



The research of factors about pig farmers to select the different vertical cooperative modes in Henan province

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ABSTRACT

Henan is an important province of pig production, the development of pig industry has a positive effect to improve farmers' income, promote rural development and promote agricultural modernization. In the stage of the pig industry to scale, standardization and industrialization, there is a problem we are facing is How to promote the level of vertical cooperative and improve the competitiveness of pig industry based on the situation of Henan. Based on the transaction cost theory, the study analyzes the factors for pig farmers to select the different vertical cooperative modes use of Multi-choice Model and holds that transaction costs affect the farmers to choose different vertical cooperative modes. There is a significant positive correlation between pens area and investment funds with the selection of vertical cooperative mode; Under transaction uncertainty indicators, there is no effect between age of householder, educational level and enjoy the policy with the selection, and there is a significant negative correlation between farming experience and technical risk with the selection, and there is a significant positive correlation between information obtained capabilities, financial risk and disease risk with the selection; Under frequency of transaction indicators, there is a significant positive correlation between slaughter capacity and the selection.

Keywords: Henan province; pig industry; vertical cooperative mode; transaction costs ; Multi-choice Model

INTRODUCTION

In recent years, in order to prevent excessive volatility in pig prices and to stabilize pig production, the relevant government departments conducted a series of regulation, for example, the central government introduced policies to support pig production in 2007. The policies improve pig production to scale breeding and vertical integration, at the same time, many retail investors gradually withdraw from the market because they are inability to bear the risk and so on. The proportion of scale breeding is continued to increase in pig industry, but the number of retail investors hold the superiority in the total farmers. In 2011, the retails accounted for 90.5 percent of farmers, scale households (annual slaughter is 50 or more) accounted for only 9.5%. In pig industry, the speed of vertical integration is slow, the mode of pig production is relatively backward, the integrated development of the industry is still lagging behind, the interest action mechanism is not perfect, there is not real form a community of economic interests, the farmers are difficult to guarantee the income in the fluctuations of the market price, all of those will hinder the stable development of pig production. Currently, the pig industry is undergoing structural transformation and upgrading in Henan. Policy support and the rapid increase in the consumption provide new opportunities for changes the developmental modes of pig industry. The rapid development of standardization, scale and industrialization created good conditions for accelerate the transformation of development mode of pig industry.

For a long time, the studies were go deep into the vertical cooperative. Some scholars believe that the transaction costs and producer characteristics are the main factors of the selection of the vertical cooperative modes in

agricultural (Frank et al., 1992; Imre Fertó, 2002), the other scholars believe that the market structure, technology, rules and so on are the main factors of the selection of the vertical cooperative modes in agricultural (Hobbs, 2000). By a further explore, Wang Guixia (2006) believe that the impact of transaction costs is more significant than the personal characteristics of the farmers and the features of production and operation in the selection of the vertical cooperative modes. Tang Qionqiong (2012) considers the production and operation characteristics and transaction costs are the main factors of the selection of the vertical cooperative modes in mushroom production, the motivation of the selection is increase revenue. Yao wen (2011) believes that transaction costs and risk are the main reasons for farmers to select vertical cooperative modes. Hu Dinghuan (2006) pointed out that comparative advantage decides the choice of vertical cooperative modes of apple farmers. Sun Yanhua (2010) considered the expected benefits maximize determined the selection of vertical cooperative modes in broiler industry. Some scholars believe reducing the price and uncertainty of payment are the motivation that the pig farmers select sellers (Dai Yingchun, 2003; Zhou Shudong, 2005). Ying Ruiyao (2009) considered the economy variables of the households and society constrained the choice of vertical cooperative modes in some extent.

In summary, the literature is more in the selection of vertical coordination in agriculture, but the literature is less in pig production field, and most of literature point to the slaughtering and processing enterprises as objects. The study of Henan pig industry is also little. So, based on the theory of transaction costs, this study was discussed the factors affecting farmers choose different vertical cooperative modes.

