The Efficiency of Customer Relationships: An Empirical Analysis of China's Agricultural Wholesale Market

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As in most developing countries, agricultural wholesale markets in China operate under imperfect market conditions. Traders are separated and volatile, information services are unavailable or poor, and formal credit or insurance is unavailable to traders. To deal with these circumstances, some traders have developed working relationships with their customers. This paper addresses the newly established relationships between agricultural traders and their customers within China's wholesale markets. Important findings of the paper are (1) improved customer relationships lead to higher profits for traders; and (2) improved customer relationships lead traders to increase their use of variable capital, permanent labor, and temporary labor.

As the distribution system for agricultural products in China was reformed in the early 1980s agricultural wholesale markets emerged and they have grown slowly but steadily. Agricultural wholesale markets have gradually taken the place of former state-owned agricultural product enterprises and now play an important role in agricultural product distribution. Agricultural wholesale markets perform the important functions of product distribution, price discovery, information transmission, and transaction payments. Today there are more than 4000 agricultural wholesale markets in China and these markets have become an important part of the agricultural marketing system. The operation of agricultural wholesale markets has significant influence on price stability, distribution efficiency, and international competitiveness. China's wholesale market system is still in its early stages of development, with traders having limited specialization and providing varying combinations of market services. Some are engaged in services as widely dispersed as buying, bulking, crating, transporting, and resale functions. They operate individually and trade freely with suppliers and buyers, make their own management decisions, and take full responsibility for their decisions.

During the process of trade, some traders have formed relatively steady and continuous customer relationships with their suppliers and buyers. Traders purchase goods from their suppliers, perform some marketing services, and sell commodities to clients (buyers). For these transactions, long-term, steady, and exclusive market relationships are preferable to short-term profit maximization. Long-lasting reciprocal relationships are built on mutual trust, but in many cases they are further sanctioned through personal friendship, kinship, or other social bonds that complement economic interactions (Finan 1988; Fukui 1995; Wang 2005). Customer relationships are prevalent in agrarian markets, characterized as equilibrating relationships by Plattner (1983) and as *freguês* relationships by Finan (1988). Much research addresses the causes or benefits of customer relationships and argues that people develop long-term relationships to cope with imperfect market conditions (Plattner 1983; Finan 1988; Fafchamps and Minten 1998a, 1998b). If traders are successful, improved customer relationships should enhance their performance.

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This work was supported by a grant from "the 10th five-year plan" projects and key subject construction projects under "211 project" by the Ministry of Education, People's Republic of China. Helping to inform this work were two additional projects: "The Study on Auction Development Process of Trade Method in Japanese Wholesale Markets and its Application Possibility" from the Sumitomi Foundation, Japan and "A Comparative Study on Wholesale Market System in East Asia (NO.2004014)" from the Asia Research Center, Renmin University of China.

The authors recognize the important contributions of staff from School of Agricultural Economics and Rural Development, Renmin University of China, especially those of Professors Tang Zhong and Zeng Yinchu. The authors are also grateful to the following for their helpful suggestions: Professor Zheng Fengtian, Associate Professor Jin Hongyun, Chen Weiping, and Xin Yi.

Plattner (1983) studied customer–middleman relationships within a fairly informal farmers market in Missouri and found relationships to be a critical determinant of market performance. Opportunities for short-run gains are often passed up for long-run stability and continued market relationships. Middlemen (vendors) within these informal markets ostensibly have greater market power than do buyers, but vendors-buyers relationships serve to diminish vendors' use of their market power.

Moving beyond farmers markets to the integrated farm-wholesale-retail establishment, the marketing literature shows that performance of members along this supply chain is a function of established customer relationships. Indeed relationship marketing encourages enterprises to develop and maintain long-term relationships with their suppliers or clients. However, most of the research in this field has been conducted in the automobile industry (Dyer and Chu 2003; Kalwani and Narayandas 1995; Heide and Stump 1995). There is considerable difference between the automobile industry and the agricultural product market, but similar research in the agricultural supply chain is seldom conducted. The most relevant piece of research is by Duffy and Fearne (2004). These authors examined the impact of partnerships between UK retailers and fresh produce suppliers on suppliers' performance. The results provide support for the theory that partnership can help a supply firm improve its performance. In the supply chain, suppliers and clients have different bargaining power. As a result, customer relationships may affect clients' performance differently. However, the relationship between partnership and performance remains untested. This paper explores the effects of customer relationships with suppliers and clients on traders' profits. When traders do business with suppliers, they are clients, and vice versa. In this way, we can investigate the effect of customer relationships not only on suppliers but also on clients.

