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GROWER'S CHOICE ON TRADING PARTNER IN APPLE MARKETS IN NORTHWERTERN CHINA

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Abstract: Based on the mathematical analysis of dominant exchange partners in agriculture, we provide a methodology from the perspective of transaction cost that can be used to deal with the relevance of fixed and proportional transaction costs related characteristics to grower choice behavior on trading partner employing multinomial logit regression model consistent with a sample of 351 apple growers collected in field survey in northwestern China. The descriptive statistics results reveal strongly a relationship amongst geographical location of farm households, contractual relationships and grower's choice on trading partner. The empirical findings indicate that proportional transaction costs related factors have significant correlation with choice behavior on trading partner in apple market. The findings call for a greater attention to establish the trust mechanism and to regulate contractual relationship between exchangers. Encouragement in cooperatives participation of small-scale growers is also highly recommended to mitigate the proportional transaction costs and thereafter to increase agricultural incomes of farm household.

Keywords: Choice; trading partner; Cooperatives; Multinomial logit regression

JEL classification: Q13

1. INTRODUCTION

Professor Ronald Coase (1937) initially coins transaction cost as the cost of carrying out a transaction by means of an exchange on the open market. He wrote in his famous paper *The Problem of Social Cost* that "it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal with and to what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make

sure that the terms of the contract are being observed, and so on." (Coase 1960). Dahlman (1979) divides transaction costs into three broad categories involving search and information costs, bargaining cost, policing and enforcement costs. Thereafter, transaction cost reasoning became most widely known through Williamson who promoted that transaction costs are determined by frequency, specificity, uncertainty, limited rationality, and opportunistic behavior (Williamson 1981). For recent four decades, a branch of famous economists focuses on issues from contractual relations, property rights system, and collective action to specialization and division, etc. from the perspective of transaction cost (Olson 1965; Williamson 1985; Wallis and North 1988). Meanwhile, a broader of researchers also put effort on studying the economics of organizations involving agency/mechanism-design theory, team theory, and resource-based/competency theories on the basis of Transaction Cost Economics (Tadelis and Williamson 2012).

In recent decades, transaction costs are identified as fixed and proportional types on the basis of whether the cost varying with the exchange quantity in previous literatures (Vakis, *et al.* 2003; Argyres *et al.* 2019; Sestu and Majocchi 2020; Bel and Sebõ 2021). In practice, fixed transaction costs, including the cost of acquiring market price information, searching for potential buyers, negotiating trading prices with buyers under the circumstances of information asymmetry, monitoring the exchange situation in case of default caused by opportunism, are independent of the transaction times and the exchange amount of products. Proportional transaction costs, referring to per unit transportation costs and price premiums deriving from bargaining capacity, change according to the quantities traded. In this article, akin to the categorizing approach in the above studies, we also typed transaction costs as fixed and proportional transaction costs in conjunction with several unique characteristics of high value-added products producers in China.

Notwithstanding the difficulty and complexity of measuring transaction costs due to the unobservable idiosyncratic, the relationship between variables of fixed, as well as proportional transaction costs and market choice on exchanger partner applying distinct econometrics approaches has been documented in a numerical of earlier works by Key, *et al.* (2000). Several researchers specifically address that transaction cost related factors like geographical location of households, sources of market information, time to travel to the nearest urban center, means of transport, and road conditions have significant correlation with market participation choice (Okoye, *et al.* 2016; Kyaw, *et al.* 2018; Amare, *et al.* 2019). Among multiple market transaction channels, cooperatives have become one of the most important trading outlets for small scale farm household especially in developing countries during the past two decades. Cooperatives, established for the purpose of providing various services rather than maximize profit as in non-cooperative business, gather small scale farm households to realize scale economy, and thereafter to reduce the transaction costs (Hind 1994; Lerman 2012).

Cook (1995) concluded that agricultural cooperatives originated in U.S. in the early 1900s because of a combination of economic, farm organization, as well as public policy factors, and developed slowly but consistently in the ensuing forty years. In China, however, cooperatives have been experienced a rapid development since the establishment of the

law on agricultural cooperatives of People's Republic of China (hereafter, the Law) in 2007 (Wang and Huo 2013). The essential functions of cooperatives are to provide services, such as agricultural extension relating to advisory and consulting services, helping their individual members realize standard production and management of orchards, supplying farm inputs with a discount, and purchasing member's products, etc. according to the Law. Noting that individual (or Self-employed) industrial and commercial households are a kind of economic body with Chinese characteristics, whereby individual natural persons or families using personal or family properties as business capital are engaged, following statutory registration, in non-agricultural business activities within the statutory scope of business (Gan 2011). Therefore, cooperatives as one of the principal market outlets are playing an increasingly important role in Chinese rural market.