CONCEPT DEFINITION

Martinez (2002) defined the vertical cooperative as longitudinal collaboration links the various stages in the marketing system, at the same time, as a continuum which coordinate the product quantity, quality and delivery time during the various stages of production and marketing. The extremes of the vertical cooperative modes are respectively market transaction and vertical integration mode, there are other modes between them.

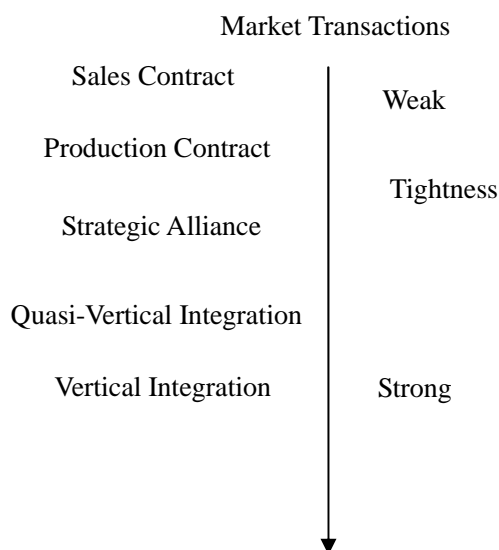


Fig.1: vertical cooperative modes ¹

The market transaction is a one-off transaction. The exchanges of information are limited during the transaction. The control is limited the transaction process of price discovery and decide whether to accept the price. It is the lowest level of control during the total models. The market price plays a dominant role in the transaction. Contract production is a sales model use the contract, including commodity contracts (sales contract) and elements contract (production contract). Sales contracts usually only provide the market for selling products and little intervene the production process. Production contracts not only provide the market for selling products, but also intervenes the production process and retain the ownership of the important production factors (Martinez, 2002). Strategic alliances means two or more enterprises which have the similar operating strength, through contractual to achieve the strategic goal of sharing resources and to form a loose network organization which have a complementary advantages, risk sharing and factor mobility, but the coalition parties remain independent operations. Quasi-vertical integration means that the companies and their suppliers through a specific contract to establish the relationship of quasi-specific investment. For example, in the agricultural sector, in order to break the small-scale peasant operation

¹ This figure is arranged according to Marion (1985) and Dai Yingchun (2003).

mode with dispersed and low level of organization, the farmers, intermediary organizations and leading enterprises establish a complex economic organization in accordance with the quasi-rent maximization objectives which is different of company or market transactions. The organization linked the small-scale peasant operation with the market. Vertical integration means that the transfer of the various stages of the product are hierarchical relationships, the resources are control at each stage of the transfer by the higher command. This model is the highest degree of control. All parties in this model depend with each other, open the information and share benefits. The fig. 1 describes the kinds of vertical cooperative modes.

THE SITUATION ANALYSIS

According to the data of investigation about Henan farmers, the study analyzes the cooperative relationship between farmers with piglets, feed, veterinary medicine suppliers from upstream and pig buyers from downstream. It considers that there are four common modes include market transactions, sales contract, production contract and vertical integration (Fig.2).

Because of the limitation of the data availability, this study only selected market transactions, sales contract and production contract from the vertical cooperative mode of the pig industry in Henan to analyze and discuss.