The remaining sections of this article are structured as follows: Section 2 provides the conceptual framework; Section 3 introduces the methodology. Section 4 describes data collection, measurement, and results; and Section V provides the conclusions.

Theoretical Framework

Wholesale markets in China lack clearly defined grades and standards, and therefore market prices for agricultural products are determined from a wide range of quality. Such a system provides few incentives for producers to supply high-quality products because all producers, including those of low-quality products, receive average market prices. Likewise, buyers seeking high-quality products have few incentives to purchase in wholesale markets because high transaction costs are associated with visibly inspecting desired purchases. To ameliorate these conditions, buyers and sellers within wholesale markets can establish trading relationships with suppliers and clients. Indeed, observed patterns within wholesale markets in China suggest that traders, suppliers, and clients have established relationships to try to lower transaction costs and improve market efficiency. In essence, high-quality suppliers seek to obtain prices commensurate with quality and traders seek to link these quality products with buyers' (clients') preferences. In the absence of clearly distinguishable grades and standards, this is best done through customer relationships among suppliers, traders, and clients.

Summarizing the findings of previous studies, the causes and benefits of customer relationships are attributable to several factors. Firstly, customer relationships have been shown to be an effective mechanism for reducing transaction costs. Transaction costs involve all the costs associated with conducting exchanges between firms, and these costs can be decomposed into ex ante transaction costs, or search and contracting costs, and ex post contracting costs, or monitoring and enforcement costs (Williamson 1985; Henart 1993; North 1990). Traders engaged in long-term relationships will not have to look repeatedly for suppliers or clients. Besides, expectations of relationship continuity help to economize on costs associated with complex contingent claims ex ante and enable the parties involved to adapt to unanticipated changes (Heide and Stump 1995; Finan 1988). Long-term relationships also facilitate contract enforcement (Minten and Fafchamps 1999). These findings are consistent with theoretical models on trust among firms in an environment with transaction costs (Dyer and Chu 2003).

Secondly, customer relationships enable traders to deal with their partners in a more trustworthy and cooperative manner by granting and receiving credit, sharing risks, and exchanging information. In developing countries, most agricultural trades take place as cash-and-carry transactions, without orders or credit (Minten and Fafchamps 1999). A general observation is that suppliers are most likely to grant credit to their steady clients. Customer relationships also promote risk-sharing between traders and their partners. Agricultural product markets are full of risks, consisting of perishable goods and therefore highly variable prices. Traders engaged in customer relationships could ask steady producers to share in potential misfortunes caused by price variation by adjusting farm prices after wholesale transactions (Finan 1988). Based on mutual trust, customer relationships will promote sharing of timely and meaningful information between partners. Finan (1988) finds that middlemen in northeast Brazil vegetable markets often provide their regular suppliers with market advice on consumer preferences. Agricultural traders in Madagascar obtained information on market conditions through personal contacts with other traders, suppliers, and clients (Minten and Fafchamps 1999). These country examples, having great relevancy for China, illustrate the fact that suppliers and clients are in different positions in the supply chain and therefore their relationships with traders are best addressed separately.

Benefits of Customer Relationship with Suppliers

Traders are hypothesized to benefit from customer relationships with suppliers. Suppliers, likewise, are expected to get steady sales from having relationships with customers and they may pass on the benefits to traders in the form of price reductions. Additionally, strong customer relationships are likely to bring traders a steady supply. Few markets offer supply information service and therefore traders have to use their own initiative to seek suppliers. This process is less difficult when agricultural products are plentiful, but very difficult during periods of short supply. Customer relationships function as an implicit agreement between suppliers and traders. Traders purchase from several selected suppliers—even when markets are oversupplied and prices are low. In return for this loyalty, the suppliers always agree to sell to the traders even during periods of short supply and high prices. During such times a competing buyer may indeed offer higher prices (Finan 1988). The outcome is that traders with long-term suppliers will get steady supply and save search and contracting costs.

