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Role of farmer's attitude to risk in the relationship between trust and contract decisions: The fresh apple market in South Korea

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Abstract

This study examines how the decisions of farmers to enter into contracts are affected by the farmers' attitudes toward uncertainty, and whether a farmer's level of optimism and other characteristics affect contract decisions. When facing a contract decision, a farmer should

consider two uncertainties, which are price risk and the contract partner's level of opportunism. A farmer with a high degree of risk aversion would not trust their transaction partners. For this study, we surveyed 220 farmers. Contract decisions were divided into decisions of adoption and of dependency. Adoption and dependency were analyzed by the Profit and Tobit models, respectively. For a highly risk-averse farmer, trust does not affect contract decision, while for the less risk-averse one, trust strongly influences the contract decision ($p < 0.001$). A farmer's optimism and age also affect the decision. The results suggest which farmers are more likely to enter into contracts and which ones should be targeted by the middlemen in the fresh apple market.

1. Introduction

A marketing contract is “an agreement between a producer and a buyer that sets a price or price formula for a commodity to be delivered at a later time” (Katchova and Miranda, 2004). Marketing contracts for broilers, swine, grapes and tomatoes that are processed in a factory have been studied. Fresh apples scarcely need processing and are usually simply wrapped up prior to purchase by consumers. If the middlemen’s contribution to enhancing the value of production is relatively low, they tend to have trouble in organizationally controlling the farmers. Thus, middleman could use the establishing of trust as a way to form relationships with farmers.

Trust in a business partner is an antecedent variable of a contract decision (Schiefer et al., 2009; Morgan and Hunt, 1994). Also, the level of a farmer’s risk-averseness influences contract decisions in terms of choosing the marketing channels (Androkovich, 1989; Andersson, 1995; Knoeber and Thurman, 1995; Hueth and Ligon, 2002; Gillespie and Eidman, 1998).

However, studies that consider both the effects of trust and attitude toward risk on contract decisions are not typical, because the two factors are not based on the same theory. Trust is a factor of a long-term contract based on transaction cost theory and risk attitude is a parameter of utility function based on the expected utility theorem. Usually, trust is a topic handled in the area of organizational management and risk attitude is investigated in financial economic studies. Practically, when farmers make contract decisions, they face situations in which they reveal their preferences for the levels of both trust and risk.

Mayer et al. (1995) suggested that “perceived risk moderates the relationship between trust and risk taking.” Davis et al. (1997) found that when the level of willingness to take risks is more than that of trust, trust does not work in choice trust behavior. Therefore, basing on the Mayer et al. (1995) framework, we investigated the role of attitudes toward risk in the relationship between trust and contract decisions.

The present study investigates the moderate effect of the attitude toward risk on the relationship between trust and contract decisions, and examines the effect of a farmer’s level of optimism and other characteristics. We propose two steps for the making of a contract decision. The first step is the adoption of a contract, and the second is the dependency of a contract. Adoption and dependency were analyzed by the Probit and Tobit models, respectively.

2. Literature review

(1) Fresh apple contract in South Korea

Each year, USD78 million worth of fresh apples are produced and the market in fresh

apples is the largest of the fruit markets in South Korea. The Ministry of Agriculture, Food and Rural Affairs (MAFRA) has supported a policy of risk management and the National Agricultural Cooperative Federation (NACF) has executed a marketing contract. There are insufficient means of risk hedging in South Korea. NACF has contracted for 10% of the produced apples.

Farmers mostly use one to two of four types of marketing channels. One type is the wholesale market where apples are priced by auction. Another type is the local vendors who have packing and grading centers. The third type is direct channels to the consumer using farmers' markets and online commerce. The last type is local units of NACF that implement marketing contracts supported by MAFRA.

Farmers make the decision of apple marketing when the flowers or fruits begin to thin at the end of July when the farmers are able to forecast their yields. The farmers make contracts with the local NACF units, specifying the quantities of apples to be delivered. At the start of the harvest time, which is at the beginning of October, the local units of NACF price the apples using criteria as summarized in <Table 1>. In the middle of October, the farmers deliver their apples to the local NACF units, who then evaluate the grades of the apples.

Since farmers want to avoid the riskiness of market price movements and negatively forecast the market situation, they grab the opportunity to sell their apples in advance. The local NACF units are responsible for grading, which must be done fairly; otherwise, the farmers would not enter into any more contracts with NACF.

