Using Choice Experiments to Elicit Farmers Preferences' for Crop and Health Insurance

By

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Abstract

A random utility discrete choice experiments is used to determine farmers' preferences for health insurance, crop insurance, and a product that switches some portion of crop insurance subsidy to health insurance premium subsidy with access to large-pool risk groups.

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Introduction

U.S. farmers are offered a variety of subsidized crop insurance options, but as self-employed entrepreneurs, they are at a disadvantage when purchasing health insurance. This is due to the fact the farmers cannot form common employer groups and, as individuals, any insurance risk pool that they would elect to join would be subject to adverse selection. This situation is compounded by the rising cost of healthcare and the fact that farming is considered a high-risk occupation, leading to increased health insurance premiums. Often, traditional farm families seek off-farm employment that provides health insurance as a benefit. This option may contribute to rural-urban migration trends and may not be available to rural communities that have significant distance from urban areas.

Theory suggests that farmers strive to balance all farm business and financial risks in the context of a portfolio (Escalante and Barry, 2001). A logical extension of this model assumes that farmers also strive to balance both business and personal health risks. This extension implies that farmers may have different preferences for federal subsidies that are available from federal risk mitigation programs. Individual farmers may be over-insured in terms of federal crop insurance for yield or revenue risk, but underinsured in terms of health risk. Many federal programs are available to farmers to mitigate crop enterprise or business risk, but farmers have limited assistance to mitigate health risk. By allowing farmers to reallocate federal insurance subsidy, they may be able to increase overall risk protection while fostering program efficiency gains derived from better allocation of federal funds.

A random utility discrete choice experiment is used to determine farmer's preferences for health insurance, crop insurance, and a holistic product that combines crop and health insurance. The holistic product allows farmers to switch some portion of crop insurance subsidy to health insurance subsidy and facilitate access to large-pool risk groups. Choice experiments have been used extensively in the literature for the valuation of non-market goods and services (Alpizar et al, 2001, Hall et al, 2002, Viney et al, 2002). Choice experiments allow researchers to value goods by using individuals stated preferences in a hypothetical setting. Choices with alternative attributes and levels of desired attributes were used in this study to elicit farmers' preference for alternative household risk mitigation strategies.

Through the use of focus groups from the health insurance industry, the crop insurance industry, extension experts, and farmers, attributes and levels of the desirable and workable products were selected. Types of crop insurance coverage analyzed include: multiple peril crop insurance, crop revenue coverage, revenue assurance, and adjusted gross revenue insurance. Crop insurance attributes include coverage level and premium. Attributes for the analysis of health insurance benefits include: coverage type; coinsurance; deductible; drug benefit; office visit co-pay, and premium. The premium in the health insurance section is adjusted to reflect what a typical employer-sponsored health plan would pay. Attributes included for the analysis of a holistic product include; crop coverage type, coverage level, provider group, subsidy switch and premium[2].

[2] Attributes and levels for all insurance products (crop, health, and holistic) have been determined through the use of expert groups. Experts have illustrated ranges that would be proper for the type of experiment being conducted.

If all combinations of attributes and levels were presented to respondents, this design (full factorial) would have consisted of 14,348,907 different possible product combinations. Using the D-optimality procedure discussed later, these choices were reduced to four blocks of nine choices and problems with orthogonality of selected choices were eliminated without sacrificing much information other than higher order interactions. Surveys were collected in over 21 counties throughout North Dakota and Minnesota, representing different risk areas and different crop and livestock regions. Most respondents were part of the North Dakota and Minnesota Farm and Ranch Business Management Education Program[3]. Farmers' preference for crop insurance, health insurance, and a holistic product was analyzed using multinomial logit models. Details of the multinomial logit model are presented in the method section.

This study provides several important contributions to the existing literature on crop insurance and household risk management strategies. First, it provides baseline data on farmers stated preference for alternative risk mitigation strategies. This is an important first step to understand how to better formulate policies that may efficiently reallocate federal subsidy to farmers. Second, farmer's preference and willingness to pay for whole farm insurance products are derived. The hypothesis that whole farm insurance products, like adjust gross revenue (AGR), may lead to lower risks and lower premiums and therefore should be preferred by farmers is yet to be tested empirically. Third, some studies have made significant contributions regarding farmers' preferences for crop insurance attributes, but these studies have been limited by their use of conjoint analysis

[3] The North Dakota and Minnesota Farm Business Management Education Programs are randomly selected groups of agricultural producers that correctly represent these state's agricultural demographic and financial characteristics (North Dakota and Minnesota Farm and Ranch Business Management Education Reports, Multiple year).

and potential demand implications for new products (Sherrick et al, 2003, Sherrick et al, 2004). Using choice experiments it is possible to extend the analysis of farmers stated preferences and derive demand functions for alternative hypothetical insurance products and farmers willingness to pay for these products. This is particularly important in a holistic product setting.

Literature Review

Studies on crop risk have identified health risk as an important risk attribute. Patrick et al (1985) surveyed farmers to better understand what they perceived to be the most challenging or important risks they faced in crop production and ways to manage these risks. Results indicate that producers consider more than just yield and price risk when making crop enterprise decisions, but these two remain the most important. Other sources of crop enterprise risk important to the survey group were inflation, input cost, disease and pests, world events, safety and health. However, empirical and theoretical models have evaluated crop and health risk separately.