Apart from the regularity in supply, relationships between suppliers and traders also help to reduce inspection costs. Quality and safety of agricultural products are sometimes hard to check and accurately assess. Quality checks involve major costs and most traders incur these costs as a necessary business expense. One advantage of doing business with regular suppliers is that inspection is often unnecessary because regular suppliers will try to ensure the quality of products for the assurance of future transactions. Not having to inspect allows traders to devote more time to other activities and thus to do more business (Fafchamps and Minten 1998b).

Cash-and-carry transactions are prevailing practices in China's agricultural markets. A recent phenomenon is that suppliers will grant credit to long-term traders who have shown credibility over time. Trade credit serves to stimulate transactions as formal credit is inaccessible for most traders. When faced with financial difficulties, traders with trade credit can continue their buying and selling business, while others might fail to survive. Those who receive credit have more working capital to work with and should, other things being equal, also be more productive and able to expand their business (Fafchamps and Minten 2002).

Price variation is one of the most notable risks in agricultural markets. Quite often, small changes in daily or weekly supplies can lead to large changes in price. Furthermore, prices are especially impacted by changes in weather conditions from one season to another. Within agricultural wholesale markets, Finan (1988) finds that middlemen try to manage price variability by encouraging their steady suppliers to share in potential misfortunes caused by price variation. To prevent large fluctuations in wholesale prices, suppliers are often asked to adjust farm prices relative to wholesale market prices. When accepted, this type of insurance serves to improve traders' performance.

Benefits of Customer Relationship with Clients

Traders perform the functions of suppliers when they do business with clients. Customer relationships will benefit clients because there is much to be gained from forming relationships that reduce risks. Traders themselves will benefit from the relationship in a similar way. Customer relationships with clients will bring traders regular sales and lower search costs as well as lower contracting costs. This is economically beneficial, especially when a market is oversupplied and products are perishable. Regular clients may demand a lower price to share the benefits, resulting in margin reductions for traders. It is possible that traders would attempt to make up price reductions by bargaining for lower supply prices from regular suppliers. Traders without regular suppliers may not suffer lower profitability, as other benefits from customer relationships could exceed potential margin losses.

Risk-sharing between suppliers and their long-term clients, as previously discussed, also functions as an insurance mechanism for suppliers. Described here is the role traders play as suppliers and the benefits that result from this mechanism. In the absence of formal insurance markets, this informal insurance mechanism enables traders to engage in high-risk, high-reward types of activities to enhance their profitability.

Customer relationships obviously facilitate contract enforcement in economies characterized by poor market institutions. These relationships enable traders to engage in more sophisticated ways of trading: forward ordering and granting credit (Minten and Fafchamps 1999). Unlike wholesale markets in Japan and some other countries, China's agricultural markets have few restrictions on traders. Some traders are short-term, often disappearing as soon as transactions are made. This means that payment default is a potential risk. But regular clients are unlikely to default because they are focused on future benefits from long-term relationships. Furthermore, regular clients have demonstrated their credibility over time. These attributes mean that traders will willingly accept regular clients' orders and/or grant them trade credit. These measures lead to enhanced transaction efficiency and more competitive traders. Those who give credit to clients are likely to enhance their ability to attract customers and compete successfully (Fafchamps and Minten 2002).

Finally, customer relationships with clients can function as an inexpensive and reliable source of information. Out of trust, regular clients will often provide traders timely and accurate information on consumer markets. Such an exchange of information speaks to the power of relationships because traders and their clients often have conflicting objectives. Hence, given knowledge about customer needs and preferences, traders are more likely to make risk-reduction decisions and promote better performance compared to their counterparts.

Methodology

At the first stage, an OLS regression is run on the performance of traders to test the effect of customer relationships. Characteristics of traders, input use and market conditions are integrated into this model. At a subsequent stage, designed to test the profitability of good management, estimation is made of the effect of technical efficiency on profitability. In general, the effect of technical efficiency on profitability is statistically significant. Of course, technical efficiency itself must be estimated before its impact on profitability is evaluated.