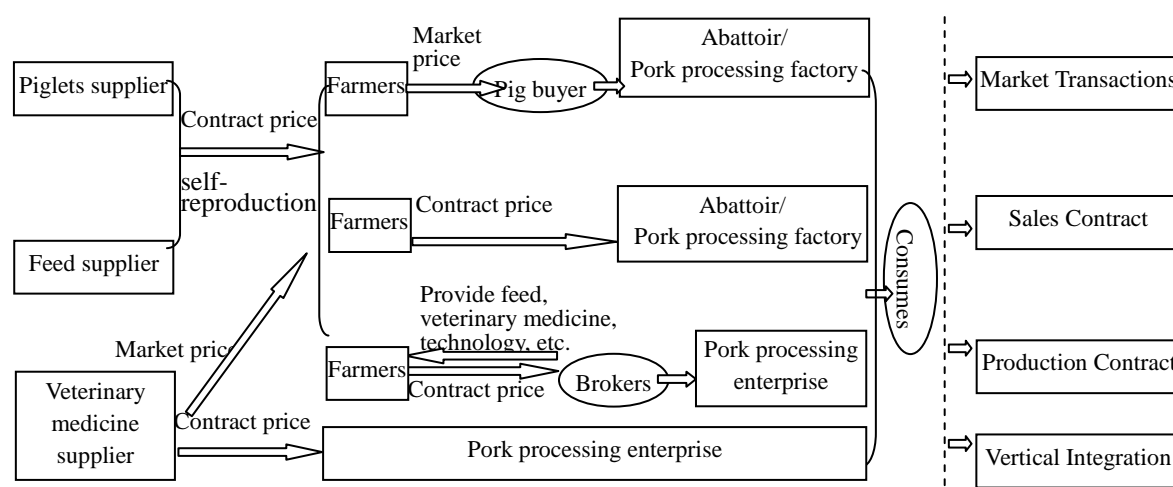


Fig.2: The organizational chart of different vertical cooperative modes of Henan

THE RESEARCH OF FACTORS

In 1937 in the "Nature of the Firm", Coase first proposed the concept of transaction costs and introduced the concept into economics analysis, successfully conducted a study of mutual substitution between markets and enterprises. The reasons of the transaction costs incurred comes from market failures and transaction difficulties which are produced under the influence of the individual differences of the transactions and the environmental factors. Williamson pointed out that the six sources of transaction costs are bounded rationality, opportunism, uncertainty and complexity, a few transactions, information asymmetry and atmosphere. Further the source, it discover the three features of the transaction itself, asset specificity, uncertainty and frequency of transaction, form three dimensions to effect the levels of transaction costs. Because of the special nature, the invested assets for the exchange are difficult to be recycled or converted to other uses when the contract finished, this is defined as asset specificity. Transaction uncertainty is the probability of the various risks throughout the transaction. Because of the people's bounded rationality, information asymmetries and so on, they cannot fully predict the future, so the uncertainty is brought. At the same time, the changes in the trading environment also increase the uncertainty of the transaction. The uncertainty increases the difficulties and costs of the transactions. The frequency of transaction are more, the costs of management and bargaining are higher. In order to decrease the costs, the enterprises will make the economic activity of the transaction in the interior when the frequency of transaction increased. Based on the availability and accuracy of the data, from these three dimensions, the research chooses variables to analyze the factors of the selections of the vertical cooperative modes.

Asset specificity: In the production process, the agricultural labor performed more particularly and sophisticated, the asset specificity is stronger. The dedicated assets invested by pig farmers mainly included fixed assets investment, land investment, labor input, time and capital of training which in order to improve breeding professional techniques and knowledge and so on. The land is used to breed pigs and the equipment tools are used in the pig production has very small possibility to be converted to other uses, they have the strong specialization. The research selects two

indicators include the pens area and fixed investment.

Uncertainty: The farmers will meet many uncertainty factors during the production process. For example, the fluctuations of pig price, disease transmission, breeding technology changes, obtain capacity of fund and information, and so on. The personal characteristics of the farmers affect the uncertainty of the transactions. From the aspects of bounded rationality, policy, technology, disease, information and funds, this research chooses age of householder, farming experience, educational level, enjoy the policy, source of information, breeder engaged in technical, loan and number of dead pigs as the indicators

Frequency of transaction: The frequency of transaction is higher, the costs of seeking buyers and bargaining is more. The slaughter capacity can represent the breeding scale in a certain extent, so this research chooses slaughter capacity as the indicator of frequency of transaction.

The table 1 is the variable settings and definitions.