Current health risk mitigation strategies have proven to be inadequate in managing household risks. Leno (2003) states that there are four main strategies being used by farmers to mitigate health risks. These strategies are: to pay for health insurance with out-of-pocket expenses, use a publicly subsidized plan, get insurance through group or coop insurance, or have one party in the household secure employment for off-farm employment insurance. These strategies may lead to rural-urban migration. Gripp and Ford (1992) analyzed the determinants of holding health insurance coverage for Pennsylvania dairy farm managers. Major results of this study were that older farmers, higher education levels, and greater farm income all increase the probability of the respondent holding health insurance. Meyer, Orazem and Wachenheim (2002) analyze labor supply responses to employer-provided health insurance. They concluded that employees enjoy significant benefits with employer based insurance and their large risk pool nature. Bharadwaj and Findeis (2003) examine the motivations for off-farm work among farm women in the United States. The researchers found that farm families with substantial farm assets are less likely to work off-farm. While these people are less likely to work off the farm, the paper finds that labor markets offering jobs with benefits are attracting labor off American farms, large and small. Health benefits are one of the main reasons for farmers and their spouses to seek off-farm employment.

Methods to evaluate farmers' preferences for alternative risk mitigation strategies have been limited to conjoint analysis. Sherrick et al (2003) determine farmers' preferences for crop insurance attributes using conjoint analysis. The authors found the most important crop insurance attributes to be coverage level and acreage flexibility. Conjoint analysis limits the ability to explore the demand and willingness to pay for the entire range (existing and potential) products. Using choice experiments, it will be possible to extend stated preference analysis to understand farmers preference for alternative risk mitigation strategies (Alpizar, Carlsson, and Martinsson, 2001). Viney, Lancsar, and Louviere (2002) utilize discrete choice experiments as a method to elicit and analyze individuals' preferences for health and healthcare. The paper provides an overview of the approach that is used and discusses issues that arise when using discrete choice experiments to assess individual preferences for healthcare. The empirical model used in this study extends Viney, Lancsar, and Louviere model to incorporate a holistic product of crop and health risks.

Methodology

The choice experiment methodology has three main components. First, focus groups must be conducted to assure correct attributes and levels are presented to the survey respondents. Second, experimental design must be performed to narrow the possible choices from the full factorial design to a design that a respondent can complete in a reasonable amount of time. Third, an appropriate econometric model must be determined from the distribution of the error term of the respondent's utility function. The proceeding section discusses this three components in detail.

It is important to present the correct attributes and levels to the farmers that are being surveyed. In order to ensure the correct attributes and levels for crop, health and the holistic products are being evaluated, expert focus group interviews from the crop insurance industry and the health insurance industry were conducted. These groups identified attributes, and attribute levels that such products must have in order to be fundamentally sound, economically feasible, and generally accepted. The health insurance experts group was completed on June 10, 2003. This group was asked mostly open-ended questions. A major finding from this group was that adverse selection is a big problem when forming health insurance groups. These groups need to be either low cost or mandatory to avoid these problems. The crop insurance experts group was completed on July 11, 2003. This group emphasized that a proposed holistic insurance program must be simple to administer. Following these groups, a preliminary focus group and survey of farmers was conducted to ensure all survey items were logical and consistent with the targeted survey population. A preliminary farmers' group was completed on September 11, 2003. A second farmers' group was completed on

September 23, 2003, following comments and revisions from the preliminary farmer group.

Stated preference methods (which include choice experiments) assess the value of non-market goods by using an individual's stated behavior in a hypothetical setting. Stated preference methods were used in this study because the researcher is able to control relationships between attributes, which permits mapping of utility functions with technologies different from existing ones, as well as being able to include existing and/or proposed choice alternatives.

Choice experiments are being applied more and more frequently for the valuation of non-market goods. Choice experiments give the value of a certain good by separately evaluating the preferences of individuals for the relevant attributes that characterize the good, and by doing this it provides much information that can be applied to the preferred design of the good.

Individuals participating in a choice experiment are given a hypothetical setting and asked to choose their preferred alternative among several alternatives in a choice set. The individuals are usually asked to perform a sequence of these choice sets. Each alternative choice available in the survey is described by a number of attributes or characteristics. A monetary value is included as one of the attributes, along with other attributes of importance to the alternative presented. When an individual makes a choice, they implicitly make tradeoffs between levels of the attributes in the different alternatives in a choice set (Alpizar, Carlsson, Martinsson, 2001). Experimental design, in this case, is the creation of choice sets in an efficient manner. The standard approach in marketing, transportation, and health economics has been to use orthogonal designs, where the variations of the attributes of the alternatives are uncorrelated in all choice sets. A design is developed in two steps: first, obtaining the optimal combinations of attributes and attribute levels to be included in the experiment and, second, combining those profiles into choice sets.