To measure traders' technical efficiency, an estimate is made of the stochastic frontier production function of Aigner, Lovell, and Schmidt (1977) and Jondrow et al. (1982).

The stochastic frontier production function is defined as

$$(1)\quad Y_t = F(X_t, \beta)\cdot e^{\varepsilon_t},\ (t = 1, 2, \ldots, n),$$

where Y_t is the annual sales of the t^{th} trader; X_t is a vector of inputs such as labor, equipment, and working capital; β is a vector of parameters to be estimated; and ε_t is composed of two independent error components: $\varepsilon_t = V_t - U_t$, where V_t captures the effects of random shocks outside the trader's control (observation and measurement error on the dependent variable and other statistical noise) and U_t captures the technical efficiency of the trader [$V_t \sim N(0, \sigma_v^2)$, $U_t \sim N(0, \sigma_U^2)$, $U_t \geq 0$].

The technical efficiency of the t^{th} individual trader is defined as $e^{-U_t} = \dfrac{Y_t}{F(X_t, \beta)\cdot e^{V_t}}$.

The conditional mean of U_t can be shown to be

$$(2)\quad E(U_t \mid \varepsilon_t) = \sigma^* \cdot \left[\frac{f^*(\varepsilon_t \cdot \lambda \mid \sigma)}{1 - F^*(\varepsilon_t \cdot \lambda \mid \sigma)} - \left(\frac{\varepsilon_t \cdot \lambda}{\sigma} \right) \right],$$

where f^* and F^* represent the standard normal density and the distribution function, respectively, and $\sigma^{*2} = \sigma_U^2 \cdot \sigma_V^2/\sigma^2$, $\sigma^2 = \sigma_U^2 + \sigma_V^2$, $\lambda = \sigma_U^2/\sigma_U^2 + \sigma_V^2$.

The estimation is carried out by the computer program FRONTIER Version 4.1, written by Coelli (1996). The estimates of the variances used to solve Equation 2 are derived from the maximum likelihood estimation (MLE) of Equation 1.

Data, Variables, and Results

A survey of agricultural traders was conducted in China from August to September, 2004. This survey was carried out by a project team from the School of Agricultural Economics and Rural Development, Renmin University of China. The survey covered ten provinces or municipalities. On average, five wholesale markets were drawn from each province or municipality and then 30 traders were drawn at random from each market. Hence 1500 questionnaires were mailed and 701 were returned, a response rate of 47 percent. Wholesale markets in production areas, distribution areas, and selling areas were included in the survey. Respondents included traders with many years of experience as well as those just getting started in trading. Of the 701 questionnaires received, 419 were valid, yielding a useable response rate of 59.8 percent.

Customer relationships were evaluated by asking respondents whether they have regular suppliers or regular clients. If a trader purchases from a supplier more than three times over the two-month period, the supplier is considered a regular. Similarly, if a trader sells to a client more than three times, the client is considered regular. Statistical results show that, for the 419 traders, 212 have regular suppliers, representing 50.6 percent; 197 have regular clients, representing 47 percent. Net income is used to evaluate traders' profitability. Control variables include market location, traders' age, experience, whether the market provides information, whether the trader is an association member, and whether the trader stores goods. Detailed explanations of each variable are given in Table 1.

To estimate technical efficiency, a Cobb-Douglas production frontier is used and the results for this stochastic frontier production function are shown in Table 2.

The error terms from estimating this production function are used to estimate the effect of customer relationships on the performance of traders (Table 3). As shown in the table, both the regular supplier dummy and the regular client dummy are statistically significant and positive. Other things being equal, traders with regular suppliers will have a profit rate that is 46.1 percent higher than that of their counterparts. Similarly, traders with regular clients will be 52.2 percent more profitable than those without regular clients. These results show the effects of customer relationships to be large and statistically significant. In essence, clients, traders, and suppliers benefit from improved customer relationships.

