microInsurance Innovation facility
PROTECTING THE WORKING POOR

EU DN

International Labour Office
Geneva

SMALLHOLDER PARTICIPATION IN HOG INSURANCE AND WILLINGNESS TO PAY FOR IMPROVED POLICIES: EVIDENCE FROM SICHUAN PROVINCE IN CHINA

Kevin Chen
Wuyang Hu
Chengwei Xiao
Li Xing

RESEARCH
PAPER No.28

JANUARY 2013

SMALLHOLDER PARTICIPATION IN HOG INSURANCE AND WILLINGNESS TO PAY FOR IMPROVED POLICIES: EVIDENCE FROM SICHUAN PROVINCE IN CHINA

Kevin Chen, Wuyang Hu, Chengwei Xiao, and Li Xing[1]

ABSTRACT

China is the world's largest hog producer. However, its hog insurance is underdeveloped and not widely taken-up by small producers. Using rural household survey data collected from Sichuan province in China, this study examines contributing factors to farmers' participation and their willingness to pay for improvements to the current insurance policy. Two key policy innovations were investigated: increasing guarantee values and extending the insured period. Results show that farmer demographic characteristics, the size of their operation, as well as their knowledge about insurance played important roles in farmers' insurance participation decisions. Farmers' willingness to pay responded positively to the two insurance terms that are more favorable to the insured, however, strong heterogeneity among farmers was found. These results provide further insights for improving hog insurance policy design and promoting farmer participation.

INTRODUCTION

China produces the world's largest number of hogs per year. According to the Food Agriculture Organization (FAO), hog production in China reached 480 million in 2010, accounting for 49.3% of total world output (FAO 2010). However, China's hog industry often suffers from the outbreak of hog disease, such as the nation-wide outbreak of hog disease in 2010, and the frequent occurrence of natural disasters, such as the 2008 ice storm in southern China and the 2008 Wenchuan earthquake in Sichuan province (Gale et al. 2012).

The Chinese government provides subsidies to producers who suffer from loss due to hog disease and natural disasters as a traditional risk mitigation strategy. However, these subsidies have been ineffective as a means of addressing the risks (Hu and Yang 2011). Currently, government subsidies only cover losses due to large-scale events and not losses due to events that affect only one or a few individual producers. Subsidies also increase financial burdens to the government while limiting the role that private capital could play in risk diversification. Therefore, hog insurance is proposed to serve as a complementary risk mitigation strategy. This is a "green box" policy[2] recommended by the World Trade Organization to support domestic agriculture.

In recent years, the Chinese government has increasingly prioritized agricultural insurance including hog insurance. In 2007, the China Insurance Regulatory Commission officially approved the establishment of a hog insurance program and authorized major agricultural insurance subsidies for individual farmers. As of June 2009, a total of 153 million heads had been insured and claims had been processed for over 7 million heads/times (China Insurance Regulatory Commission 2009). However, despite the promising future of hog insurance in China, government officials, hog insurers, as well as scholars are concerned about the current participation rate among producers, and among small producers in particular. The key research question is why the highly subsidized premium and the strong encouragement from the government fail to effectively encourage small producers to participate in the hog insurance program. This study offers insights into this question by explaining factors affecting farmers' participation decisions and willingness to pay (WTP) for improved insurance policy terms.

BACKGROUND

In 2009, 70 million small producers (defined as producers with 50 heads or less) accounted for 97% of the hog producers in China (China National Statistics Bureau 2010). There has been a lack of small producer participation in hog insurance because the hog insurance program has only been established in a very small number of China's 31 provinces. Moreover, for those regions where the hog insurance is offered, little effort has been made to accommodate the unique needs of small producers. In some regions,

[1] Kevin Chen is the Director of the International Center for Agricultural and Rural Development at the Chinese Academy of Agricultural Sciences, and is also the China Program Leader and a Senior Research Fellow with the International Food Policy Research Institute (his email is k.chen@cgiar.org). Wuyang Hu is an associate professor at the University of Kentucky (his email is wuyang.hu@uky.edu). Xiao Chengwei and Xing Li was a Masters student when this paper was initially prepared and a Research Fellow at the Institute of Agricultural Economics and Development, respectively. The authors want to acknowledge the financial support from the Micro-Insurance Facility at the International Labor Organization and are also grateful for the support provided by China's Contribution to IFPRI/CGIAR. The authors also want to acknowledge guidance and assistance received from Yanyan Liu, Ruth Hill, and Yuehua Zhang during the stage of survey design and data collection.