A starting point is the full factorial design, which is a design that contains all possible combinations of the attribute levels that characterize the different alternatives. A full-factorial design is generally very large and not tractable in a choice experiment. Therefore, it is necessary to choose a subset of all possible combinations, while following some criteria for optimality, and then construct the choice sets. In choice experiments, design techniques used for linear models have been popular. Orthogonality, in particular, has often been used as the principle part of an efficient design (Huber and Zwerina, 1996). Marketing researchers have developed design techniques based on the D-optimal criteria for non-linear models in a choice experiment context. D-optimality is related to the covariance matrix of the K-parameters, defined as $D-efficiency=[|\Omega|^{1/K}]^{-1}$. Huber and Zwerina (1996) identify four principals for an efficient design of a choice experiment based on a non-linear model: (i) orthogonality, (ii) level balance, (iii) minimal overlap, and (iv) utility balance. Table 1 presents examples of the three choice set designs that were evaluated in this paper.

The economic model presented in this section deals only with purely discrete choices (Alpizar, Carlsson, Martinsson, 2001). Each individual's maximization problem is:

$$
\begin{aligned}
& Max_{c,} U[c_1(A_1),\ldots,c_n(A_n);z] \\
s.t. \quad & i.\ \ y=\sum_{i=1}^{N} p_i c_i(A_i) + z \qquad (1) \\
& ii.\ \ c_i c_j = 0, \forall i \neq j \\
& iii.\ \ z \geq 0, c_i(A_i) \geq 0 \text{ for at least one } i
\end{aligned}
$$

where, *U*[…] is a quasi-concave utility function; $c_i(A_i)$ is alternative combination *i* (profile *i*) as a function of its generic and alternative specific attributes, the vector A_i; p_i is the price of each profile; *z* is a composite bundle of ordinary goods with its price normalized to 1 and *y* is income.

A number of properties follow from the specification of the maximization problem: First, the c_i's are profiles defined for all the relevant alternatives. For example, one such profile could be a health insurance plan with only health benefits, coinsurance of 80/20, a yearly deductible of $1,000 and a monthly premium of $700. Additionally, the choice of any profile is for a fixed, and given, amount of it, e.g. a day or a unit. There are *N* such profiles, where *N* is given by all relevant profiles. In the current investigation, there are 15 factors, or attributes to be considered. Each of these attributes has three levels, so the full factorial design will imply 3^{15} or N=14,348,907. Second, the price variable in the budget restriction must be related to the complete profile of the alternative, including the given continuous dimension. For example, premium paid at each coverage level.

Third, the numbers of alternatives that can be chosen are defined by restriction *ii.* Generally, choice experiment researchers are focused on obtaining a single choice. Fourth, in a purely discrete choice, the selection of a particular profile $c_j(A_j)$, which is provided in an exogenously fixed quantity, implies that, for a given income, the amount of ordinary goods z that can be purchased is also fixed. Combining this with the restriction that only a single profile, c_j, can be chosen results in the equation:

$$z = y - p_j c_j \tag{2}$$

Fifth, restriction *iii* specifies that the individual will choose a non-negative quantity of the composite good and the goods being studied. If it is assumed that the good is essential to the individual or that an environmental program must be implemented, then the respondent made a choice ($c_i > 0$ for at least one i).

The multinomial logit (MNL) model assumes that the random components are independently and identically distributed with an extreme value type I distribution (Gumbel). This distribution is characterized by a scale parameter δ[4]. The scale parameter is related to the variance of the distribution such that $\text{var}_\varepsilon = \pi^2 / 6\mu^2$. When it is assumed that the random components are extreme value distributed, the choice probability can be written as:

$$P(j \mid S_m, \beta) = \frac{\exp(\mu V_j)}{\sum_{i \in S_m} \exp(\mu V_i)}. \tag{3}$$

There are two basic problems with the MNL specification: first, the alternatives are independent, and second, there is a limitation in modeling variation in taste among respondents. The IID assumption (constant variance) causes the first problem, which results in the independence of irrelevant alternatives (IIA) property. This property states that the ratio of choice probabilities between two alternatives in a choice set is unaffected by changes in that choice set. The MNL model should not be used if this assumption is violated.

There are several hypotheses that are included with this project. The first is that farmers prefer a whole farm crop insurance product and are willing to pay for this product. The second hypothesis is that healthcare spending significantly affects farmers' preferences for health insurance, or higher premiums will prevent farmers from obtaining health insurance coverage. The third hypothesis is that farmers prefer a holistic product to mitigate crop and health risk jointly and are willing to pay for this product. The fourth hypothesis of this project is that farmers are willing to switch a portion of their federal crop insurance subsidy to compliment health coverage.

Results

A total of 86 surveys were returned with complete and usable discrete choice survey portions[5]. Farmers included in focus groups for this study believe they face obstacles in obtaining affordable health insurance because they lack access to groups like other employer-sponsored healthcare plans. Another finding of focus groups was that farmers may be willing to switch some of their federal crop insurance premium subsidy to health insurance if this switch would allow them access to large risk groups for insurance pooling purposes. Table 2 contains descriptive information about the respondents.

From the results of the generalized discrete multinomial logit model it is possible to determine how each attribute and attribute level affects the probability of the respondent's overall choice of insurance product. The attributes affecting the probability

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[5] Only 60 respondents were required to satisfy the optimal design and provide a required sample size of 2160 observations (36 * 60). Another advantage of choice experiments is that smaller samples can be used to respond to several choice sets. 86 survey in this study provided a larger sample size (information set) than required, with desirable properties of large samples.

of the respondent's choice of crop insurance product are the crop insurance type, coverage level, and premium. Each of these attributes has three levels to select from. The crop insurance section of the survey was arranged into three blocks of six. This design was discussed previously in the experimental design section.