After the quick overview of transaction cost issues linked to market choice and cooperatives functions, three transaction modes are developed in section 2. The detail of data collection and econometric approach are explained in section 3. Empirical results are reported in section 4. Conclusions are presented in the final section.

2. TEORECTICAL ANALYSIS

The essay attempts to look at the transaction cost-related factors affecting grower's choice decision on trading partner when entering agricultural market. The first step of establishing the analytical framework is to define the distinct costs faced by farm household during the produce and sales process. Basically, the total cost consists of two blocks which are transaction costs and traditional production costs including rent, labor, capital (i.e., fertilizers, chemical pesticides, herbicide, equipment, plastic/paper bags act as barriers to protect the fruit against attack by summer insect pests and diseases when the fruits reach 3/4 in diameter as presented by Bessin, etc. (1998). Particularly, according to prior literatures mentioned in introduction, transaction costs occurred in sales process are typed into fixed transaction cost with information and negotiation cost, and the proportional transaction cost with the transportation cost, the entertaining cost, as well as the products loss during sales process which can be monetary measured in our research.

Generally, there are multiple trading outlets for growers selling their products in agricultural markets in China, such as retailers, wholesalers, agricultural produce agents, agrofirms, agricultural cooperatives, supermarkets, etc. In our research, based on the field survey, three dominant transaction modes are defined according to the transaction object: 1) grower-wholesaler transaction mode (hereafter, GW mode); 2) grower-agent transaction mode (hereafter, GA mode); 3) grower-cooperatives transaction mode (hereafter, GC mode). Each of these will be discussed briefly below.

2.1. Grower-wholesaler Transaction Mode (GW)

Wholesalers serve as important links in a market channel (Das and Tyagi 1994). They play a primary role in physical movement of agricultural products from farm households to the

downstream. In GW mode, wholesalers are perceived as the first trading link when agricultural products entering the sales process. Grower initially trades products with wholesaler/wholesalers depending on their transaction amounts and the prices offered by various wholesalers. Wholesalers then distribute products to retailers, supermarkets, agrofirms like processors (particularly apple juice firms), exporters, etc. The sales prices and trading locations can be negotiated between the two parties prior to face-to-face trade through phone communications in our research regions.

2.2. Grower-agent Transaction Mode (GA)

Agent means a person who, for the acquisition of gain on his or her own account, buys agricultural products from farm household and sells the products to other person or firms. Agent charges commission from each transaction and acts as a middleman sometimes.

In GA mode, apple grower trades products with local agent/agents. The ability to negotiate fees and/or commissions varies from grower to grower. Practically, grower with larger exchange amount, to some extent, has higher negotiation power compared with those with smaller exchange amounts. Moreover, agent typically charges a commission for each transaction, and the charge is usually a percentage of the total exchange volume. In combination with our field discussion, sometimes the commission is charged by the unit price which varies from 1.0 yuan to 3.0 yuan per kilogram according to the quality of fresh apples, i.e., apple size, color, variety, etc. In other words, agent charges more for the high-quality products than the low-quality ones as the trading price goes up with the increasing of the quality.

2.3. Grower-cooperatives Transaction Mode (GC)

Gray (2009) groups cooperatives into three categories which are local cooperatives, centralized cooperatives and federated cooperatives. In the article, the cooperatives observations are the local cooperatives which the number of members is from 50 to 600 (Schaars, 1971); the services include the joint purchasing of supplies, collective marketing of products; the members live within close proximity of each other, and quite familiar with each other personally. Grower (usually being as a member in cooperatives) trading products with cooperatives, to a certain extent, can internalize the transaction cost occurred during the produce and sales process. The distribution system of GC mode is similar to the mode GA with the exception that cooperatives won't charge fees from their members. On the other side, member in cooperatives can get a ratio of return based on their trading amount/ quantity of products with cooperatives at the end of the year. According to the law, the total return to the members will not be less than 60 percent of the total distributable earnings of cooperatives. Further, cooperatives supply their members with inputs for agricultural production in a lower price than market price, including fertilizers, chemical pesticides, apple bags, and machinery services.