Table1: Variable settings and definitions

Variable		definition
Asset specificity	Pens area	pens area for pig production and operation(mu)
	Fixed investment	funds for the construction of fixed assets(ten thousand yuan)
Uncertainty	Age of householder	age of householder(years)
	Farming experience	time which engaged in pig production and operation(year)
	educational level	0=primary and below,1=junior high school,2=senior middle school,3= college and above
	policy	0=not enjoy the policy,1=enjoy one of the policies.....
	Information	1=one source of information,2=two sources of information.....
	Technical risk	breeder who engaged in technical guidance
Frequency of transaction	Funding risk	0=loans,1=no loans
	Disease risk	the number of dead pigs(tou)
	Slaughter capacity	the number of fattening pigs slaughter(tou)

MODEL EXPLAIN

The farmers seek to maximize the expected return when they select vertical cooperative. According to the previous set of the features factors that influence the level of transactions costs for farmers, the following function to show the selections of the different of the vertical cooperative modes for farmers:

The selections of the different of the vertical cooperative modes = F (Variable of asset specificity, Variable of uncertainty, Variable of frequency of transaction) + Stochastic disturbance

The dependent variables in the model are the selections of the different of the vertical cooperative modes. The questionnaires design the channels and modes about obtaining the piglet, the feed and the veterinary medicine and selling pig. According to the data from the questionnaires, the study decides and assigns the value for each vertical cooperative mode, the value of the market transaction is 0, the value of the sales contract is 1 and the value of the production contract is 2.

The research main study the factors of the farmers select the different of the vertical cooperative modes. The farmers main have three vertical cooperative modes, including market transactions, sales contract and production contract. The number of the dependent variable is more than two and they are discrete variable. There exists a certain gradation between the three variables in tightness of vertical cooperative. So the research adopts Multi-choice Model to conduct econometric analysis. This research provided that the variables are independent with each other when uses the model. The estimating equations of the model is a group probabilities which means that the famers who have Characteristics X_k face m sorts of the selections about the vertical cooperative modes.

$$P(y=y_i | X_i, \beta) = P(y=y_i | x_1, x_2, \dots, x_k) \quad (1)$$

Where, y_i have m kinds of the selections from 1 to m . In order to analyze the Multi-choice Model, the study is introduced y_i^* which is the unobserved latent variable.

$$y_i^* = X_i' \beta + \varepsilon_i^* \quad (2)$$

Where, ε_i^* is stochastic disturbance which is independent with each other and identically distributed, there is a certain corresponding relationship between the value of y_i and y_i^* which is the unobserved latent variable.

$$\begin{cases}
 1, y_i^* \leq c_1 \\
 2, c_1 < y_i^* \leq c_2 \\
 y_i = 3, c_2 < y_i^* \leq c_3 \\
 \dots \\
 m, c_m < y_i^*
 \end{cases} \quad (3)$$

There is the hypothesis that the distribution function of ε_i^* is $F(x)$, the probabilities of the dependent variable y takes the value of each choice:

$$\begin{aligned}
 P(y_i=1) &= F(c_1 - X'\beta) \\
 P(y_i=2) &= F(c_2 - X'\beta) - F(c_1 - X'\beta) \\
 &\dots\dots \\
 P(y_i=m) &= 1 - F(c_m - X'\beta)
 \end{aligned} \quad (4)$$

In the formulas, x_k is the factors which effecting the selection of the different of the vertical cooperative modes by farmers, β is estimated coefficients, the direction and degree of β obtained by the maximum likelihood estimation method.

DATA

The data come from the investigations and questionnaires by research group for Henan Province. In the south of Henan province, Luohe is the largest city in breeding densities of pig. Zhumadian is the largest city in slaughter capacity of pig production. Xinxiang is the largest city in breeding densities and slaughter capacity of pig production in the north of Henan province. The pig production situation has strong representative in these three cities, so the study selects them as sample points. Adopting sampling survey method, this research conducted an investigation include basic situation, production management, disease prevention, constructing of standardization and policies Satisfaction and collected 68 copies of valid questionnaires among 72 copies sample data, Table 2 shows the specific distribution of the samples.

Table2: Sample Distribution

Sample points	Number
Xinxiang	38
Luohe	18
Zhumadian	12
Total	68

RESULTS AND DISCUSSION

At first, the research does the univariate correlation test between the different of vertical cooperative modes and the factors which affecting the selection of the vertical cooperative modes, the results are shown in Table 3.