Hausman and McFadden (1984) proposed a specification test for the multinomial logit model to test the assumption of the independence from irrelevant alternatives (IIA). Independence from Irrelevant Alternatives is a consequence of the initial assumption that stochastic terms in the utility function are independently and identically distributed. The procedure is to first estimate the model with all choices. The alternative specification is the model with a smaller set of choices. Thus, the model is estimated with this restricted set of alternatives and the same model specification. The set of alternatives is reduced to those in which one of the smaller set of choices is made. The test statistic is

$$q = [b_r - b_u]'[V_r - V_u]^{-1}[b_r - b_u]$$

where 'r' and 'u' indicate restricted and unrestricted (larger choice set) models and V is an estimated covariance matrix for the estimates. In order to compute the coefficients in the restricted model, it is necessary to drop those observations that choose the omitted choice. In this case, 139 observations were skipped. The Hausman statistic is used to carry out the test. In this case the Pr(C>c) value of 0.000000 suggests that the independence from irrelevant alternatives assumption is satisfied.

Table 3 presents the results of the multinomial logit model for the crop insurance stated preferences:

$$Y = \alpha_{Opyear} OperationYears + \alpha_{Age} Age + \alpha_{NW} NetWorth + \alpha_{NFPEI} EmployInsure + \alpha_{EDU} Education + \alpha_{Size} Size(acres) + \alpha_{CL} CoverageLevel + \beta_{\Pr em} \Pr emium + \alpha_{C/LVar} C/LVar + \varepsilon$$

In this model, different choices of crop insurance product are influenced by different factors. The only variables that are significant across all three choices are education and crop insurance type, which is perfectly correlated with the choice. Education has a positive coefficient, meaning that as this variable increases in level, so will the probability of the respondent choosing that particular insurance product. There are many other significant variables in the model, but these variables are not significant across all choices. This demonstrates the respondents differing motives, business, and personal needs when choosing crop insurance products to mitigate business and financial risk.

When choosing MPCI, the significant variables are: net worth, paid employee insurance, education, farm size, crop insurance type, and crop insurance coverage level. MPCI has the most significant variables in the model, but does not include crop insurance premium as a significant variable. This could be attributed to a number of factors. Coverage level could be much more important when making decisions regarding MPCI or farmers could have regarded the premium section as unbelievable in the survey because most of the respondents already hold MPCI and know what the premium is, negating the levels presented.

The significant variables for Crop Revenue Coverage (CRC) are: net worth, employee insurance, education, farm size, crop and livestock variable, crop insurance type, and crop insurance premium. The significant variables when choosing CRC illustrated that as wealth, education, and farm size increase, there is an increased probability of holding yield and revenue products like CRC as opposed to yield only products like MPCI. The crop and livestock variable being negative and significant show that as a producer moves from crop production to mixed crop/livestock to livestock only production there is decreased probability of holding crop insurance. This finding makes sense as this crop insurance product is not offered for livestock. When selecting CRC, coverage level was not significant to the model but premium was significant and had a negative coefficient, as expected. This demonstrates that farmers may not care about coverage levels as much as price when selecting this type of insurance. As premiums increase, the probability of holding CRC will decrease.

When choosing adjusted gross revenue or whole farm insurance, the variables that are significant to the model are: education, crop and livestock variable, crop insurance type, and crop insurance premium. These significant variables are very similar to the significant variables for CRC. This shows that farmers may make decisions based on the same criteria for whole-farm insurance as they do for current yield/revenue products.

Table 4 presents a model where demographic characteristics have been included with health insurance attributes to determine what factors influence health insurance choice decisions. The health insurance section of the survey has been broken into four blocks of nine to make it possible for one person to rate all alternatives in a timely fashion. The independence from irrelevant alternatives (IIA) assumption has been tested and is satisfied in the health insurance multinomial logit model. Table 4 presents the results of the discrete multinomial logit model for the health insurance preferences:

$$Y = \alpha_{Age} Age + \alpha_{NW} NW + \alpha_{OHIB} OHIB + \alpha_{HCS} HCS + \beta_{DED} DED + \beta_{Drug} DRUG + \beta_{Copay} Copay + \beta_{Type} Type + \beta_{\Pr em} \Pr em + \varepsilon$$

There are only two variables that are not significant when explaining the probability of choice 80/20. These variables are the product attribute, prescription drug benefits and the demographic variable net worth. Prescription drug benefits were expected to be significant at the 10% level, because many politicians and others in the media have been concerned with this for some time. It is possible that other attributes included in the model were dominant when selecting 80/20 coinsurance health insurance. Net worth is the other non-significant variable. This may be attributed to the fact that nearly all people (not the very wealthy) find health insurance to be a necessary expense throughout life. If people in all net worth ranges select similar health insurance coverage, this variable will return as insignificant in the model. The product attributes deductible, co-payment, and premium performed as expected. As the attribute levels for these three increases, the probability of choosing 80/20 will decrease. The other attribute in the model was for health insurance type. This attribute returned a positive coefficient, means that as health insurance type progresses from health only to health and vision, finally to health and dental that the probability of choice increases. It seems reasonable that farmers would desire more coverage, like vision and dental over health only if the price, deductible, drug benefits and co-payment were the same.