[2] According to the WTO, green box policies refer to those that are believed to have minimal distortion on trade (WTO 2012).

there are explicit policies that require at least 50 heads of hog slaughtered per farm per year to be considered for insurance. Terms in the current insurance policies are often considered unattractive by small producers and no alternative insurance options are provided. The lack of interest from producers, especially from the preponderance of whom which are small producers, is a major obstacle to scaling-up hog insurance in China. This study examines factors that may increase farmers' participation in hog insurance, drawing evidence from Zizhong county in Sichuan province.

Sichuan is one of the few provinces in China where small producers are specially listed as the target customers of the insurance program. Sichuan, one of the largest hog-producing provinces, produced over 71 million heads and ranked number one in hog output in 2010. This amount of production accounts for 10.8% of national hog output (China National Statistics Bureau 2011). In Sichuan, hog production is concentrated in a few key counties. Zizhong is one of these counties with a production level of over 1.4 million heads per year (Zizhong Food and Animal Husbandry Bureau, 2011). Zizhong County is an ideal candidate for our study because it was selected by the provincial government to participate as one of the first hog insurance pilot counties in 2005. It was also among the early adopters and beneficiaries of the insurance premium subsidy program launched by the central government in 2007. The premium subsidy program is still in practice today.

Using information collected from a survey of 1,684 producers in Zizhong county, Sichuan, this study examines what factors may affect small producers' participation in hog insurance. Some researchers have pointed out that one of the most important factors discouraging farmers from entering into an insurance contract is the unfavorable terms in the policy (e.g., Hu and Yang 2011). This research further explains how many small producers would be willing to pay if the terms of the insurance policy were improved. At the time of the study, the total insured value for hogs in Sichuan province was ¥500/head.[3] The insurance covered a period of 4 months, which was assumed to be the length of time needed for farmers to raise hogs for sale. At this time, the premium was ¥18/head. Of the ¥18, producers needed to pay ¥5.4 while the government subsidized the remainder.

In this study, two major types of improvement to the current predominant policy are proposed. These improvements were selected as a result of discussions with focus groups involving experts and producers. The first approach involves increasing the guarantee level from the current ¥500 to ¥800, and the second approach involves increasing the insured period from 4 months to 6 months. A payment card question was adopted in the survey to elicit farmers' WTP for these improved terms. To the best of our knowledge, this study is one of the first to investigate Chinese hog producers' participation in hog insurance and WTP for various hog insurance policy terms. The relatively large size of our sample used and the focus on small producers are rarely seen in the literature. Understanding small producers' participation in hog insurance and WTP for improved insurance terms offers insights to insurance policy design that encourage participation and subsequently effectively mitigate the risks faced by a large number of small hog producers in China.

RELEVANT LITERATURE

Recent research in hog insurance design and farmer participation is rare in the international literature (Cao and Zhang 2011), except for a few related to livestock insurance (e.g., Gramig et al. 2009; Koontz et al. 2006). Most of the literature on agricultural insurance in China is concentrated at the macro level, and focuses on insurance management and supervision. Although some of these researches focus on crop insurance (e.g., Wang and Yu 2010), very few deal with hog insurance. Most of the work on hog insurance only appeared after 2007, when the implementation of hog insurance was officially authorized in China. Before this, earlier research was limited to focusing on theoretical models of hog insurance promotion. Mao and Li (2008) suggested that creating financial incentives, such as cash rebates, product bundling, discounts, prizes, or mandatory insurance, could encourage insurance participation. Liu et al. (2008) identified unreasonable terms in insurance policies, the lack of farmer knowledge of insurance, and the lack of attention paid by insurers to small producers as major barriers to farmer participation.

There are also few empirical studies on hog insurance participation. Zhang (2010) randomly surveyed 154 hog farmers in 6 natural villages in Shanxi province and found that size of operation, knowledge about insurance, degree of trust to insurance companies, as well as the size of government subsidies all affected their willingness to participate in insurance. Hu and Yang (2011) selected 101 farmers in suburban areas of Beijing and found that size of operation, proportion of household income coming from hog production, and knowledge of insurance were significant factors in farmers' participation. The same authors also investigated farmer participation when the guarantee level was hypothetically raised from ¥700 to ¥1,000

[3] One US dollar was approximately equivalent to 6.5 RMB at the time of this study.

and government subsidies covered 50% of the cost of the premium. They found that size of operation, household income, and degree of trust in insurance companies were important factors affecting farmers' decisions.

Zhang et al. (2011) took a slightly different approach by studying the relationship between hog death rates, vaccine quality, and the demand for hog insurance. These researchers investigated 531 farmers in Zhejiang province. They found that the bio-security measures producers took affected their choice of vaccine quality and their willingness to participate in insurance. Usage of high quality vaccines and purchase of hog insurance, significantly reduced the needs for bio-security measures undertaken by farmers. Farmers using high quality vaccines were less likely to participate in hog insurance.

