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Analyzing Farmer Participation Intentions and Enrollment Rates for the Average Crop Revenue Election (ACRE) Program

By

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Executive Summary

The 2008 Farm Bill created the Average Crop Revenue Election (ACRE) program as a new commodity support program. We analyze actual county-level ACRE enrollment rates and a mail survey of farmers just before the ACRE sign-up deadline in Mississippi, North Carolina, Texas and Wisconsin. As discussions begin regarding the next Farm Bill, an understanding of the factors affecting ACRE participation can provide guidance as program changes are discussed.

Our empirical analysis of the survey suggest that initial farmer plans to switch to ACRE in 2009 were driven by producer perceptions of whether or not ACRE would pay more than existing programs and whether or not it would provide more risk protection. On the other hand, planning to stay with existing programs in 2009 and possibly switching to ACRE later was driven more by producer risk aversion and perceptions about the effect of yield and price variability on income risk in the coming years. Membership in organizations such as National Farmers Union, National Farmers Organization, and the Grange was consistently and strongly associated with intending to stay with existing programs in 2009. Consistent state and crop effects were also found. Texas and Wisconsin producers were more likely to plan to wait and possibly switch to ACRE later and cotton growers strongly intended to stay with existing programs in 2009, likely due to the large 'cost' of giving up the relatively larger direct payments for cotton and price expectations that made counter-cyclical payments more likely.

Our empirical analysis of actual, county-level ACRE enrollment rates suggests that crop effects were again important – cotton areas had low enrollment rates, wheat areas had high enrollment rates, and counties with more diversity in crops had higher enrollment rates. In addition, regions where farmers believed yield variability would be an important source of risk also had higher enrollment. Programmatic knowledge and transactions costs also mattered for ACRE enrollment. Counties with greater participation in current farm programs had higher ACRE enrollment rates, as more growers were likely more familiar with how farm programs worked and/or received more educational efforts. Similarly, as all owners and operators must sign ACRE election forms, counties with a greater proportion of farmers renting land and/or buildings had lower enrollment rates.

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Many regressors measuring farmer beliefs and attitudes were significant in both analyses, indicating the key role that attitudes and beliefs play in decisions about farm programs. In some cases, however, similar regressors showed opposite effects, which we interpret as evidence that farmer beliefs about and understanding of ACRE were rapidly evolving during the months immediately preceding the ACRE deadline.

These results lead us to conjecture about what many economists and policy analysts failed to foresee about ACRE participation – programmatic intangibles arising from uncertainty and administrative complexity. The ACRE decision was clearer for farmers focused on some crops (e.g., cotton and wheat). However, the fact that many producers did not follow recommendations – to sign up for ACRE because expected returns would exceed returns from traditional programs – runs contrary to the often accepted notion that producers are simply rent seeking in farm program participation. This paper takes a first step toward understanding why.

Anecdotes of not being able to obtain clear programmatic answers from the USDA Farm Service Agency (FSA) at the time of our survey suggest that producers may have perceived a significant value to deferring the decision until greater program clarity and more experience were obtained. Also, anecdotes of farmers operating more than 40 farm serial numbers and having to obtain signatures from numerous landlords in order to enroll in ACRE suggest that transactions costs were also important. Interestingly, ACRE participation has not significantly increased over the life of this Farm Bill.

Over time, a variety of forces have pushed farm policy toward a more complex revenue-based commodity program, rather than separate price and yield risk management programs that have dominated for many years. In the end, our results suggest that the next Farm Bill debate needs to consider whether farm program complexity has reached a point that those intended to benefit from the policy cannot effectively evaluate and utilize the farm program options offered. Perhaps more effort should be devoted to examining simpler revenue-based commodity support programs that are easier for farmers and non-farm landlords to understand.

