indicating the level of difficulty for small and individual cattle farmers to get market information. *Quality inspection* refers to testing animal health if buyers require cattle with quality specification, which is measured as a binary nominal variable.

The second group is related to negotiation costs, consisting of *payment delay*, *bargaining power*, *transport costs* and *farm specialisation*. The delay in payment occurs when cattle are sold and payment is not received simultaneously. *Payment delay* is a measure of whether there is a delay existing for farmers after they sell their cattle. As in the previous case, *Payment delay period* is a kind of negotiation cost, which is measured in terms of weeks the buyer delayed payment to the cattle farmer. An individual producer or small group of producers is likely to be at a payment delay disadvantage, when facing a meat processor who has the power to establish the price and delivery time. *Bargaining power* is a 5-grade ordinal variable, which refers to whether farmers passively accept transaction prices or negotiate against their buyers. *Transport costs* can be seen as an opportunity cost of the producer's time and effort in organising transportation, which is measured in *yuan*. *Farm specialisation* reflects the asset specificity, which is measured in terms of percentage of household incomes from cattle production.

The third group contains *grade uncertainty* and *farm service*, which can reflect monitoring costs. When selling live animals directly to processors, cattle producers may face *grade uncertainty*, which is a binary variable. Although a price is agreed upon before the cattle leave the farm, the producer's return may be lower than expected if the cattle do not grade as expected. *Farm service* refers to technological support, information assistance, farm input provision, market service, etc. provided to the producers, which is a 5-grade ordinal variable.

The last group measures producer characteristics. Data on the type of farming firm (size, profit, nature of the business, etc) and the socioeconomic characteristics of the producer (age, education, experience, household number, etc.) were collected.

**Table 1 Variable Description and Expectation**

Variable	Description	Value	Expected Sign
<b>Information costs</b>			
Price fluctuation	How large is the price fluctuation (in a typical week)?	1= Less than 10%	-
		2= 10-30%	
		3= more than 30%	
Information access	Describe how easy it is for you to get information (such as market, related policy, or new technology)?	1= Very difficult 2= Difficult 3= Medium 4= Easy 5= Very easy	-
Quality inspection	Is there a quality inspection before selling the cattle to the next linkage?	1= Yes 2= No	+
<b>Negotiation costs</b>			
Payment delay	Is there a payment delay?	1= Yes 2= No	+
Payment delay time	Time needed to get payment	time elapsed (weeks)	+
Influence on agreement	Influence on the agreement	1= Passively accepting price 2= Little bargaining power 3= Moderate bargaining power 4= Nearly equal bargaining power 5= Equally negotiating the price	-
Transportation effort	Who usually organizes transportation of your cattle?	1= Yourself 2= Dealer 3= Buyer	-
Transportation cost	Cost of transportation	Money spent ( <i>yuan</i> /head)	+
Farm specialisation	Percentage of household income from cattle	1= <10 2= 10-19 3= 20-29 4= >30	-
<b>Monitoring costs</b>			
Grade uncertainty	If concerned about grade uncertainty when selling deadweight?	1= Yes 2= No	-
Farm service	Extent of service such as technical support, information assistance, etc.	1= Very little 2= Little 3= Moderate 4= Much 5= Very much	-
<b>Social -economic characteristics</b>			

Cattle sold number	Cattle sold number, Jan.- Dec. 2004	Number	+
Ownership structure	Ownership	1= Collective 2= Household	+
Feed conversion ratio	Feed conversion ratio <sup>6</sup>	1= <1 2=1.1-2.0 3= 2.1-3.0 4= >3.1	-
Extent of investment	Investment	1= Very little 2= Little 3= Moderate 4= Heavy 5= Very heavy	-
Age of farmer	Age group	Age	?+
Size of family	Household number	Number: 1-7+	?
Education level	Level of education	Years of education	-
Raising experience	Years in cattle raising	1= <1 Year 2= 1-5 Year 3= >5 Year	?