Cao and Zhang (2011) examined hog insurance purchasing behavior from the demand and supply perspective, using the same dataset as Zhang et al. (2011). The study showed that farmers' purchasing behavior is related to their age and level of education. While insurance companies were more willing to sell insurance to the more experienced producers, the latter were often less likely to purchase the insurance due to their high confidence level resulting from years of experience. The study also found that the size of the operation and the number of swine on a farm were both positively linked to insurance purchase, which were not considered by insurers. Although insurance companies were incentivized to encourage hog vaccine investment as a complementary risk mitigation strategy, producers viewed vaccination as an alternative to hog insurance.

The existing literature has a number of critical limitations. First of all, all of the studies on farmer hog insurance participation in China reviewed above focused on large producers. The average operation size in the studies above was well over 100 head. In theory, large producers are more likely to participate in hog insurance than small producers, considering that a greater share of their household income and family wealth comes from the hog operation. In fact, the percentage of non-insured producers is much higher among small farmers, which is especially worrisome as they usually have very limited access to advanced technology such as vaccines or bio-security systems and are less capable of diversifying risks.

The second limitation is that most studies have focused on hog insurance in more developed regions, such as Beijing and the coastal province Zhejiang, while hog production is mainly concentrated in inland provinces. For instance, all top three hog producing provinces (Sichuan, Henan, and Hunan) are in the less-developed western and central inland regions. The management and implementation of hog insurance in these regions diverge significantly from those of more developed regions. For instance, the guarantee level for each hog was ¥700 in Beijing, while it was ¥500 in Sichuan. In Zhejiang province, insurers were allowed to be selective about which customers they would approve, while in Sichuan, insurers were required to accept all legitimate insurance applications. As a result, the current body of literature dedicated to farmer insurance participation decisions does not account for the insurance participation decisions of the majority of hog producers in China.

Finally, previous studies are limited by their relatively small sample sizes, which range from a few dozen to a few hundred households. This is due to the complexity of data collection. Collecting household-level data on farmers' hog insurance decisions requires the assistance of government officials and local insurance brokers. In this research, we collected information from 1,684 farmers in Zizhong county, most of which were small producers.

DATA

A questionnaire was developed by the research team to investigate hog (excluding sow) insurance participation in Zizhong, Sichuan. Prior to the finalization of the questionnaire, numerous focus group discussions were held to identify survey questions that best addressed the main research questions. The participants of these focus groups included hog insurance experts, researchers, and hog farms. After the preliminary questionnaire was developed, four rounds of pretests were conducted in July, September, October, and November 2010. These pretests were used to confirm the sampling scheme, fine-tune the wording, and test the results by conducting descriptive statistical analysis. Each pretest collected around 100 samples.

The final in-person survey was implemented in December 2010. The survey was administered by six teams, which were composed of students and faculty from a local university as well as members of researchers of this project. Each team was lead by an experienced individual as team leader. All team members were trained in the actual survey sites. The language used in the survey was fixed to reduce bias. At the end of each day, the survey teams met to discuss issues encountered during the day. Questions or concerns were shared with the project leader. Solutions or notes were then distributed back to each survey team on the same day. All survey data were digitalized at the end of each day and sent to the project leader. Hard copies of completed questionnaires were collected periodically from the survey teams to verify the electronic copy. All

surveyors were accompanied by local agricultural extension agents to help ease the conversation during their visits.

Survey samples were selected using a mixed sampling scheme. There are 32 townships in Zizhong county. A clustered sampling method was used. Based on 8 criteria, a cluster analysis generated 3 clusters. The 8 criteria were: annual hog production, heads insured, heads that received payment, size of arable land, size of the rural population, size of rural households, rural GDP, and number of individuals working in non-agriculture related fields away from home. Within each cluster, one township was randomly chosen. The three selected townships were: Gongmin, Chonglong, and Ganlu. Table 1 displays the characteristics of the three townships based on the 8 selection criteria of the cluster. It is clear that compared to the county-wide average, the three townships represented a variety of conditions.

Six natural villages were randomly selected from each of the three chosen townships. All hog producers were surveyed in these 18 villages, with a response rate close to 80%. A total number of legible 1,684 respondents were included in the data.

The questionnaire was composed of three main sections. The first section asked respondents about their household demographic and socioeconomic characteristics. This section also contained questions on the basics of their agricultural operation, such as farm income composition. The second section asked farmers about their hog production practices, including questions on hog insurance. The third section contained questions on how the respondents financed their farms. A key question was whether farmers participated in hog insurance in 2010. The data collected also included information on hog insurance participation in 2009 and 2008. While it was interesting to investigate whether there had been changes in farmer participation over time and contributing factors to the changes, these issues were not the focus of the current study.