3. RESEARCH METHODOLOGY

3.1. Sampling

The research was carried out in Shaanxi province in northwestern China. Due to the suitable climate and geographic location for apple farming activity, the Agricultural Department of People's Republic of China planed 30 apple-growing counties in 2003 for establishing apple industry comparative advantages (Wang and Huo, 2014). Since then, the apple industry including fresh apple planting scale, apple processing firms (i.e., apple juice firms) has been experienced a rapid development.

The statistical data shows that fresh apple production in Shaanxi accounts for a quarter of the total in China in 2018 (source: China Agriculture Research System, CARS). Further, considering the appropriate climate and geographic characteristics for apple planting in Shaanxi province, many experiments/research projects with reference to apple production and sale have been executed which also make this province comparatively data-rich and typicality. Hence, apple growers in Shaanxi are selected as farm-level observations to deal with the research on the high value-added product producers' choice behavior on trading partners in rural market.

The primary data collected through a survey using systematic sampling method with structured questionnaire from six counties in Shaanxi province in northwestern China in 2018. Particularly, for the county-level samples, we identified six apple production counties from thirty apple growing counties in Shaanxi. Six village-level samples were randomly selected in each county, and eleven farm household-level samples were randomly observed in each village. Finally, a total of 351 apple farm household-level valid questionnaires were collected except the ones with questions not being fully filled due to grower's poor memory.

To achieve the purpose of the study, the questionnaire was designed to characterize and quantify various transaction costs faced by growers during production and sales process. The questionnaire elicited information on five parts: 1) grower demographics referring the age, years of obtaining academic education, off-farm experience of household head, apple planting years to reflect grower skill, degree of trust in wholesaler, agents, and cooperatives, respectively; 2) farm characteristics including total farm size, apple farm size, production cost; 3) geographical locations associating with the distance from farm household to the nearest rural market, to the nearest high way, to the nearest urban center, the number of fruit cooperatives and rural markets inner county, as well as the village road condition; 4) fixed transaction costs specified into time on obtaining market price information, time on bargaining with potential buyers, availability to internet, the contract relation, as well as the disagreement on the measurement of product quality criteria; 5) proportional transaction costs primarily involving the cost of delivery , entertaining buyers, and the delay of payment, etc. The concrete definition of each variable is illustrated in table 1.

Table 1: Variable Definitions

Variable code	*Variable definition*	*Unit*
Dependent variable		
	1 = grower trades products with wholesalers 2 = grower trades products with cooperatives 3 = grower trades products with agents	
Grower demographics		
AGE	Age of household head	years
FEDU	Years of academic education of household head	years
FEXP	Years of farming experience of household head	years
OEXP	1 if household has off-farm experience 0=otherwise	
TRUW	Degree of trust in wholesalers	1=very untrust 2=untrust
TRUC	Degree of trust in cooperatives	3=medium 4=trust
TRUA	Degree of trust in agents	5=very trust
Farm characteristics		
FSIZ	Farming size	mu [a]
ASIZ	Apple orchard size	mu [a]
APRO	average production cost including rent, labor, and capital	thousand yuan/mu
Geographic characteristics		
DTRM	Distance to the nearest rural market	km
DTHW	Distance to the nearest high way	km
DTUR	Distance to the nearest urban center	km
NOCP	Number of fruit cooperatives inside the county	unit
NORM	Number of rural markets inside the county	unit
ATRC	Attitude toward road condition of the resident area	1=very bad 2=bad 3=medium 4=good 5=very good
Fixed transaction cost		
TOMI	Time on obtaining market price information	hours
TONB	Time on negotiating with potential buyers	hours
ACTI	1 if household is available to internet,0=otherwise	
CONT	1 if household signs a contract, 0=otherwise	
DIFF	1 if household and buyer hold different criteria to measure the products quality, 0=otherwise	
Proportional transaction cost		
CTRP	Cost of transporting products to sales sites	yuan
CTRE	Cost on entertaining buyers	yuan
DELY	Delay of fully paid by buyers	days
TFPY	Grower asks buyers for the payment after trading the products	times
LOSS	Products loss rate during the sales process	percent