The farmers in the survey indicated three main market channels to sell their cattle: via the spot market, via middlemen, or directly selling to processors. The first two channels could be combined as the market-price channel, where market price coordinates marketing behaviour. In contrast, in the channel of direct sale to processors, farmers will have to negotiate pre-sale contracts, either oral or written, with certain specifications such as weights and quality. The relationship between the linkages is much closer under the latter channel than the former one and is more likely a vertical integration. In this sense, the marketing channel selection by farmers could be taken as a binary choice between the spot market channel and the direct market channel to processors. Therefore, a binary Logit model can be used to analyse the determinants of beef cattle farmers' marketing channel selection. Following Pindyck and Rubinfeld (1998), the Logit model can be estimated according to Equation (1):

$$\log \frac{P_i}{1 - P_i} = O_i = \alpha + \beta_j X_i \quad (1)$$

where  $P_i$  represents the probability of the decision being chosen. We have:  $P_i = 0$  if cattle farmers choose the channel of selling directly to meat processors,  $P_i = 1$  otherwise, if cattle producers sell cattle through middlemen or the spot market,  $i = 1, 2, 3 \dots n$ .

The log of the probability ratio converts the probability value to the odds value. Therefore, the dependent variable  $O_i$  represents the odds a cattle farmer will choose marketing channel based upon various independent variables.  $X_i$  is a vector of

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<sup>6</sup> It is defined as the number of kgs of feed required to produce one kg of live-weight gain.

independent transaction cost and producer characteristics variables,  $\beta_j$  represents an unknown vector of coefficients to be estimated associated with each explanatory variable,  $\alpha$  is a constant.

This study hypothesises that the marketing channel selection decision is a function of four independent variable categories: social characteristics ( $C_i$ ), information costs ( $I_i$ ), monitor costs ( $M_i$ ), and negotiation costs ( $N_i$ ). The vector of category coefficients is represented by  $\lambda_r$ ,  $\delta_s$ ,  $\eta_t$ , and  $\theta_w$ . The error term is defined as  $\varepsilon_i$ , and  $e$  represents the base of natural logarithms. The completed Logit equation is specified in Equation (2) and estimated using a maximum likelihood procedure.

$$O_i = \frac{1}{1 + e^{-(\alpha + \lambda_r C_i + \delta_s I_i + \eta_t M_i + \theta_w N_i + \varepsilon_i)}} \quad (2)$$

## Results and discussion

Descriptive results showed that selling cattle in the spot market was still the main selection by farmers. Thirty-six per cent of surveyed farmers had sold cattle solely through the spot market, followed by 22 per cent of them who had sold via a dealer and 14 per cent of them choose selling directly to processors. Only one per cent of respondents had sold cattle directly to feedlots. The rest of farmers (27 per cent) indicated using combined channels. However, in terms of cattle numbers, only 2 per cent (225 head) of cattle were sold through the spot market, compared with 15 per cent (1540 head) sold directly to processors and feedlots. The majority were sold through mixed channels accounting for 77 per cent (7968 head) of cattle sales and through dealers there were just 6 per cent (590 head).

In the descriptive results, some values did not vary much across the farmers. These could be dropped from the regression analysis even though they are important in theoretical expectations. They are the variables: price fluctuation, grade uncertainty, farm service and cattle raising experience. The transaction cost variables included in the analysis are: information access, whether or not there is a quality inspection, payment delay and delay time after selling cattle, bargaining power when selling cattle, transport effort after cattle are sold and farm specialisation. There are a number of socio-economic variables which were expected to influence the dependent variable. They were: the level of investment in cattle, number of cattle sold, education level, feed conversion ratio, the age of owner and ownership structure. Hence, 13 transaction cost and social-economic variables were used in the initial model formulation. The SPSS (Statistical Package of Social Sciences) software program, version 14.0, was used to carry out the Logit analysis.

After applying the Logit analysis to the remaining variables, it was revealed that some were insignificant and others, in addition to being insignificant, did not have the

expected sign. These variables were also dropped from the analysis. The regression results of the Logit model are reported in Table 2. The variables included in the model are: payment delay, bargaining power and farm specialisation. The equation was selected based on expected signs and t-statistics at the 0.05 level. The overall significance of the model is measured by the Wald statistic, which follows a chi-squared distribution (with degrees of freedom as indicated). The equation was significant at the 0.001 level of significance. Therefore, the null hypothesis can be rejected for the model. This suggests that the independent variables explain a significant proportion of variation in dependent variable.

The results indicate that the channel selection of cattle sold to the direct market has a greater payment delay incurred after the sale (payment delay) and a higher degree of influence on the agreement (bargaining power) and a higher proportion of household income from cattle raising (farm specialisation). The significance level of farm specialisation was slightly worse than 0.05, but this variable was still included, as it is important in theoretical expectations.