When explaining the probability of choice 90/10, the same two variables are not significant in the model. These are the variables associated with prescription drug benefits and net worth. Theses variable are probably non-significant for the same reasons as in 80/20. All coefficients associated with health insurance 90/10 product attributes returned the same sign and significance as in 80/20 for the same reasons.

The characteristics in numerator of 100/0 have one more variable that is non-significant than the other two. The variables that are not significant in 100/0 are prescription drug benefits, health insurance type, and net worth.

Table 5 presents a model where demographic characteristics have been included with holistic insurance attributes to determine what outside factors influence holistic insurance choice decisions. The holistic insurance section of the survey has been broken into four blocks of nine. The independence from irrelevant alternatives (IIA) assumption has been tested and is satisfied. Table 5 presents the results of the discrete multinomial logit model:

$$\begin{aligned}Y = {} & \alpha_{Opyear} OpYears + \alpha_{Age} Age + \alpha_{Dep} Dependents + \alpha_{FTW} FullTimeWork + \alpha_{NW} NetWorth \\ & + \alpha_{NFPEI} EmployeeInsurance + \alpha_{HCS} HealthcareSpending + \alpha_{OHIB} HealthInsBen1 \\ & + \alpha_{SHIB} HealthInsBen2 + \alpha_{SHP} Health\Pr ob + \alpha_{EDU} Education + \alpha_{Size} FarmSize \\ & + \beta_{CL} CoveraeLevel + \beta_{SS} SubSwitch + \beta_{GRP} Group + \beta_{\Pr em} \Pr emium + \varepsilon\end{aligned}$$

The probability of choosing AGR is determined by the following significant variables: dependents, number of workers, healthcare spending, operators health insurance benefits, significant health problems, farm size, education, holistic subsidy switch, group, and premium. This choice is being critically evaluated to determine if farmers prefer some type of whole farm insurance, and what attributes of this product are important to them when choosing this alternative. When conducting focus groups regarding whole-farm insurance, farmers and crop insurance agents said they would be more likely to try whole farm insurance if and only if they were presented with higher coverage levels (>90%) to resemble other property insurance so it is interesting to note that the only holistic product attribute that was deemed insignificant in the model was the coverage level attribute. (This attribute was insignificant in all holistic choices) The coefficient for subsidy switch is negative and significant at the 10% level for AGR. This means that as subsidy switch converts premium from crop insurance to health insurance, the respondent will be less likely to hold AGR. The coefficient for provider group is a negative, meaning that as the provider group switches from private to public (government) provider, the respondent will be less likely to hold this type of insurance. Premium is negative and significant as expected in this model.

The product attributes for revenue assurance returned the same sign and significance as those in AGR. This illustrates that farmers make decisions based on the same product characteristics for whole farm and one crop revenue protection. Demographic characteristics that were significant in the selection of RA are; dependants, full time workers, operator health insurance benefits, spouse health insurance benefits, and education. The product attributes for MPCI finds that provider group is no longer important to the probability of choice. This may be because the respondent is not concerned with who supports that group activity, but may make decisions based on cost and availability.

Conclusion

The results from the crop insurance section of the survey show that farmers stated and revealed preferences are comparable. The crop insurance farmers hold now is what they choose when making stated preference decisions. One disparity between the focus groups and the estimated results is that the focus groups identified that availability of higher coverage levels is important to them when making their crop insurance purchase decisions. The estimated results showed that coverage levels for crop insurance were only significant at the ten percent level when selecting MPCI or yield coverage. When coverage level was significant in the model, it had a positive coefficient meaning that as coverage level increased, so did the probability of choosing that product. The coefficient for premium was usually significant at the ten percent level and had a negative coefficient, meaning that as the premiums increase, the probability of choosing that product will decrease.

The results from the health insurance section of the survey illustrate that farmers prefer to hold any type of health insurance that is perceived affordable to them. As deductible levels, office visit co-payments, and premiums increase, the probability of choosing that particular type of health insurance will decrease. These results were expected by researchers when beginning the project. The negative coefficient for prescription drug benefits was not expected. It would seem reasonable that as drug benefits increased in the model, so would the probability of choosing that alternative, but as drug benefits increase, the probability of choosing that alternative will decrease. The mean of X for prescription drug benefits was 2.69 on a one to three scale, so nearly all respondents chose the highest level, and other factor could be influencing this, such as cost. Health insurance type has a positive coefficient in the model, meaning that as the health insurance type increases from health, to health and vision, and finally health vision and dental, the respondent will be more likely to choose that alternative.

Holistic insurance has proven to be more popular that expected. 64% of respondents chose some type of holistic insurance product. Coverage level proved insignificant in all alternatives, but had a mean of X of 2.89 out of three, so most chose the >75% coverage level. Subsidy switch, provider group, and premium all had negative coefficients meaning as these increase, the probability of that alternative choice will decrease.

Limitations and Need for Further Research

This study is just the beginning for those who would like to better understand farmers' preferences for health, crop, and holistic insurance products. One of the major limitations of this study is that subgroups have not been identified within the population. If a cross tab analysis were conducted to determine the insurance preferences of those in different counties, risk groups, or production specialties, this would provide a great wealth of knowledge. If the study were broadened to include other states that may be lower in crop risk, there may be increased willingness for a product that includes a subsidy switch.