<Table 1> Criterion of grading apples for marketing contracts

Weight		Surface color and sugar content		Grade
Under 39 pieces per box		A grade: upper 90% and 14 degrees Brix		39A, 39B, 39C
49 pieces per box		B grade: 70-90% and upper 12 degrees Brix		49A, 49B, 49C
59 pieces per box	x	C grade: under 70%	=	59A, 59B, 59C
69pieces per box				69A, 69B, 69C
79 pieces per box				79A, 79B
89 pieces per box				89
Upper 99 pieces per box				99

(2) Trust and risk aversion

Practically, when farmers make a contract decision, they face a situation in which they reveal their preferences for both the level of trust and risk. The attitude toward risk is a preference for a volatile price in a spot market. The price is determined randomly and has a

distribution. A random price is converted into a certain value, which is determined by a risk premium. Since risk-averse farmers prefer a certain value to a risky price, they will ship a higher ratio of their products by contract than would less risk-averse farmers. If the farmers sign a contract even though the price risk is removed, the farmers face another risk, which is one of opportunistic behavior. It is impossible that contract provisions could include the responses for all possible situations. If the contract provisions intended to reveal more possible situations, the implementation expenses would be much higher than would the benefits brought about by the contract. Imperfect contracts lead to the rise of several opportunistic behaviors. Trust is defined as the willingness to make oneself vulnerable to opportunistic behavior, which is considered to be a contract choice (Schoorman et al., 2007). Farmers sign a contract decision considering the tension between the two types of risk.

Meanwhile, when we consider the two factors, there are problems about the relationship between trust and the attitude toward risk. Does the latter trigger the former? And, does the attitude toward risk have a moderate effect on the relationship between trust and trusting behavior? Empirically, the first problem has been rejected (Eckel and Wilson, 2004). The second problem has been accepted in several leading studies. Chiles and McMackin (1996) examined the role of preference for risk in transaction cost theory. They concluded that, although a specific asset may have a high value, risk lovers prefer the spot market to integration. In contrast, although a specific asset may have a low value, risk-averse managers prefer integration to the market. The risk preference of managers influences the choice of organization type. Mayer et al. (1995) suggested that “perceived risk moderates the relationship between trust and risk taking.” Davis et al. (1997) found that when the level of willingness to take risks is higher than that of trust, trust does not work in choice trust behavior. Therefore, based on the Mayer et al. (1995) framework, we investigated the role of the attitude toward risk in the relationship between trust and contract decision-making.

(3) Optimism

Dispositional optimism is defined as a “positive generalized expectation about a future event” (Scheier and Carver, 1985). Optimism affects various economic behaviors. For example, optimistic people tend to work for longer and retire at a later age. When they have an asset, they prefer to have more rate of stock and save more money. No study has yet considered optimism as a factor in contract choice. We examined how contract decision-making before the harvesting of apples is affected by optimism. Optimism was measured by life expectancy miscalibration, which is calculated as expected life span to actual life span (Puri and Robinson, 2006). The measurement could easily replace formal psychometric optimism tests. We will survey that

3. Method

(1) Model

We considered a farmer who produces apples. In order to maximize expected utility, he makes a decision whether to adopt a marketing contract and what proportion of the quantity of his production of apples to deliver. Contract choice is represented by θ ($\theta = 0,1$). If θ is 1, the farmer adopts the contract. Otherwise, if θ is 0, the farmer does not. Then, he makes a decision about the deliverable quantity, α , which is more than zero.

$$\text{Max EU}[(1 - \theta)\{PY - C(Y)\} + \theta\{(1 - \alpha)PY + \alpha FY - C(Y)\}]$$

Subject to P market price

F : contract fixed price

Y : production yield

C(Y): cost of production

θ : choice of contract, $\theta = 0,1$

α : rate of contract quantity to area, $\alpha > 0$

The first model was estimated by the Probit model. θ is a binary choice between adopting and not adopting the contract, and is affected by X set of variables.

$$\text{Pr}(\theta = 1|X) = \Phi(X^T\beta)$$

The following log-likelihood for the Probit model is the choice, θ_i , of an individual farmer, i.