Table 1. Characteristics of Three Chosen Townships Based on the Cluster Selection Criteria

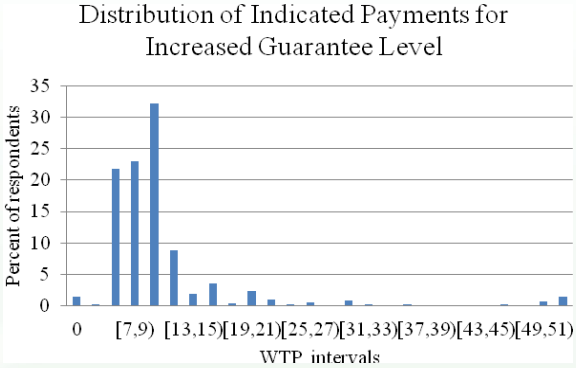
Two questions regarding farmer WTP for improved insurance terms were included in the survey. The first question asked producers what was the maximum level of premium they would be willing to pay if the guarantee level were to be increased from the current ¥500/head to ¥800/head and the current level of government subsidies (¥12.6/head) were to remain unchanged. The second question asked what was the maximum WTP if the current 4-month insurance period were to be increased to 6 months.

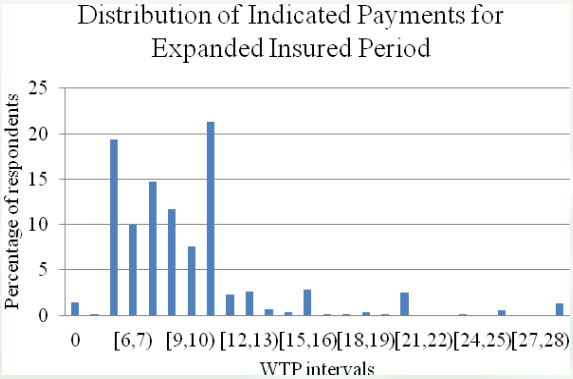
A payment card type of question was used to elicit WTP after each question (Brox et al. 2003). A series of values were offered at the end of each question and respondents were asked to choose the value that best reflected their WTP. The lowest value offered was ¥5.4/head, which was the current level of out-of-pocket premiums that farmers needed to pay, with the next levels increasing by ¥2/head increments and ranging from ¥7/head to ¥51/head. Farmers were also allowed to enter a value by hand including the value ¥0. Figure 1 shows the distribution of the indicated premiums for each question. Similar to other studies using the payment card WTP elicitation methods, the indicated payment values were concentrated around the lower values (e.g., Loureiro and Hine 2002).

Table 2 lists descriptive statistics of several key demographic variables and other relevant variables of the sample. Although there was no official census statistics on the demographic features of hog producers in Sichuan, the sample characteristics were consistent with those of a previous study undertaken in the same province, which found that the average age was 45 and the average education level was about 8 years (Liu et al. 2007). It is crucial to note that in our sample, the average number of heads raised in 2010 (measured as average over months) was about 12 and over 98% of the sampled producers had less than 50 heads, thus qualifying them as small producers. Table 2 also gives a list of variables that can be used to explain farmers' decision to participate in hog insurance and their WTP for improved insurance terms. These variables were chosen by summarizing factors examined in previous literature.

Township	annual hog production (head)	heads insured	head received payment	size of arable land (mu)	size of rural population	number of rural households	rural GDP (RMB10,000)	Number of individuals working in non-ag related fields away from home
Gongmin	57674	9933	342	33195	47236	14176	10197	14801
Chonglong	52364	8959	695	23580	43257	11623	8496	15790
Ganlu	26612	2614	241	16095	20046	6519	7550	6300
Three township average	39488	5786.5	468	19837.5	31651.5	9071	8023	11045
Zizhong county average	42655	4978	382	26515	34679	9848	8256	11138

Figure 1. Distribution of Indicated Willingness to Pay Measures





MODELS

Farmer participation in hog insurance in 2010 was modeled after a binary choice model, where the dependent variable was the decision to participate and the independent variables were those given in Table 2. The technique of interval regression was adopted to analyze farmers' WTP for improved insurance terms (Alberini 1995; Cameron and Huppert 1991). Since the two payment card questions had similar structures, our presentation in this section only focused on the question related to increasing the guarantee level.