Table 3 also shows that experience, education, and technical efficiency affect profitability positively and significantly. Experience is significant at the ten percent level and the coefficient for this variable suggests that one year of experience will increase traders' profit by 3.8 percent. Education and technical efficiency are significant at the one percent level. The positive coefficient for education means that higher education enhances the profitability of traders. Technical efficiency has large positive effects on traders' profitability, although its value is not high, with a mean efficiency of 0.38 (Table 2). As revealed by the statistically insignificant coefficients, association membership and information provided have no effect on trader's profitability. Possible explanations for these statistically insignificant coefficients are that the traders' association does not function well, and that the information providing service is poor. That is, there could be little chance for communication among member traders. Simply put, the wholesale markets' information system still needs some improvement. The information provided is either untimely, inaccurate, or both. As a result, traders do not have the necessary information for decision making.

Table 4 shows the results of the estimation of customer relationships' effect on traders' input use. Neither regular suppliers nor regular clients have a statistically significant impact on fixed capital. However, regular suppliers have a positive and

Table 1. List of Variables For Estimation.

Name of variables	Description	Unit	Mean	Standard deviation
Profit	Annual gross revenue from trade business minus total sum of fixed capital cost[1], variable capital cost[2], and labor cost[3].	RMB Yuan	2922695	1402794
Regular supplier	If trader has regular supplier = 1; Otherwise = 0		0.48	0.50
Regular client	If trader has regular client = 1; Otherwise = 0		0.42	0.49
East area	If trader is in the east area of China = 1; Otherwise = 0		0.17	0.38
Middle area	If trader is in the middle area of China = 1; Otherwise = 0		0.40	0.49
Age	Trader's age	Year	38.94	9.13
Education	Never attended school = 1; Under primary school = 2; Primary school = 3; Middle school = 4; High school = 5; Junior college = 6; Some college = 7; Graduated college = 8		4.03	1.78
Experience	Years since started the business	Year	10.50	6.23
Relatives in business	Relatives do trade business separately.	Person	0.51	0.87
Association member	If trader is a market association member = 1; Otherwise = 0		0.95	0.90
Information provided	If market provides information = 1; Otherwise = 0		0.40	0.49
Goods stored	If trader stores goods = 1; Otherwise = 0		0.27	0.45
Sales	Annual gross revenue from trade business	RMB Yuan	3368968	7961223

[1] The sum of flow costs of trucks, mobile phones, and computers.
[2] Interest of credit debt.
[3] Labor cost includes all the payments for hired permanent laborers, temporary laborers, and imputed family labor costs.

Table 2. Technical Efficiency of Traders.

Variable	Estimate	t-statistic
Constant	8.64	17.89***
Ln(capital)	0.48	10.50***
Ln(permanent labor)	0.30	3.66***
Ln(temporary labor)	0.04	2.72***
Ln(equipment)	0.05	2.20**
σ^2	3.68	8.09***
λ	0.77	11.48***
Log-likelihood function	-720.77	
Mean technical efficiency	0.38	
No. of samples	419	

and * indicate significance at the five percent and one percent levels, respectively.

Table 3. Customer Relationships and Profit.

	Dependent variable ln (profit)	
Independent variables	Regression coefficient	t-statistic
Constant	8.382	9.757***
Regular supplier	0.461	1.909*
Regular client	0.522	1.901*
East area	0.472	0.767
Middle area	0.317	1.055
Age	-0.003	-0.216
Education	0.262	2.705***
Experience	0.038	1.970*
Relatives in business	0.004	0.021
Association member	-0.893	-1.626
Information provided	-0.032	-0.132
Goods stored	-0.462	-1.593
Technical efficiency	2.558	3.227***
R-square	0.251	
Adjusted R-square	0.186	
F-statistic	3.87***	
No. of samples	419	

*, * *, and *** indicate significance at the ten percent, five percent, and one percent levels, respectively.

Table 4. Estimation Results of Input Use Efficiency.