Reference

Alpizar, F., F. Carlsson and P. Martinsson. (2001) "Using Choice Experiments for Non-Market Valuation." Working Papers in Economics no. 52. Department of Economics, Goteborg University.

Bharadwaj, L. and J. Findeis. (2003) "Off-farm Work Among Farm Women: Motivations, Earnings and Benefit Receipt." *American Agricultural Economics Association*. Montreal, Canada. July 27-30.

Escalante, C. L. and P. J. Barry. (2001) "Risk Balancing in an Integrated Farm Risk Management Plan." *Journal of Agricultural and Applied Economics,* (33)3. pp. 413-29.

Gripp, S. and S. Ford. (1997)"Health Insurance Coverage for Pennsylvania Dairy Farm Managers." *Agricultural and Resource Economics Review*, 26(2). pp. 174-183.

Hall, J., R. Viney, M. Haas and J. Louviere. (2002) "Using Stated Preference Discrete Choice Modeling to Evaluate Healthcare Programs." *Journal of Business Research* 57(6). pp. 1-7.

Hausman, J. and D. McFadden. (1984): "Specification Tests for the Multinomial Logit Model." *Econometrica*. 52 (September), 1219-1240.

Huber, J. and K. Zwerina. (1996) "The Importance of Utility Balance in Efficient Choice Designs." *Journal of Marketing Research* 33. pp. 307-317.

Leno, S. (2003) Focus Group Interview. June 10, 2003

Meyer, R., P. Orazem., W.A. Wachenheim. (2002) "Labor Market Implications of Rising Costs of Employer-Provided Health Insurance," Staff General Research Papers 10016, Iowa State University, Department of Economics.

Patrick, G.R., P.N. Wilson, P.J. Barry, W.G. Boggess and D.L. Young. (1985) "Risk Perceptions and Management Responses: Producer-Generated Hypothesis for Risk Modelling." *Southern Journal of Agricultural Economics*, 17(2). pp. 231-238.

Sherrick, B. J., P. J. Barry, G. D. Schnitkey, P. N. Ellinger, and B. C. Wansink. (2003) "Farmers Preferences for Crop Insurance Attributes" *Review of Agricultural Economics*, 25(2). pp. 415-429.

Sherrick, B.J., P.J. Barry, P.N. Ellinger, and G.D. Shnitkey. (2004) "Factors Influencing Farmers' Crop Insurance Decisions." *American Journal of Agricultural Economics*, 86(1). pp. 103-114.

Viney, R., E. Lancsar and J. Louviere. (2002) "Discrete Choice Experiments to Measure Consumer Preferences for Health and Healthcare." *Expert Review of Pharmacoeconomics and Outcomes Research*. 2(4). pp. 319-326.

Table 1. Sample Choice Experiment Design for Health, Crop, and Holistic Products

Choose only one of these four:

Choice A ☐		**Choice B** ☐		**Choice C** ☐		**Choice D** ☐
Coinsurance	80/20	Coinsurance	90/10	Coinsurance	100/0	
Deductible	$500	Deductible	$750	Deductible	$500	
Drug Benefits	No	Drug Benefits	Partial	Drug Benefits	No	I prefer none of
OV Copay	$15	OV Copay	$30	OV Copay	$30	these alternatives
Coverage Type	Health	Coverage Type	Health	Coverage Type	Health	
			Vision		Dental	
Premium	$700	Premium	$700	Premium	$550	Form 4

Choose only one of these four:

Choice A ☐		Choice B ☐		Choice C ☐		Choice D ☐
Type	MPCI	Type	CRC	Type	AGR	I prefer none of
Coverage Level	65-75%	Coverage Level	>75%	Coverage Level	>75%	these alternatives
Premium	10.0%	Premium	7.5%	Premium	5.0%	Form 3

Choose only one of these four:

Choice A ☐		**Choice B** ☐		**Choice C** ☐		**Choice D** ☐
Crop Type	AGR	Crop Type	RA	Crop Type	MPCI	
Coverage Level	>75%	Coverage Level	65-75%	Coverage Level	65-75%	
Subsidy Switch	10-20%	Subsidy Switch	31-50%	Subsidy Switch	31-50%	I prefer none of
Group	Coop	Group	Gov't	Group	Gov't	these alternatives
Premium	5%	Premium	5%	Premium	3%	Form 3