Table3: The correlation test results between univariate factor with different vertical cooperative modes

Variable		Z statistic	Probability	Significant level
Asset specificity	Pens area	3.2048	0.0014	***
	Fixed investment	3.1104	0.0019	***
Uncertainty	Age of householder	0.6997	0.4841	
	Farming experience	2.1864	0.0288	**
	educational level	1.0443	0.2963	
	policy	1.2267	0.2199	
	Information	-2.9543	0.0031	***
	Technical risk	3.4383	0.0006	***
	Funding risk	4.2090	0.0000	***
Disease risk	3.0790	0.0021	***	
Frequency of transaction	Slaughter capacity	4.5521	0.0000	***

Note: *, **and *** mean significance at 10%, 5% and 1% levels.

The table 3 shows that, there is a significant positive correlation between pens area, fixed investment, farming experience, technical risk, funding risk, disease risk and slaughter capacity with the selection of the vertical cooperative modes; there is a significant negative correlation between information and the selection; there is no

effect between age of householder, educational level and enjoy the policy with the selection. The probability values about Z statistic are small and the results are significant in statistics. In short, the probability is bigger that the farmers adopt production contract when the pens area is bigger, the fixed investment is more, the breeding time is longer, the technical risk is bigger, the loan is more and the disease risk is bigger. Conversely, the probability is bigger that the farmers adopt market transactions when the capability of getting the information is more.

Then, the research analyzes the samples using Multi-choice Model, the results are shown in Table 4. The results shows that, LR statistic is 49.9375, the probability value is $1.43E-06$, the coefficients are significant overall, the fit of the model is better.

Table4: The econometric analysis results of selection factors about different vertical cooperative modes

Variable		Coefficient	Std. Dev.	Z statistic	Probability	Significant level
Asset specificity	Pens area	0.0143	0.0108	2.3306	0.0264	**
	Fixed investment	0.2890	0.1681	2.0188	0.0856	*
Uncertainty	Age of householder	0.0190	0.0315	0.6024	0.5469	
	Farming experience	-0.6976	0.2031	-3.4351	0.0006	***
	educational level	-0.0002	0.0004	-0.5818	0.5607	
	policy	0.0862	0.1137	0.7583	0.4483	
	Information	0.1460	0.1811	2.8065	0.0358	**
	Technical risk	-0.7702	0.3930	-1.9600	0.0500	**
	Funding risk	0.0573	0.0430	2.3327	0.0426	**
Disease risk	0.0008	0.0004	2.1236	0.0337	**	
Frequency of transaction	Slaughter capacity	0.0001	0.0000	3.0197	0.0025	***

Note: *, **and *** mean significance at 10%, 5% and 1% levels.

The follow is the analysis against the table 4.

First, from the asset specificity angle, there is a significant positive correlation between pens area and fixed investment with the selection of the vertical cooperative modes by farmers. The Z statistic and probability value is significance, the results is in line with the anticipations. So the results show that the Asset specificity level is higher, the farms are trend to select closer of the vertical cooperative mode.

Second, from the uncertainty angle:

(1) Bounded Rationality factors: it includes age of householders, farming experience and educational level. There is no effect between age of householder and educational level with the selection of the vertical cooperative modes by farmers. The reason maybe the pig production is a lower level, pig industry is labor-intensive industries, the entry barriers is lower, the pig breeding technology is relatively easy to obtain, so there is little effect from age and education level of the farmers to the pig production and operations. But there is a significant negative correlation between farming experience and the selection of the vertical cooperative modes by farmers. Scilicet, the farmers who have more farming experience prefer to select market transactions mode, the new farmers will choose sales or production. The reason maybe that the farmers can predictable during the breeding processes who have more farming experiences. They can avoid unnecessary losses in those areas of the pig slaughter time, looking for buyers, purchasing of production and preventing of diseases, decrease the cost of the breeding and increase the capability of anti-risk. In a market transactions mode, they also keep a stable earnings rate.