Finally, as economists, we may need to be more cognizant of farm program uncertainty in our policy assessments. Perceiving farm policy as simply an exercise in rent-seeking, those asking for the ACRE program may have pushed to create a program that would pay in high-price scenarios, but in the end created something difficult for USDA to implement and nearly impossible for producers to fully comprehend. However, viewing these programs as tools to provide risk protection, economists perhaps need to step back and recognize that producers face not only price and yield risk, but increasingly another risk – farm program uncertainty

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Analyzing Farmer Participation Intentions and Enrollment Rates

for the Average Crop Revenue Election (ACRE) Program

The Food, Conservation and Energy Act of 2008 (2008 Farm Bill) introduced a major change in the commodity title. Eligible producers now face a choice between participating in the traditional set of commodity programs (i.e., direct and counter-cyclical payments and loan deficiency payments) versus participating in the newly created Average Crop Revenue Election (ACRE) program (Zulauf et al. 2008). To become eligible for revenue-based ACRE payments, producers lose eligibility for price-based counter-cyclical payments, give up 20% of their direct payments and accept a 30% reduction in the loan rates used to determine marketing assistance loans and loan deficiency payments (USDA-FSA 2009a, 2009b; Zulauf et al. 2008). In addition, the choice to participate in the ACRE program is irrevocable through the life of the 2008 Farm Bill (i.e., at least through 2012). Thus, ACRE participation is an annual choice that, once exercised, becomes irrevocable for the life of the Farm Bill, regardless of market conditions.

ACRE is unique, as no previous U.S. commodity support program has relied on revenue (particularly state revenue) as the main determinant of payments, though revenue-based crop insurance has been available since the mid-1990s. As a result, many economists examined ACRE to determine the types of farmers who would likely benefit from it and therefore sign up. Most of these studies found that for many farmers growing crops such as corn, soybeans, and wheat, expected ACRE payments (largely driven by yield and price expectations) would likely exceed the 20% reduction in direct payments, the loss of counter-cyclical payments, and the reduction in loan deficiency payments. As a result, many land-grant economists encouraged farmers to examine ACRE and to seriously consider participating (e.g., Hilker et al. 2009, Edwards 2009; Schnitkey and Paulson 2009; Mitchell 2009; Marra 2008). Using national data, Woolverton and Young (2009, p. i) suggested that "… for 2009-12, producers of corn, soybeans, wheat, and rice are likely to benefit more from the ACRE program than from the price-based, income-support programs." Babcock and Hart (2008, p. 10) echoed this sentiment, pointing out that "… a large proportion of U.S. farmers will find ACRE much more attractive than current commodity programs."

Some analyses also found that ACRE provides better risk protection. Cooper's (2009) simulation analysis for representative farms in Illinois, Kansas, and North Dakota found that ACRE reduced down-side revenue risk more than traditional programs for corn, soybeans, and wheat in 2009. Chen et al.'s (2010) simulation analysis found strong preferences for ACRE in all scenarios analyzed for a representative Indiana farm. Zulauf et al.'s (2010) analysis suggests that ACRE provides better risk protection since it increases minimum farm revenue more than traditional revenue insurance does. Schnitkey (2010) concluded that, from a purely economic perspective, it is difficult *not* to take ACRE over the traditional programs since ACRE has higher expected returns and provides better risk protection.

Because many expected a large number of eligible producers to sign up for ACRE in 2009, extension economists and grower associations provided educational programs and publications prior to the 2009 sign-up deadline (August 14, 2009) to familiarize farmers with the program and its tradeoffs and advantages (Hilker et al. 2009; Mitchell 2009; Marra 2008; Schnitkey and Paulson 2009; USDA-FSA 2009b; NCGA 2009). However, initial ACRE enrollment data indicated that only about 8% of farms with eligible base acreage signed up for ACRE in 2009, representing roughly 13% of eligible base acreage (USDA-FSA 2009a; Woolverton and Young 2009). This lower than expected ACRE enrollment led many farm policy observers to ask why participation was not higher, for example:

> *Final signup for Average Crop Revenue Election (ACRE) frustrated land grant economists who spent months trying to explain the farm program's optional risk management program to producers. One complained he couldn't convince his own father to enroll. In the end, every land grant economist I know signed up for ACRE on their own farms, compared to less than 5 percent enrollment on eligible farms nationwide. What went wrong?* (Zarley Taylor 2009).

Woolverton and Young (2009) postulate that producer risk preferences, learning and negotiation costs, decision irreversibility, and the option to enroll in later years led to lower than expected enrollment, but they provide no empirical evidence. However, in a recent poll the most commonly cited reason farmers did not sign up for ACRE was that they did not understand the program themselves or that it was too difficult to explain to landlords (Zarley Taylor 2010).