Let W^* be the underlying true WTP (i.e., insurance premium) to obtain the increased guarantee level. W^* was known to the respondents but not to the researchers. Following Alberini (1995), a linear expression can be used to link W^* with explanatory variables:

(1) $$W^* = \mathbf{X}\boldsymbol{\beta} + \varepsilon$$

where vector $\mathbf{X}$ are explanatory variables; $\boldsymbol{\beta}$ are associated parameters to be estimated; and ε is an error term following normal distribution. If the j-th chosen value of the payment card question can be represented by μ_j and W is used to denote the observed WTP measure by the researcher, then:

(2) $$W = \mu_j \text{ if } \mu_j \le W^* < \mu_{j+1}$$

Subsequently, the relationship between the probability of the underlying true WTP and the observed measure can be established as:

(3)

$$\begin{aligned} &Prob(W = \mu_j) = Prob(\mu_j \le W^* < \mu_{j+1}) \\ &= Prob(W^* < \mu_{j+1}) - Prob(W^* \le \mu_j) \\ &= F(\mu_{j+1} - \mathbf{X}\boldsymbol{\beta}) - F(\mu_j - \mathbf{X}\boldsymbol{\beta}) \end{aligned}$$

where F is the distribution function of a normal distribution with an unknown standard deviation σ to be estimated. Based on equation (3), the maximum likelihood estimator can be applied to obtain estimates of unknown parameters. Since the interval regression is linear in parameters explaining WTP, each estimated coefficient is also the marginal effect.

EMPIRICAL RESULTS

Estimation results of the hog insurance participation model are displayed in Table 3. Overall, the model is highly significant, with McFadden's R2 equal to 0.2. The number of heads insured in 2010 and hog insurance participation in previous years were perfectly correlated with insurance participation decisions in the year 2010, therefore, were dropped from the analysis. The signs of significant variables were consistent with those of the previous literature. The age of the household head had a positive impact on the likelihood to participate in insurance, with each additional year increasing the likelihood to participate by 0.13%. A higher level of education also suggested a greater likeliness to purchase insurance. Each additional year of education suggested a 0.7% higher chance that the producer would purchase insurance.

Although household per capita income was not a significant determinant, per capita assets were positively correlated to hog insurance participation. Each ¥10,000 increase in per capita asset level leads to a roughly 0.25% increase in purchasing probability. The size of the operation was a positive factor for insurance participation. Each additional pig raised by the household increased the farm's overall hog insurance purchasing probability by 0.05%. Since the present year's decision to purchase insurance was not independent from the farm's realized gains/losses of the previous year, hog death rates of 2008 and 2009 were included as explanatory variables. Hog death rate of 2009 had a positive impact on farmers' decisions to purchase insurance in 2010. Each

percentage increase of hog death rate in 2009 indicated a 0.06% higher possibility to purchase insurance.

Table 2. Variable Descriptive Statistics and Definition

Variable	Mean	Std. Dev.	Explanation
if_ins	0.11	0.31	dummy variable, whether purchased insurance in 2010
household_size	3.77	1.45	continuous variable, household size
male	0.89	0.31	dummy variable, male = 1
age	53.96	10.79	continuous variable, household head age
edu	6.65	2.57	continuous variable, household head years of education
cap_inc	4957.43	1485.15	continuous variable, per capita household income
cap_val	294704.60	59255.67	continuous variable, per capita household asset
pig_rai_2010	11.84	51.19	continuous variable, number of pigs raised in 2010
per_2009	6.00	16.81	continuous variable, hog death rate*100 in 2009
per_2008	5.34	16.82	continuous variable, hog death rate*100 in 2008
per_ris	13.24	11.63	continuous variable, self-estimated hog death rate*100 in 2010
ins_num_2010	1.77	16.86	continuous variable, number of heads insured
if_know	0.91	0.29	dummy variable, heard about hog insurance = 1
if_mob	0.45	0.50	dummy variable, mobilized by officials to purchase insurance = 1
whe_buy	0.14	0.35	dummy variable, knew purchasing time of insurance = 1
if_sub	0.17	0.38	dummy variable, knew subsidy in premium = 1
gua_lev	0.09	0.28	dummy variable, knew highest possible payment level = 1
if_duc	0.05	0.22	dummy variable, knew the deductible = 1
pur_dec	0.71	0.46	dummy variable, purchased insurance based on own decision = 1
tru_com_no	0.13	0.34	dummy variable, did not trust insurance companies = 1
tru_com_neutral	0.10	0.30	dummy variable, neutral towards insurance companies = 1
tru_com_yes	0.77	0.42	dummy variable, trusted insurance companies = 1
cla_pro	76.35	19.55	continuous variable, likelihood of receiving payment for a claimed loss (out of 100)
req_loa	0.44	0.50	dummy variable, ever needed a loan in recent two years = 1
if_obt	0.47	0.50	dummy variable, if needed be able to borrow at least ¥5,000 = 1
Gongmin	0.39	0.49	dummy variable, residents of Gongmin township = 1
Chonglong	0.27	0.45	dummy variable, residents of Chonglong township = 1
Ganlu	0.34	0.47	dummy variable, residents of Ganlu township = 1
N=1684			