Note: [a] 1 mu=0.0667 hectare;

3.2. Multinomial Logit Mode

Statistically, a multinomial logistic regression mode generalizes logistic regression by allowing more than two discrete outcomes (Greene 1993). The mode is commonly used to assess the influence of explanatory variables on the nominal response variable, and the subjects are often observed nested within clusters (Hedeker 2003). To concentrate on the role played by the variables relating transaction costs on grower's choice decision on exchange partner, the trading modes are classified into three types termed as GW, GC, and GA which means that the predict data are categorical. Thus, the multinomial logit regression mode is an appropriate approach to handle the purpose of our case according to the previous analysis.

Practically, we observe three data points (categories). Each data point g (g = (1, 2, 3)) consists of a set of n explanatory variables, n = (1, 2, ..., 27) and an associated categorical outcome. Let g = 1 denote the observed grower trading apples with wholesalers; g = 2 denote the observed grower trading apples with cooperatives; g = 3 denote the observed grower trading apples with agents. We choose as the baseline and calculate the odds that grower in mode GW and mode GA falls in category 1 and 3 as opposed to the baseline, respectively. Moreover, we also estimate the relative risk ratio to describe the exponentiated coefficients from the Multinomial Logit Model.

Specifically, we define

$$\begin{aligned} p_1 &= P(Y=1|X) \quad q_1 = P(Y=1|X+1) \\ p_2 &= P(Y=2|X) \quad q_2 = P(Y=2|X+1) \\ p_3 &= P(Y=3|X) \quad q_3 = P(Y=3|X+1) \end{aligned}, \tag{1}$$

Category 1 and category 3 are of the two of interest, respectively, then

$$\begin{aligned} \textit{odds ratio for category } 1 &= \frac{q_1/(1-q_1)}{p_1/(1-p_1)} \\ \textit{odds ratio for category } 3 &= \frac{q_3/(1-q_3)}{p_3/(1-p_3)} \end{aligned}, \tag{2}$$

$$\begin{aligned} \textit{risk ratio for category } 1 &= q_1/p_1 \\ \textit{risk ratio for category } 3 &= q_3/p_3 \end{aligned}, \tag{3}$$

In our research, the base category is category 2 (i.e., grower-cooperatives transaction mode, in which case we now define the 'relative risk' to be

$$\begin{aligned} &P(Y=1)/P(Y=2) \\ &P(Y=3)/P(Y=2) \end{aligned} \tag{4}$$

Which are the risks relative to the base category, respectively. Consequently, the relative risk ratio (rrr) of category 1 and category 2 can be written as

$$\begin{aligned} &\textit{relative risk ratio of category } 1 \textit{ for category } 2 = \frac{q_1/q_2}{p_1/p_2} \\ &\textit{relative risk ratio of category } 3 \textit{ for category } 2 = \frac{q_3/q_2}{p_3/p_2} \end{aligned} \tag{5}$$

In practice, the relative risk ratio represents the effects of a unit increase in independent variable on the likelihood of choosing the corresponding market relative to trade with cooperatives which is the base category. Those relative risk ratios are reported in Table 3 for the independent variables shown in table 2.

3.3. Descriptive Statistics

The numbers in Table 2 suggest that, for growers in mode GW and GC, the differences in the academic educational years of farm household head, degree of trust in cooperatives, farm and geographical location-related variables, time on knowing market price information and bargaining with trade partners, the accessibility to the internet, the different opinion on the measurement of product quality criteria, cost of delivering products to the exchange location, and the delay of being fully get paid are statistically significant at p=0.05 level.

When making comparison of growers in mode GA and GC, the statistical test results show that the differences in grower demographics and farm characteristics-related variable, except the degree of trust in apple agents and the farm size, are all statistically insignificant between the two categories whereas the differences in variables of geographic characteristics are statistically significant except for the variable "distance to the nearest highway." Associating with transaction cost-related factors, the differences in variables described as whether grower signs a formal contract and the delay of fully being paid are statistically significant.

Specifically, from the perspective of grower demographics and farm characteristics, the mean values reveal that growers with higher academic educational level, more years of apple growing experience, larger farm size and apple orchard are more prone to transacting products with cooperatives. From the point of geographic characteristics, growers living far from the nearest rural market, highway, and the nearest urban area are more likely to choose apple agents as their trading partners.