$$\ln L(\beta) = \sum_{i=1}^n [\theta_i \ln \Phi(X_i'\beta) + (1 - \theta_i) \ln (1 - \Phi(X_i'\beta))]$$

The second model was estimated by the Tobit model, in which α_i is the proportion of the contracted quantity to the area. Since the farmer does not know what yield his produce will be at the contracted time for delivery, his production is substituted into the production area:

$$\alpha_i = \begin{cases} \alpha_i^* & \text{if } \alpha_i^* > 0 \\ 0 & \text{if } \alpha_i^* \leq 0 \end{cases}$$
$$\alpha_i^* = X_i'\delta + u_i, \quad u_i \sim N(0, \sigma^2)$$

The log-likelihood for the Tobit model is estimated by:

$$\ln L(\delta, \sigma) = \sum_{\alpha_i=0} \ln \Phi\left(-\frac{X_i'\delta}{\sigma}\right) + \sum_{\alpha_i>0} \ln \left[\frac{1}{\sigma} \phi\left(\frac{\alpha_i - X_i'\delta}{\sigma}\right)\right]$$

(2) Data collection

The subject of this study is a marketing contract that was made in 2014 between a group of farmers and a fresh apple packer. We surveyed the farmers from July to September 2015 in South Korea, and collected and analyzed 220 questionnaires.

Trust was measured by the question: “Do you believe that your contract partner fairly grades your apples?” The attitude toward risk was measured by the questions: “Do you intend to sell your apples at the harvest time, because you do not know how the market situation will be next time?” and “Do you intend to control input and labor, because you do not know how the market situation will be next time?”. In addition, characteristics, such as age, number of children, level of education, extent of farming experience, production area and level of optimism, of the farmers were surveyed. The variables are defined in <Table 2>.

<Table 2> Definition of variables

Variables	Definition	Reference
Attitude toward financial risk	The intention of the farmers to sell apples at harvest time in spite of dissatisfaction with the price due to lack of knowledge of future market prices	Franken et al., 2014 Fellner and Maciejovsky, 2007
Attitude toward input to control risks	Farmer intends to control input and labor due to lack of knowledge of future market prices	
Trust	Farmer believes that partner fairly evaluates performance	Schoorman et al., 2007
Optimism	Ratio of expected life to average actual life span	Puri and Robinson, 2007
Demographics	Age, number of children, level of education, work experience, area	Kachova and Miranda, 2004 Roe et al., 2004
Non-farming income	If farmer has non-farming income, 1. If not, 0.	
Diversification	If farmer grows other crops, 1. If not, 0.	

4. Results

(1) Descriptive statistics

<Table 3>Descriptive statistics 1

Variables	Unit	Mean	S.D.	Minimum	Maximum
Age	Year	58.5	9.5	27	85
Farming experience	Year	21.8	11.3	3	50
No. of children	Person	2.5	1.3	0	9
Area	ha	3,407	2,580	100	20,000
Income	USD millions	51	40	0.0003	260
Level of Trust	points	3.52	1.13	0	5
Level of financial risk aversion	points	3.2	1.14	0	5
Level of input control risk aversion	points	3.17	1.12	0	6
Level of optimism	-	-0.06	0.39	-0.96	1.27

<Table 4> Descriptive statistics 2

Variable	Unit	Yes	No
Contract choice	Farmer	161(73%)	59(27%)
Non-farming income	Farmer	69(31%)	151(69%)
Diversification	Farmer	94(43%)	126(57%)

(2) Results of analysis

The results are as follows. The level of the farmers' trust in the packer positively affected the ratio of the contracted quantity to 0.3 ha ($p < 0.001$). In the case of those farmers who were in the risk aversion group, trust did not affect the contract decision. Meanwhile, in the case of risk-neutral farmers, trust strongly influenced the contract decision ($p < 0.001$). The results may explain some of the mysteries of the process of making marketing contracts, in particular, why farmers who have low levels of trust in packers choose a contract and why farmers who are risk lovers sign an agreement with packers. In addition, the level of optimistic attitude

negatively affected the contract decision ($p < 0.05$), which means that packers need to introduce a farmer to the pessimistic prospects of the market. The square of age negatively influenced contract decision ($p < 0.001$), which means that packers need to target the segment of middle-aged, 50 to 60-year-old farmers. These results will contribute to the development of the relationship between attitude toward risk and trust, and the finding of several factors of contract decisions.