Producers' knowledge of detailed insurance terms also contributed positively to their decision to participate in hog insurance. Compared to those who were unaware of when to purchase hog insurance, those who were aware were 8.8% more likely to purchase. Respondents who were informed of the subsidies that the government contributed to cover the cost of insurance premiums and those who were informed of the level of the deductibles were 2.5% and 4.5% more likely to purchase than their uninformed counterparts.

Finally, the significance of township dummy variables suggested heterogeneity among the sampled townships. On one hand, this indicated that our sample represented a variety of regional situations. On the other hand, the significance of these dummies implied

that there were location-based factors that contributed to the difference among producers. Although not a goal of this research, future studies on hog insurance in China could further investigate the difference of rates across regions.

Table 3. Logit Model Estimation Result of Insurance Participation

Variable	Coefficient	Std. Err.	Marginal Effect
household_size	0.054	0.061	0.003
male	0.142	0.322	0.009
age/100	2.132**	0.927	0.134
edu	0.114***	0.039	0.007
cap_inc/10,000	-0.142	0.105	-0.009
cap_val/10,000	0.040***	0.014	0.003
pig_raise_2010	0.008**	0.004	0.001
per_2009	0.010**	0.005	0.001
per_2008	-0.006	0.006	0.000
per_ris	-0.002	0.008	0.000
if_mob	0.006	0.184	0.000
whe_buy	1.013***	0.203	0.088
if_sub	0.357*	0.212	0.025
gua_lev	0.416	0.265	0.030
if_duc	0.574*	0.312	0.045
pur_dec	0.168	0.217	0.010
tru_com_no	-0.262	0.286	-0.015
tru_com_neutral	-0.109	0.328	-0.007
cla_pro	-0.002	0.004	0.000
req_loa	0.131	0.184	0.008
if_obt	0.252	0.184	0.016
Gongmin	1.188***	0.217	0.086
Chonglong	-0.607*	0.334	-0.034
Constant	-5.647***	0.878	
Log likelihood=-458.66045		Number of obs=1684	
LR chi2(25) =236.13***		Pseudo R2 = 0.2047	
***p<0.01,**p<0.05,*p<0.1.			

Table 4 gives the results of the interval regression for the two WTP questions. Both models were highly significant according to the LR tests. However, there existed fairly noticeable differences between factors contributing to both questions as well as between the WTP questions and the insurance participation decision. Unlike in the participation decision, producer demographic characteristics and the size of their operation were insignificant in the WTP equations. For the increased guarantee level, on average, producers who suffered 1% higher hog death rate in 2008 were willing to pay a ¥0.02/head higher premium to be able to sign up to a policy that had a ¥800/head guarantee level instead of a ¥500/head level. Producers who estimated a higher death rate of the pigs they raised were more willing to pay for the higher guarantee level. They were willing to pay roughly ¥0.03/head more for each 1% increase in their estimated death rate.

Farmers' overall knowledge of hog insurance positively affected their WTP for premiums. Farmers were typically willing to pay a ¥1.6/head higher premium if they had heard about hog insurance. Knowing when to purchase hog insurance would result in an increased WTP of ¥0.91/head. However, being aware of the highest possible payment level (i.e., ¥500/head) underlying the current insurance policy was found to reduce farmers' WTP by ¥1.21/head. Knowing the level of the deductibles would raise farmers' WTP by ¥1.88/head. A possible explanation for this outcome is that if the guarantee level were to be raised to ¥800/head, the relative difference between the guarantee level and the current deductible would be sufficiently enlarged so as to enable the producers to benefit.

Interestingly, producers who made insurance purchasing decisions themselves (instead of being mobilized by officials) were less likely to support the higher guarantee level and their WTP was ¥0.77/head lower. Compared to producers who trusted the insurance companies, those who did not were willing to pay ¥1.92/head less while those who were neutral were willing to pay ¥1.82/head less. This result suggested that in order to improve producers' support for improved insurance policy terms, insurance companies might need to work on earning their trust. Producers' ability to acquire a loan with a minimum value of ¥5,000 positively affected their WTP. Farmers who could acquire the loan would be willing to pay ¥0.84/head more than those who could not.

Finally, ownership variables were also significant. Residents in Gongmin township would be willing to pay ¥0.85/head more than those in Ganlu township, while producers in Chonglong would be willing to pay ¥1.23/head less.