4. EMPIRICAL RESULES

The study is primarily focus on accessing the determinants of grower's choice on trading partner using multinomial logistic regression mode in which mode GC is chosen as the reference category. The coefficient represents the change in the odds of the dependent

Table 2: Descriptive Statistics: Growers-Cooperatives as the Base Category

Variable	*unit*	*Grower-wholesalers*		*Grower-cooperatives*		*Grower-agents*			
Code		*Mean*	*Std. Dev.*	*Mean*	*Std.Dev.*	*Mean*	*Std. Dev.*	*Pr 1*	*Pr 2*
Grower demographics									
AGE	years	54.68	8.81	51.90	7.01	51.80	7.18	0.0542	(0.9484)
FEDU	years	8.25	2.76	9.66	2.47	9.08	1.86	0.0021*	(0.2336)
FEXP	years	17.46	4.78	18.46	4.11	17.65	4.29	0.2020	(0.3858)
OEXP		0.28	0.99	0.46	1.00	0.33	1.07	0.2754	(0.5499)
TRUW	1-5 with	3.94	0.80	3.68	0.88	3.85	0.86	0.0623	(0.3909)
TRUC	increase	3.47	0.81	3.98	1.01	3.70	1.18	0.0003*	(0.2625)
TRUA	degree of trust	3.58	0.88	3.29	1.08	3.83	0.87	0.0586	(0.0170*)
Farm characteristics									
FSIZ	mu	5.29	2.83	6.64	3.05	5.17	2.26	0.0051*	(0.0160*)
ASIZ	mu	2.96	1.50	4.73	2.44	4.11	1.99	0.0000*	(0.2177)
APRO	Thou.yuan/mu	2.27	2.25	1.99	1.68	2.02	2.08	0.4492	(0.9396)
Geographic characteristics									
DTRM	km	9.01	5.93	16.26	10.91	22.64	9.15	0.0000*	(0.0056*)
DTHW	km	5.20	5.10	8.51	7.08	11.11	7.06	0.0003*	(0.1024)
DTUR	km	8.82	4.80	11.98	7.48	16.56	4.24	0.0003*	(0.0011*)
NOCP	units	0.74	0.61	1.15	1.09	1.65	0.95	0.0005*	(0.0292*)
NORM	units	0.29	0.48	0.29	0.46	0.10	0.38	0.9350	(0.0434*)
ATRC [a]		3.40	1.19	3.95	0.95	3.25	1.28	0.0044*	(0.0062*)
Fixed transaction costs									
TONB	hours	0.03	0.17	0.19	0.51	0.04	0.11	0.0132*	(0.3802)
TOMI	hours	0.63	1.55	1.60	5.18	0.86	1.15	0.0001*	(0.0698)
ACTI		0.06	0.24	0.17	0.38	0.05	0.22	0.0114*	(0.0858)
CONT		0.25	0.44	0.29	0.46	0.03	0.16	0.6026	(0.0008*)
DIFF		0.29	0.45	0.71	0.46	0.53	0.51	0.0000*	(0.0936)
Proportional transaction costs									
CTRP	yuan	273.89	1039.42	468.49	808.84	260.00	317.98	0.0000*	(0.0936)
CTRE	yuan	141.77	163.40	52.44	97.18	113.75	169.61	0.2515	(0.1326)
DELY	days	6.63	8.91	13.98	10.28	6.85	7.30	0.0000*	(0.0006*)
TFPY	times	0.16	0.57	0.17	0.54	0.23	0.77	0.9017	(0.7138)
LOSS	percent	1.87	2.89	2.02	4.70	2.45	7.85	0.7676	(0.7673)

Note: [a] 1=very bad 2=bad 3=medium 4=good 5=very good

The numbers with asterisk * not in the parentheses denote variables significantly different from the category *Grower-Wholesaler* at the 5% levels.

The numbers with asterisk * in the parentheses denote variables significantly different from the category *Grower-Agent* at the 5% levels.

variable being in category GW and GA vis-à-vis the reference category GC, associated with a one unit change of the corresponding independent variable. The regression model attempts to explain the relative effect of differing explanatory variables on the trade choice. The regression results including the relative risk ration are indicated in table 3.