<Table 5> Estimation of results of marketing contract adoption model

	Model 1		Model 2		Model 3	
	Estimate	z value	Estimate	z value	Estimate	z value
Age	0.328	3.356***	0.318	3.294***	0.325	3.351***
Squared age	-0.003	-3.543***	-0.003	-3.497***	-0.003	-3.500***
No. of children	0.062	0.668	0.071	0.774	0.054	0.591
Farming experience	0.020	1.849*	0.019	1.747*	0.018	1.649**
Edu. dummy 1	0.094	0.378	0.149	0.585	0.131	0.507
Edu. dummy 2	-0.193	-0.562	-0.216	-0.629	-0.178	-0.510
Non-farming income	0.172	0.770	0.169	0.743	0.199	0.861
Diversification	-0.184	-0.901	-0.201	-0.976	-0.232	-1.113
Area	0.000	0.853	0.000	0.903	0.000	0.916
Optimism	-0.408	-1.541	-0.490	-1.807*	-0.468	-1.709*
Trust	0.366	3.976***	0.372	3.948***	0.404	4.033***
Level of financial risk aversion			-0.015	-0.154	-0.043	-0.431
Level of input control risk aversion			0.120	1.221	0.100	1.006
Level of financial risk aversion * trust					-0.147	-1.836*
Level of input control risk aversion*trust					-0.041	-0.501
Log-likelihood	-108.493		-107.574		-105.787	
AIC	240.99		243.15		243.58	
McFadden's pseudo-R ²	0.151		0.159 ($\Delta R^2 = 0.008$)		0.173 ($\Delta R^2 = 0.014$)	

* $p < 0.1$, ** $P < 0.05$, *** $P < 0.01$

<Table 6> Estimation of results of marketing contract quantity model

Variable	Model 4		Model 5		Model 6	
	Estimate	t value	Estimate	t value	Estimate	t- value
Age	-0.004	-1.527	-0.005	-1.746**	-0.004	-1.459
Squared age	0.008	0.45	0.010	0.563	0.009	0.492
No. of children	0.003	1.465	0.003	1.46	0.003	1.525
Farming experience	0.092	1.88*	0.099	2.009**	0.090	1.877*
Edu. dummy 1	-0.023	-0.331	-0.020	-0.293	-0.018	-0.261
Edu. dummy 2	0.009	0.208	0.000	-0.001	0.013	0.296
Non-farming income	0.01	0.237	0.005	0.122	-0.008	-0.206
Diversification	0	-0.827	0.000	-0.835	0.000	-0.45
Area	-0.129	-2.338**	-0.140	-2.522**	-0.129	-2.369**
Optimism	0.048	2.626***	0.044	2.373**	0.045	2.446**
Trust			0.017	0.874	0.023	1.146
Level of financial risk aversion			0.029	1.512	0.034	1.715*
Level of input control risk aversion					-0.040	-2.374**
Level of financial risk aversion * trust					-0.046	-2.754***
log Sigma	-1.276	-21.863	-1.281	-21.973***	-1.307	-22.469***
Log-likelihood	-70.968		-69.735		-64.361	
McFadden's pseudo-R2	0.133		0.148 ($\Delta R^2 : 0.015$)		0.213 ($\Delta R^2 : 0.065$)	

* p<0.1, ** P<0.05, *** P<0.01

<Table 7> Comparison between low and high trust groups

	Low trust group		High trust group	
	Estimate	T value	Estimate	T value
Age	-0.024	-0.646	-0.003	-1.20
No. of children	-0.065	-0.220	0.002	0.13

Farming experience	0.001	0.054	0.003	1.95*
Edu. dummy 1	-0.365	-0.751	0.102	2.83***
Edu. dummy 2	-0.710	-0.768	0.004	0.09
Non-farming income	0.322	0.613	0.015	0.47
Diversification	-0.870	-1.551	0.030	1.01
Area	0.000	-0.240	-0.000	-2.64***
Optimism	-0.623	-0.856	-0.077	-1.86*
Level of input control risk aversion	0.368	2.235**	-0.007	-0.50
log Sigma	-0.356	-1.594***	-1.650	-27.15***
Log-likelihood	-21.128		-3.211	
McFadden's pseudo-R2	0.166		0.81	
observations (left-censored)	32(20)		188(39)	

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