For the second question on increasing the current 4-month insurance period to 6 months, on average, farmers would be willing to pay ¥0.69/head more if they knew about the existence of hog insurance. Compared to those who were not aware of the deductible amount, producers who were willing to pay ¥1.82/head more for the period to be extended. Farmers who made their own decision whether to purchase insurance were willing to pay ¥0.44/head less.

Similar to their WTP for the increased guarantee level, farmers were willing to pay less if they did not trust the insurance companies or if they maintained a neutral standing. Unlike the previous question though, farmers who were more neutral were willing to pay less than

those who were more negative. Farmers capable of borrowing at least ¥5,000 in loans were willing to pay ¥0.54 more for the insured period to be extended. Producers in the three townships exhibited the same pattern in terms of their WTP for the period to be extended: individuals in Gongmin township were willing to pay more while residents in Chonglong township were willing to pay less compared to those in Ganlu township.

Table 4. Interval Regression Result of Willingness to Pay for Improved Insurance Terms

Variable	WTP for increased guarantee level		WTP for increased insured period	
	Coefficient	Std. Err.	Coefficient	Std. Err.
household_size	-0.085	0.120	-0.025	0.069
male	0.138	0.554	0.094	0.318
age/100	-0.152	1.728	-0.253	0.993
edu	-0.060	0.072	0.042	0.041
cap_inc/10,000	0.149	0.234	-0.005	0.135
cap_val/10,000	0.050	0.032	-0.006	0.018
pig_raise_2010	-0.001	0.007	0.002	0.004
per_2009	-0.009	0.010	-0.005	0.006
per_2008	0.020*	0.010	0.004	0.006
per_ris	0.028*	0.015	0.004	0.009
ins_num_2010	-0.005	0.013	-0.007	0.007
if_know	1.646**	0.700	0.691*	0.402
if_mob	-0.582	0.368	-0.233	0.212
whe_buy	0.905*	0.523	0.490	0.300
if_sub	0.257	0.506	-0.125	0.29
gua_lev	-1.205*	0.674	-0.035	0.387
if_duc	1.883**	0.875	1.821***	0.502
pur_dec	-0.773*	0.430	-0.441*	0.247
tru_com_no	-1.918***	0.505	-0.814***	0.290
tru_com_neutral	-1.822***	0.581	-1.213***	0.334
cla_pro	0.000	0.009	0.005	0.005
req_loa	-0.298	0.358	0.121	0.205
if_obt	0.844**	0.353	0.544***	0.203
Gongmin	0.852**	0.412	0.427*	0.237
Chonglong	-1.225***	0.445	-0.456*	0.255
_cons	9.957***	1.638	8.142***	0.941
Log likelihood = -4527.3424			Log likelihood =-4823.184	
Number of obs =1684			Number of obs=1684	
LR chi2(27) = 89.76***			LR chi2(27) =81.06***	
***p<0.01,**p<0.05,*p<0.1.				

CONCLUSION AND IMPLICATIONS

China produces the world's largest number of hogs each year. Despite being a potentially effective way to cope with risks and despite strong government support through subsidized premiums, hog insurance remains underdeveloped and are not widely taken-up among Chinese farmers, particularly among small farmers. The first goal of this study was to investigate what factors may contribute to farmers' decisions to purchase hog insurance. The study used a survey collected from 1,684 producers in Zizhong county in China's Sichuan province. The results indicated that farmers' demographic characteristics, the size of their operation, their knowledge about insurance, as well as the township to which they belong all affected their participation decision.

Given the low level of participation in hog insurance, two improvements to the current hog insurance policy were proposed and examined in this study: an increased guarantee level and an extended insured period. A payment card question was used after each proposed improvement to elicit producers' WTP. The results suggested that these improvements were attractive to some producers but that strong heterogeneity existed in terms of what type of producers would be willing to pay extra for either improvement.

For the vast majority of small hog producers, insurance might be a useful risk management tool. Results of this study could help policy makers to better direct their effort to motivate small producers to participate in hog insurance. In addition, understanding producer WTP for improvements in insurance terms could provide information to the government as well as insurance companies for better designing insurance products and to conduct cost-benefit analysis of these new products. As revealed in this analysis, producer trust in insurance companies was an important factor in their WTP. How to establish a more positive image for producers could also be an issue faced by insurance companies.

As a relatively new concept, hog insurance is still in an early phase of its development in China. Research on the topic is lagging behind the fast expanding government support and international development. Several other promising future research areas related to hog insurance in China include the management of insurance claims, the mechanisms and roles of hog insurance brokers, and the principles of re-insurance in the hog and livestock insurance sector.