Table 2: Respondent Characteristics

Operator Age (AGE)		**Health Insurance Source (HIS)**	
Under 30	8%	None	3%
31-45	44%	Individual/Self Funded	57%
46-60	40%	Government	1%
Over 61	8%	Cooperatives/NGC's	3%
Dependents (DEPEND)		Employment Insurance	26%
None	13%	Other	5%
1 Dependant	20%	**Operator Benefits (OHIB)**	
2 Dependants	27%	No	62%
3 Dependants	22%	Yes	38%
4 Dependants	12%	**Spouse Benefits (SHIB)**	
5 Dependants	5%	No	42%
6+ Dependants	2%	Yes	58%
Full Time Workers (FTW)		**Significant Health Problems (SHP)**	
None	8%	Yes	26%
One	41%	No	74%
Two	40%	**Education (EDU)**	
Three	5%	High School	19%
Four +	7%	Some College	34%
Total Assets (TA)		College Grad	43%
Less than $100,000	9%	Grad School	5%
$200,000-$499,999	26%	**Total Farm Size (SIZE)**	
$500,000-$999,999	24%	1-500 Acres	3%
$1,000,000-$1,999,999	26%	500-999 Acres	13%
$2,000,000-$4,999,999	8%	1,000-1,999 Acres	30%
Over $5,000,000	3%	2,000-2,999 Acres	24%
Net Worth (NW)		3,000-3,999 Acres	13%
Less than $200,000	10%	4,000 Plus Acres	13%
$100,000-$249,999	19%	**Healthcare Spending (HCS)**	
$250,000-$499,999	24%	Less than $1,000	8%
$500,000-$999,999	17%	$1,000-$1,999	10%
$1,000,000-$2,499,999	14%	$2,000-$4,999	27%
Over $2,500,000	6%	$5,000-$9,999	36%
Employee Insurance (NFPEI)		$10,000+	16%
Yes	24%		
No	76%		

Table 3. Crop Insurance Multinomial Logit Model Results

	Chi Squared	1101.886			
	Degrees of Freedom	27			
	McFadden R Squared	0.79098			
Variable	**Coefficient**	**Standard Error**	**b/St.Er.**	**P[|Z|>z]**	**Mean of X**
	Characteristics in Numerator of Prob[Y=1]		MPCI	27%	
CITYPE	-13.7213	1.3919	-9.8580	0.0000	2.2810
CICL	2.9091	0.9837	2.9570	0.0031	2.6143
CIPREM	-0.8722	0.7901	-1.1040	0.2696	2.0717
OPYRS	0.3061	0.1838	1.6660	0.0957	25.3488
AGE	-0.2809	0.1822	-1.5420	0.1231	45.9767
EDU	3.5873	1.0459	3.4300	0.0006	2.3372
NW	0.6697	0.3162	2.1180	0.0342	2.9535
NFPEI	7.8857	1.7470	4.5140	0.0000	1.9186
SIZE	0.9001	0.2817	3.1950	0.0014	3.5814
CLVAR	-0.5752	0.5376	-1.0700	0.2847	1.7907
	Characteristics in Numerator of Prob[Y=2]		CRC	35%	
CITYPE	-4.4527	1.0063	-4.4250	0.0000	2.2810
CICL	1.1137	0.8280	1.3450	0.1786	2.6143
CIPREM	-1.6115	0.7213	-2.2340	0.0255	2.0717
OPYRS	0.2505	0.1806	1.3870	0.1655	25.3488
AGE	-0.2232	0.1679	-1.3290	0.1837	45.9767
EDU	2.5065	1.0045	2.4950	0.0126	2.3372
NW	0.4824	0.2631	1.8340	0.0667	2.9535
NFPEI	5.7208	1.6549	3.4570	0.0005	1.9186
SIZE	0.5019	0.2150	2.3350	0.0196	3.5814
CLVAR	-0.8920	0.4169	-2.1400	0.0324	1.7907
	Characteristics in Numerator of Prob[Y=3]		AGR	17%	
CITYPE	3.5637	1.2141	2.9350	0.0033	2.2810
CICL	-0.6466	0.7103	-0.9100	0.3626	2.6143
CIPREM	-4.1297	0.9391	-4.3970	0.0000	2.0717
OPYRS	0.2301	0.1878	1.2250	0.2205	25.3488
AGE	-0.2426	0.1743	-1.3920	0.1638	45.9767
EDU	2.1144	1.1199	1.8880	0.0590	2.3372
NW	0.4208	0.2848	1.4780	0.1394	2.9535
NFPEI	2.1775	1.5663	1.3900	0.1645	1.9186
SIZE	-0.3673	0.2250	-1.6320	0.1027	3.5814
CLVAR	-0.9928	0.4860	-2.0430	0.0411	1.7907
		Percent Correct Predicted=92.8294%			

Table 4: Health Insurance Multinomial Logit Model Results

	Chi Squared	844.2346			
	Degrees of Freedom	24			
	McFadden R Squared	0.40039			
Variable	**Coefficient**	**Standard Error**	**b/St.Er.**	**P[|Z|>z]**	**Mean of X**
	Characteristics in Numerator of Prob[Y = 1]		80/20	18%	
AGE	0.3914	0.2140	1.8290	0.0674	45.9767
NW	0.4272	0.3284	1.3010	0.1933	2.9535
OHIB	22.8825	9.4631	2.4180	0.0156	1.9419
HCS	1.6267	0.7319	2.2220	0.0263	3.4186
HIDED	-5.4683	1.9600	-2.7900	0.0053	2.3592
HIDRUG	-1.0254	1.4712	-0.6970	0.4858	2.6990
HICOPAY	-4.3181	1.5979	-2.7020	0.0069	2.4380
HITYPE	3.0853	1.3341	2.3130	0.0207	2.5879
HIPREM	-13.3330	6.7214	-1.9840	0.0473	2.1925
	Characteristics in Numerator of Prob[Y = 1]		90/10	26%	
AGE	0.3790	0.2138	1.7720	0.0763	45.9767
NW	0.4925	0.3272	1.5050	0.1322	2.9535
OHIB	23.3377	9.4511	2.4690	0.0135	1.9419
HCS	1.6170	0.7318	2.2100	0.0271	3.4186
HIDED	-5.3475	1.9576	-2.7320	0.0063	2.3592
HIDRUG	-1.1108	1.4658	-0.7580	0.4486	2.6990
HICOPAY	-4.4797	1.5950	-2.8090	0.0050	2.4380
HITYPE	2.9977	1.3427	2.2330	0.0256	2.5879
HIPREM	-13.0783	6.7196	-1.9460	0.0516	2.1925
	Characteristics in Numerator of Prob[Y = 1]		100/0	33%	
AGE	0.3775	0.2138	1.7650	0.0775	45.9767
NW	0.4762	0.3264	1.4590	0.1445	2.9535
OHIB	23.5688	9.4566	2.4920	0.0127	1.9419
HCS	1.6518	0.7299	2.2630	0.0236	3.4186
HIDED	-5.4716	1.9576	-2.7950	0.0052	2.3592
HIDRUG	-1.1062	1.4639	-0.7560	0.4499	2.6990
HICOPAY	-4.4161	1.5941	-2.7700	0.0056	2.4380
HITYPE	2.8626	1.3353	2.1440	0.0321	2.5879
HIPREM	-12.9881	6.7219	-1.9320	0.0533	2.1925
	Percent Correct Predicted=55.29%				