(2) Policy factor: there is no significant correlation between enjoy the policies and the selection of the vertical cooperative modes by farmers. The reason maybe that the government issues a number of preferential policies, but only the subsidy policy for mature sows is extension, at the same time, this policy is promoted and implemented cover all regions, the difference of enjoying the policy is very small, the affection of the polity is not significance to select the vertical cooperative modes.

(3) Information risk factor: there is a significant positive correlation between the information obtained capabilities and the selection of the vertical cooperative modes by farmers. Scilicet, the channel of getting information is more, the probability is less to select production contract. In contrast with the expected results, the reason maybe that the farmers who adopt the market transactions mode have many uncertainty factors, so the farmers will catch the information by kinds of channels. The results show that the channels of getting information is more, the probability is more to select market transactions.

(4) Technical, Funding, Disease risk factors: there is a significant negative correlation between technical risk and the

selection of the vertical cooperative modes by farmers, and there is a significant positive correlation between financial risk and disease risk with the selection. Scilicet, the breeder who engaged in technical guidance is more, the probability is more to select market transactions mode, and the loan and the number of dead pigs is more, the probability is more to select production contract mode. The results are the same with the expected. The reasons are that the more breeder who have the production technical will decrease the risk during the production processes. No loans and dead pigs, the uncertainty factors decrease, the transaction costs will become lower, so the farmer choose market transactions which have low-cost will obtain greater benefits.

Finally, from the frequency of transaction angle, there is a significant positive correlation between slaughter capacity and the election of the vertical cooperative modes by farmers. Scilicet, the probability is more to select production contract mode. The result is the same with the expected, the breeding scale is bigger, the frequency of transaction is higher, there is more transaction costs to sell the pigs, Involved in production contract can guarantee sales channels, reduce the cost of pig sales.

CONCLUSION

The research holds that transaction costs affect the farmers to choose different vertical cooperative modes. There is a significant positive correlation between pens area and investment funds with the selection of vertical cooperative mode; Under transaction uncertainty indicators, there is no effect between age of householder, educational level and enjoy the policy with the selection, and there is a significant negative correlation between farming experience and technical risk with the selection, and there is a significant positive correlation between information obtained capabilities, financial risk and disease risk with the selection; Under frequency of transaction indicators, there is a significant positive correlation between slaughter capacity and the selection.

Based on the research and conclusions, the tight vertical cooperative mode is more beneficial to the stable development of the pig industry and increases the income of farmers. According to the situation of the Henan province, the research proposes the following recommendations.

The industry structure determines the enterprise performance. The government needs to issue industry policies to promote the industry structure in the form of the tighter vertical cooperative mode. In the previous study, it holds that there is no effect between enjoy the policy and the selection from farmers. It is because that the award conditions are too high to reach for many farmers, so making the policy failure. Next, the policies of the incentives and subsidies must be refining and classification. The policies play the role to guide the production of the all levels farmers progressively, encourage the farmers to develop scale breeding, cultivate the leading enterprises, promote the development of the tight vertical cooperative modes and include more farmers into the system of cooperative mode. In this way, the pig industry is developed stably and increases farmers' income.

Universities and research institutions joint to research and discuss the rural finance and solve the problem of the weak rural finance. Encouraging financial institutions enter the rural market and increase the size of loans for various aspects of the pig industry and ensure the funding needs. The last but not the least, the government strengthen the propaganda of the government's subsidy policy and ensure subsidies in place.

The government integrates the management mechanisms of pig vaccines and veterinary medicine market, strengthen the approval and supervision for the advocacy work of veterinary medicine supplier at countryside, train the disease prevention knowledge for farmers on system and increase the quality and variety of the free vaccines. Thereby farmers were reduced the disease risk during the process of the pig production.

Strengthening the construction of the rural infrastructure and establishing and improving the platform of the information exchange in rural areas to ensure the farmers obtain the information related the pig production. Through this way, the farmers were reduced the uncertainty which is caused by lack of information.

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