REFERENCES

Alberini, A. "Efficiency vs Bias of Willingness-to-Pay Estimates: Bivariate and Interval-Data Model." *Journal of Environmental Economics and Management*, 29(September 1995):169-80.

Brox, J. A., R. C. Kumar and K. R. Stollery (2003) "Estimating Willingness to Pay for Improved Water Quality in the Presence of Item Nonresponse Bias" *American Journal of Agricultural Economics* 85: 414-428.

Cameron, T. A. and D. D. Huppert. "Referendum Contingent Valuation Estimates: Sensitivity to the Assignment of Offered Values." *Journal of the American Statistical Association*, 86(December 1991):910-18.

Cao, Y. and Y. Zhang (2011) "Hog Insurance Adoption and Suppliers' Discrimination: A Bivariate Probit Model with Partial Observability" Selected Paper, Agricultural and Applied Economics Association Annual Meeting, July 26-26, 2011, Pittsburgh, Pennsylvania.

China Insurance Regulatory Commission (2009) "Notice on Strengthening Hog Production through Insurance and Disease Control" No.86 August 3, 2009. http://www.gov.cn/gongbao/content/2010/content_1574196.htm

Cramig, B. M., R. D. Horan and C. A. Wolf (2009) "Livestock Disease Indemnity Design When Moral Hazard is Followed by Adverse Selection" *American Journal of Agricultural Economics* 91(3): 627-641.

Food and Agriculture Organization 2010. http://faostat.fao.org/site/573/default.aspx#ancor

Gale, F., D. Marti and D. Hu (2012) "China's Volatile Pork Industry" Outlook Report No. 30 (LDPM-201101), February 2012.

Hu, W. and N. Yang (2011) "Empirical Analysis of Farmers' Demand for Hog Insurance—A Case Study from Beijing" *Journal of Agricultural Outlook* 2: 33-37.

Koontz, S. R., D. L. Hoag and D. D. Thilmany *The Economics of Livestock Disease Insurance: Concepts, Issues and International Case Studies* Cromwell Press, Trowbridge 2006.

Liu, W., Y. Qi and X. Wu (2007) "Analysis of Hog Producers' Adoption of Vaccination" *Agricultural Technology and Economics* 1: 80-87.

Liu, Y. and D. Ren (2009) "The Current Situation of Swine Insurance in China" *Insurance Studies* 9: 93-100.

Loureiro, M. L. and S. Hine (2002) "Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local (Colorado Grown), Organic, and GMO-Free Products" *Journal of Agricultural and Applied Economics* 34: 477-487.

Mao, W. and L. Li (2008) "Preliminary Investigation of the Issue of Pareto Optimum in China's Hog Insurance" *Journal of ABC Wuhan Training College* 2: 54-55.

National Bureau of Statistics of China, China Statistics Yearbook 2010. http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm

National Bureau of Statistics of China, China Statistics Yearbook 2011. http://www.stats.gov.cn/tjsj/ndsj/2011/indexeh.htm

Wang, E. and Y. Yu (2010) "Farmer Willingness to Pay for Crop Insurance under Multi Safety Nets" *Issues in Agricultural Economy* 7: 61-69.

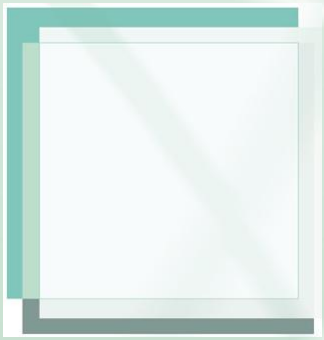
World Trade Organization (2012) "Agriculture Negotiations: Background Fact Sheet" http://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

Zizhong Food and Animal Husbandry Bureau, personal communication 2011.

Zhang, H., H. Jiang and L. Li (2010) "Empirical Analysis of Farmers' Willingness to Purchase Hog Insurance" *Guizhou Agricultural Sciences* 10: 228-230.

Zhang, Y. and F. Yang (2010) The Research on Livestock Insurance, Demands and Participation Rate:

An Empirical Research Based on Questionnaires of 471 Pork Producers in Zhejiang" Selected Paper, Agricultural Risk and Food Security International Symposium, June 2010, Beijing, China.



International
Labour
Office

microinsurance@ilo.org
www.ilo.org/microinsurance

Housed at the International Labour Organization's Social Finance Programme, the Microinsurance Innovation Facility seeks to increase the availability of quality insurance for the developing world's low income families to help them guard against risk and overcome poverty. The Facility was launched in 2008 with generous support from the Bill & Melinda Gates Foundation to learn and promote how to extend better insurance to the working poor. Additional funding has gratefully been received from several donors, including the Z Zurich Foundation and AusAID.