Table 5: Holistic Insurance Multinomial Logit Model Results

Chi Squared		889.0262	McFadden R^2		0.42937
Degrees of Freedom		42	Percent Correct Predicted=65.11		
Variable	**Coefficient**	**Standard Error**	**b/St.Er.**	**P[|Z|>z]**	**Mean of X**
	Characteristics in Numerator of Prob[Y = 1]		AGR 16%		
AGE	-0.0077	0.0134	-0.5730	0.5664	45.9767
DEPEND	0.1874	0.0850	2.2050	0.0275	2.2326
FTW	-0.5881	0.1891	-3.1100	0.0019	1.6279
NW	-0.0228	0.1417	-0.1610	0.8721	2.9535
NFPEI	-1.5368	0.8987	-1.7100	0.0873	1.9186
HCS	0.1515	0.1236	1.2260	0.2203	3.4186
OHIB	5.9576	1.2531	4.7540	0.0000	1.9419
SHIB	0.8827	0.3860	2.2870	0.0222	1.6744
SHP	-0.8897	0.3892	-2.2860	0.0222	1.7442
EDU	0.9606	0.1847	5.2000	0.0000	2.3372
SIZE	-0.0996	0.1541	-0.6460	0.5180	3.5814
COCL	0.0757	0.2411	0.3140	0.7536	2.8876
COSS	-1.1323	0.2276	-4.9740	0.0000	2.6512
COGRP	-0.8742	0.2925	-2.9890	0.0028	2.6925
COPREM	-1.8341	0.3087	-5.9410	0.0000	2.4935
	Characteristics in Numerator of Prob[Y = 2]		RA 27%		
AGE	-0.0078	0.0121	-0.6480	0.5168	45.9767
DEPEND	0.2456	0.0749	3.2780	0.0010	2.2326
FTW	-0.6705	0.1658	-4.0430	0.0001	1.6279
NW	0.0594	0.1256	0.4730	0.6361	2.9535
NFPEI	-0.7794	0.8809	-0.8850	0.3762	1.9186
HCS	0.0814	0.1175	0.6930	0.4882	3.4186
OHIB	4.9322	1.0576	4.6630	0.0000	1.9419
SHIB	1.3208	0.3767	3.5060	0.0005	1.6744
SHP	-0.5097	0.3114	-1.6370	0.1016	1.7442
EDU	0.4459	0.1308	3.4100	0.0007	2.3372
SIZE	0.2111	0.1482	1.4240	0.1544	3.5814
COCL	-0.1034	0.2375	-0.4350	0.6633	2.8876
COSS	-1.0485	0.2091	-5.0130	0.0000	2.6512
COGRP	-0.8526	0.2884	-2.9560	0.0031	2.6925
COPREM	-1.7833	0.2990	-5.9650	0.0000	2.4935
	Characteristics in Numerator of Prob[Y = 3]		MPCI 20%		
AGE	-0.0105	0.0130	-0.8120	0.4169	45.9767
DEPEND	0.1709	0.0861	1.9860	0.0471	2.2326
FTW	-0.3198	0.1924	-1.6620	0.0965	1.6279
NW	0.1107	0.1467	0.7550	0.4504	2.9535
NFPEI	-0.4396	0.9792	-0.4490	0.6535	1.9186
HCS	0.1396	0.1287	1.0850	0.2778	3.4186
OHIB	4.8458	1.2721	3.8090	0.0001	1.9419
SHIB	0.5033	0.3900	1.2900	0.1969	1.6744
SHP	-0.5023	0.3233	-1.5530	0.1204	1.7442
EDU	0.6359	0.1436	4.4290	0.0000	2.3372
SIZE	0.0397	0.1693	0.2350	0.8145	3.5814
COCL	-0.1715	0.2499	-0.6860	0.4926	2.8876
COSS	-1.0125	0.2306	-4.3900	0.0000	2.6512
COGRP	-0.6069	0.3087	-1.9660	0.0493	2.6925
COPREM	-1.9623	0.3316	-5.9180	0.0000	2.4935