**Table 2 Results of Logit Regression Model<sup>(a)</sup>**

	B	S.E.	Wald	Df	Sig.
Payment Delay	4.796	0.809	35.116	1	0.000
Bargaining Power	-0.904	0.405	4.985	1	0.026
Farm Specialisation	-0.545	0.281	3.760	1	0.052
Constant	-2.832	1.591	3.167	1	0.075

Log likelihood = 67.68, Chi-square = 121.857, df = 3, Sig. = 0.000, Cox and Snell R Square = 0.556.

a: Method used for Logit regression is forward stepwise and the estimation terminated at iteration number 6 because parameter estimates changed by less than 0.001.

Payment delay, bargaining power and farm specialisation are the three major determinants in the model. They are all from the group labelled negotiation costs. Payment delay measures whether farmers have to wait for a payment after the sale of cattle. Since the payments are received immediately after selling cattle to spot markets and middlemen, a payment delay of varying length will occur for farmers who sell their cattle directly to processors. The reasons for farmers choosing the latter is that selling to processors could result in better prices and a premium bonus. On the other hand, the increasing concerns about food quality and safety from consumers have pushed beef cattle processors to adopt quality control inspections. Thus, to get better returns, this has stimulated farmers to choose direct marketing to processors.

Farmers' bargaining power measures their influence on selling agreements. In the survey, farmers who chose selling directly to processors had 8.9 times larger sale herd size on average than those selling to the spot market and middlemen. The larger the herd size, the stronger the bargaining power of farmers. As farmers' bargaining power increases they will use the direct marketing channel to cattle processors, as contrasted with those who have a small number of cattle to sell and relatively low bargaining power. They tend to choose to use the spot market and middlemen.

Farm specialisation may cause specialised farmers to depend on their trading partners. From this perspective, it can be seen as a kind of specific investment made by farmers. Once a specialisation strategy is adopted, the specialised farmers face more market risks. The higher the percentage of incomes from cattle raising, the more specialised a cattle farm. This will lead to spatial monopoly and opportunistic behaviours. In order to avoid some market risks, specialised cattle farmers would choose a closer vertical coordination like selling directly to processors.

With regard to other transaction costs, they are dropped during the preliminary assessment. Three variables standing for information costs did not show much difference between the two marketing selection groups. Neither did the variables of monitoring costs. Take information costs as example, price did not fluctuate much in a week and it was quite easy for farmers to get market information, except for cattle pre-sale quality inspection which varied between the two channels. When choosing these three variables, information costs are not influential factors for farmers' marketing choices. Under the Logit model, only negotiation costs can be identified as determinants of the marketing channel selection by cattle farmers. In the future study, other models will be tried on which will make further analysis of transaction costs theory.

## **Conclusions**

This study attempts to explain why a number of beef cattle farmers are shifting from the spot market and middlemen channels to direct marketing. The basic arguments are based on the transaction cost approach. When trying to measure the effects of the transaction costs on farmers' channel selection, we have designed a series of variables to quantify them.

This analysis supports the hypothesis that transaction costs are significant in causing the changes in farmers' marketing channel selections. It also demonstrates a method by which the importance of the transaction costs can be measured.

The implications of this analysis can be seen as negotiation costs are the most important among all the transaction costs for the Chinese beef cattle industry. With more bargaining power and more specialisation in the beef cattle, more farmers may choose to sell directly to meat processors to avoid market risks, but even this will incur a payment delay. In the next study, the findings of the analyses of processors' procurement preferences will be presented with the use of transaction cost theory as well.

Based on the analysis results, the number of farmers choosing to use direct market channel can be predicted to increase as it will minimise transaction costs. With a shift to direct marketing channel will help improve the quality of product in the beef cattle supply chain; ultimately assure consumers of the safe meat products.

As the structure of the market channel changes, new challenges are created for public and private policy. There needs to be greater cooperation and sharing of information

to develop producer/processor knowledge of the costs, returns and value-adding activities. Processors have more justification in claiming a greater share of returns resulting from better quality raw materials provided by cattle producers. The key for processors is, therefore, to ensure that a series of incentives is offered for cattle farmers to keep trading with them, like the introduction of technologies such as ultrasound to increase the accuracy of predicting saleable meat yield/carcass value in live cattle (thereby reducing the negotiation cost measured on terms of time of payment delay).

Government policy can be more favourable to market institutions to minimise the transaction costs of trading between cattle farmers and processors. Programmes of farm support may be adequate for cattle farm development. As they become more specialised in beef cattle production, farmers' bargaining power will increase when dealing with processors. Furthermore, standards for dead-weight and live-weight cattle marketing may be specified so as to save transaction costs.

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