Regarding grower demographics, the less of householder head's academic educational years, the more likely a grower will choose to exchange products with wholesalers or agents. Given that trust between the exchangers may be a starting point for the development of key relationship outcomes (Orth *et al.* 2013), our empirical result reveals that growers having higher degree of trust in agents and lower degree of trust in cooperatives are more likely to trade with apple agents. The relative risk ratio estimation results reveal that a unit increase in the degree of trust in cooperatives of growers trading with agents would lead to 55.3 percent less likely to choose agents as their trading partners. The finding is also consistent with the recent research by Belay (2020) who addressed that trust in the board of directors and in the management has clearly correlation with member's satisfaction with the cooperatives as a trading partner. The results imply an important effect of grower's trust in trading partners on their market selection choice.

In terms of farm characteristics, the smaller growers' apple orchard is, the greater probability they will transact apples with wholesalers. The less farm size of grower is, the more likely they prefer to trade with apple agents. The result implies that growers with larger apple orchards may have greater willingness to exchange products with cooperatives. These results can be supported by the data in table 2: the average apple planting size of grower selling to cooperatives is 4.73 mu, compared to 2.96 mu for growers trading with wholesalers and 4.11 mu for those trading with agents.

Referring geographical characteristics, a decrease in the number of fruit cooperatives inside the county would increase the probability of growers choosing to trade with wholesalers. Growers valued the local road condition poorer are more likely to trade with wholesalers primarily because they can negotiate with wholesalers to exchange the apples at the orchards which greatly reduce the transportation cost. Further, this also implies that growers perhaps be more willing to trade with cooperatives if the local road condition is better. The data in table 2 also partly confirmed the result: the transportation cost of grower trading with wholesalers is annually 273.9 yuan compared to 468.9 yuan for growers trading with cooperatives and 260.0 yuan for growers trading with agents, respectively.

Variables of the geographical location are significantly related to grower's choice behavior. Growers residing in the longer distance to the nearest rural market and closer to the nearest highway are more likely to sell products to apple agents, rather than trading with cooperatives. The result is also consistent with the recent findings of Okoye *et al.* (2010), who have pointed that road condition to the nearest town significantly affected farmers' market participation decision. Meanwhile, the odds of grower trading with agents would go up with an increase of the number of rural markets inside the county. In other words, growers trading with agents are 122.6 percent more likely to sell to agents relatively

Table 3: Estimation of Market Choice on Trading Partner (Multinomial Logistic Model): Grower-Cooperatives as Base Category

Variable code	*Grower-wholesalers*			*Grower-agents*		
	coef.	*Relative risk ratios*	*P>|z|*	*coef.*	*Relative risk ratios*	*P>|z|*
Grower demographics						
AGE	0.0007	1.0007	0.980	-0.0706	0.0517	0.172
FEDU	-0.2239**	0.7994	0.043	-0.4462**	0.1780	0.012
FEXP	-0.0654	0.9367	0.178	-0.0990	0.0893	0.267
OEXP	-0.0254	0.9749	0.903	-0.2035	0.2977	0.494
TRUW	0.5100	1.6653	0.075	0.1080	0.4458	0.809
TRUC	-0.3779	0.6853	0.190	-1.1333**	0.4472	0.011
TRUA	0.3089	1.3619	0.175	2.3292***	0.5314	0.000
Farm characteristics						
FSIZ	-0.0113	0.9888	0.897	-0.3903*	0.2001	0.051
ASIZ	-0.2835**	0.7532	0.036	0.0475	0.2583	0.854
APRO	0.0000	1.0000	0.866	0.0002	0.0002	0.431
Geographic characteristics						
DTRM	-0.0240	0.9763	0.654	0.5011***	0.1477	0.001
DTHW	-0.0578	0.9438	0.551	-0.9723***	0.3283	0.003
DTUR	-0.1321	0.8763	0.281	-0.0248	0.1862	0.894
NOCP	-1.5199**	0.2187	0.036	-0.2225	1.2020	0.853
NORM	0.6880	1.9897	0.395	6.3094**	2.2260	0.005
ATRC	-0.5091*	0.6010	0.054	-0.5147	0.1282	0.152
Fixed transaction costs						
TOMI	-0.0885	0.9153	0.299	-0.1943	0.1282	0.130
TONB	-0.6041	0.5466	0.427	-1.9597	1.8290	0.284
ACTI	-0.4535	0.6354	0.540	0.4026	1.4485	0.781
CONT	-1.7230***	0.1785	0.004	-2.9993*	1.5984	0.061
DIFF	-0.4871	0.6144	0.425	0.4917	0.9149	0.591
Proportional transaction costs						
CTRP	-0.0001	0.9999	0.855	-0.0028**	0.0012	0.018
CTRE	0.0050	1.0051	0.108	0.0084**	0.0036	0.020
DELY	-0.0394	0.9614	0.121	-0.0236	0.0511	0.644
TFPY	0.3539	1.4246	0.454	0.4795	0.6691	0.474
LOSS	-0.0226	0.9777	0.743	0.0472	0.0776	0.543
Number of observations		351				
Pseudo R-squared		0.5050				
Log-likelihood value		-123.3024				