	Dependent variable			
Variable	Fixed capital [a]	Variable capital [b]	Permanent labor [c]	Temporary labor [d]
Constant	6.841***	12.091***	0.516	5.058***
	(4.766)	(19.800)	(1.447)	(2.756)
Regular supplier	0.136	0.316*	0.240**	0.399
	(0.316)	(1.723)	(2.237)	(0.719)
Regular client	-0.051	-0.037	0.193*	1.281**
	(-0.111)	(-0.190)	(1.688)	(2.168)
East area	0.833	-0.967**	0.040	-0.541
	(0.907)	(-2.476)	(0.176)	(-0.448)
Middle area	-1.299***	-0.565***	-0.286**	0.849
	(-2.640)	(-2.699)	(-2.335)	(1.339)
Age	-0.013	0.010**	0.010*	-0.010
	(-0.575)	(1.027)	(1.786)	(-0.358)
Education	0.536***	0.193	0.100**	-0.097
	(3.079)	(2.607)	(2.313)	(-0.433)
Experience	0.000	0.000	-4.722E-05	0.002
	(-0.134)	(-0.561)	(-0.102)	(1.042)
Relatives in business	-0.023	-0.205*	0.075	-0.490
	(-0.082)	(-1.717)	(1.083)	(-1.372)
Association member	0.926	0.387	0.131	1.960
	(0.941)	(0.924)	(0.537)	(1.506)
Information provided	-0.105	-0.141	-0.153	0.954*
	(-0.250)	(-0.787)	(-1.462)	(1.764)
Goods stored	-0.052	-0.896***	-0.059	-1.158**
	(-0.117)	(-4.734)	(-0.531)	(-2.038)
Technical efficiency	-0.410	-0.171	-0.082	-0.808
	(-0.329)	(-0.322)	(-0.265)	(-0.503)
R-square	0.111	0.236	0.141	0.073
Adjusted R-square	0.111	0.201	0.102	0.030
F-statistic	2.707***	6.728***	3.584***	1.686*
No. of samples	419	419	419	419

Figures in parentheses refer to the t-statistic.

*, **, and *** indicate significance at the ten percent, five percent, and one percent levels, respectively.

[a] ln(the sum of equipment, refrigeration, and office rooms)

[b] ln(working capital)

[c] ln(quantity of hired long-term workers)

[d] ln(temporary labor cost)

statistically significant impact on variable capital. As for permanent labor, both regular suppliers and regular clients have positive and statistically significant effects. Also noteworthy is the fact that regular clients affect temporary labor positively and significantly. These results suggest that customer relationships promote input use; at a minimum, the results show that customer relationships do not lower factor intensity. Education affects fixed capital positively and significantly, while being in the middle area has negative and significant effects.

Conclusions

As in most developing countries, China's agricultural wholesale markets are characterized by high risks, poor services, and unstable traders. Payment default is always a possibility and this adds to market uncertainty. Formal credit and insurance are inaccessible for most traders and information within markets is severely unreliable. An observed positive is that customer relationships with their business partners help traders cope with imperfect market institutions. In theory, customer relationships should enable traders to deal with their partners in a more trustworthy and cooperative manner, thus reducing transaction costs, promoting information sharing, and encouraging risk sharing. These positive customer relationships should then enhance traders' profitability. While the empirical results of this study cannot be linked directly to each of the aforementioned theoretical relationships, they clearly show the benefits of establishing customer relationships.

In our survey, about half of the traders have cooperative relationships with suppliers and clients. These relationships provided the necessary data for empirical analysis of the interaction effects between traders and customers. The results of customer relationships do have strong and positive effects on traders' performance. Traders with regular suppliers or regular clients are shown to be more profitable. Other things equal, traders with regular suppliers are shown to have a profit rate that is 46.1 percent higher than that of their counterparts. Similarly, those with regular clients are shown to be 52.2 percent more profitable than their counterparts. Education and experience also have statistically significant and positive effects on traders' profitability. However, contrary to expectations, neither the provision of information nor member association had any effect on traders' profitability. These outcomes are likely to be the result of poor performance by the traders' association information and of poor service. Clearly there is no evidence to suggest that customer relationships will negatively impact traders' input use. On the contrary, both the relationship with suppliers and that with clients have positive effects on traders' use of both permanent and temporary labor.

Based on the findings of this study, traders are seen to develop stable, win-win relationships with their suppliers and clients. Thus improved market efficiency would suggest that actions should be taken to facilitate the formation of customer relationships. At the same time, formal institutions should be improved to supplement the effects of customer relationships. For example, formal credit and insurance could be made more accessible to traders. Additional efficiency could be gained by improving market information systems and developing more effective associations of traders.

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