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

to cooperatives if there is a unit increase in the number of rural markets. On the other hand, growers residing far from the highway may be more willing trade with cooperatives.

Somewhat to our surprise, only one out of the five fixed transaction costs related variables-whether signs a formal contract or not-has significantly negative effect on market transaction partner choice decision. That is, the greater likelihood of having a formal contractual relationship between the two exchange parties, the more likely growers would choose cooperatives as their transaction partner. This could be suggesting that cooperatives may provide a better contract relationship for growers compared with apple wholesalers and/or agents.

Overall, two parameters of proportional transaction costs are significant at 5 percent level as reported in the last block in table 3. The estimating results reveal that variables including the transportation cost and entertaining cost significantly affect grower's choice on apple agents. While all proportional transaction cost related variables insignificantly influence grower's choice on wholesalers compared to cooperatives. For example, the lower the transportation cost is, the greater likelihood of selling to apple agents; the higher cost on entertaining buyers is, the more likely to sell to agents relative to the cooperatives.

Noting that the proportional transaction costs tend to be more relevant to grower's choice behavior on transaction objects compared with the fixed components. The possible explanation, in combination with the field discussion, can be the neglect on the importance of the market information. In other words, grower is usually the price receiver instead of setter due to his/her small-scale transaction amount. Another reason can be attributed to the lower negotiation power in agricultural market which also leads growers to pay less attention to bargain with buyers.

5. CONCLUSIONS AND LIMITATIONS

In order to deal with the objective of the article, three dominant transaction modes are initially defined in line with trading object in apple market in China. Then an analyzing framework from the perspective of transaction cost by adding some geographic characteristics is promoted to evaluate the impact factors on grower choice decision facing various trading partners employing multinomial logit regression mode. The empirical results demonstrate heavily impact of variables including the distance from grower resident location to the nearest rural market and the nearest highway, and with the combination of one fixed and two proportional components regarding transportation and entertaining costs on their choice decisions.

Several policy implications of the present research are worth noting. Given the mathematical reasoning result and the descriptive statistics findings, high value-added product producers are intensively advised to participate in cooperatives to mitigate the proportional transaction costs by internalizing part of the transportation cost and entertaining expenditure. For policy makers, who are particularly devoted to the development of cooperatives, the completion of cooperatives service functions, as well as the solutions to

serious difficulties of cooperatives, given the significance relation between growers' choice decision and their trust in buyers, we greatly suggest that policies aimed at enhancing the cooperatives reputation to upgrade grower's trust in cooperatives may provide a potential avenue for increasing the probability of being chosen as trading partner. Of further importance, given a strongly connection between formal contractual relationship and grower's choice on exchange partners revealed in the empirical results, an establishment of legally contractual relationship between growers and wholesalers/agents/cooperatives when entering the agricultural market is highly recommended. The legal contract relationship can regulate and monitor the transaction behavior between the two parties, and transfer the risk of breaking the contract from individual grower with lower bargaining power to buyers with higher negotiation position. Moreover, encouraging growers to participate in cooperatives can be also a way to improve their risk bearing capability, as both cooperatives and their members share similar goals.

However, with the limitation of research period and the budget, we use only one year data instead of panel data to estimate the relationship between transaction costs related factors and grower's choice decision on trade partner which might lead to biased results employing the econometrics tools. Moreover, we take into consideration of the transaction cost occurred between growers and their direct trading partner, rather than the overall transaction costs occurred in the supply chain. Those are left to future study.

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