ACRE represents a significant change from previous commodity programs, with farmers commonly citing complexity as a problem (Woolverton and Young 2009; Edwards 2010; Zarley Taylor 2010; Lubben and Novak 2010). Farmers must learn how the new ACRE program works and determine if it will be beneficial for their operation, requiring a substantial investment of time and effort. Furthermore, commodity support programs, even if decoupled, have crop allocation and input use effects (e.g., Gardner et al. 2010; Femenia et al. 2010; Bhaskar and Beghin 2009, 2010; Goodwin and Mishra 2006; Serra et al. 2006; Hennessy 1998; McIntosh et al. 2007). Thus farmers switching to ACRE would need to develop and apply managerial expertise to adapt their farming operations to the new program, including potentially adjusting acreage allocations, technology choices and input use. Such effects are likely more important for ACRE, since it is not completely decoupled – ACRE payments depend on the crops actually planted, not just the crops planted years ago to establish a farm's base acres (Mitchell 2009; USDA-FSA 2009b).

This paper identifies factors significantly influencing farmer intentions regarding ACRE participation in 2009. We use a unique producer survey conducted in spring 2009 that specifically asked producers in four states about their intentions for the ACRE decision they would make later that year. In addition, this paper examines how similar factors influenced actual 2009 ACRE enrollment rates at the county level. This paper is the first to use farm-level survey data to empirically examine factors influencing intended and actual participation in the new ACRE program. Previous investigations used simulation approaches with representative farm data and/or aggregate (national) data to explore factors driving the ACRE sign-up decision (Olson and DalSanto 2008; Cooper 2009; Chen et al. 2010; Woolverton and Young 2009). Combining attitudinal data from the farmer survey and county-level data, we use a random utility-multinomial logit approach to examine farmer plans regarding ACRE sign-up in 2009. A two-limit Tobit model is also utilized to analyze actual county-level ACRE enrollment rates in order to assess whether the same factors that influenced intended participation had similar effects on actual ACRE decisions. Given the looming debate regarding renewal of various Farm Bill provisions, several suggestions have been made to 'improve' ACRE (Babcock 2010; Welden 2011). Improving understanding of the factors determining participation in the current ACRE program can inform this debate.

ACRE Program Background and Payment Calculation

The defining characteristic of the ACRE program is that, unlike traditional commodity programs, payments to farmers are triggered by revenue shortfalls rather than price shortfalls. Several proposals for a revenue-based commodity program were developed prior to the 2008 Farm Bill debate. All were similar in that they replaced a price-triggered program with a revenue-triggered program, but differed in the level of aggregation for calculating the revenue trigger − at the national, state, county or farm level. The National Corn Growers Association proposed replacement of counter-cyclical payments with county-average revenue coverage, while the American Farm Bureau Federation proposed state-average revenue coverage, and the Administration and American Farmland Trust both proposed programs triggered on U.S. average revenue. None of these proposals enjoyed unanimous support and regional differences existed – for example, southern legislators generally favored maintaining pre-existing commodity programs. Ultimately, the final legislation was a political compromise that uses national prices and state yields and requires that a farm loss occur, but gives producers the option to remain in the traditional commodity programs or to opt into the new ACRE program.

Producers elect ACRE for an officially designated USDA-Farm Service Agency (FSA) farm serial number, with many producers' farming operations including more than one FSA-designated farm. Because the choice to participate in the ACRE program applies to all eligible crops grown on a given FSA farm, producers must consider ACRE versus the traditional programs for all program crops by farm serial number, with eligible crops including barley, corn, cotton, oats, peanuts, sorghum, soybeans, and wheat.

ACRE payments for a crop are triggered when a revenue loss occurs at both the state level and at the individual farm level (i.e., both state and farm actual revenue must be below their respective ACRE guarantees). When both triggers are met, ACRE payments are made for that crop based on the difference between the state ACRE guarantee and actual state revenue.

The state ACRE guarantee (SG) for a crop is 90% of the benchmark state yield (BSY) multiplied by the ACRE guarantee price (AGP): $SG = 0.9 \times BSY \times AGP$. The BSY is the average of the state's yield per planted acre (the sum of harvested acres and FSA-designated failed acres) for the five most recent crop years after removing the highest and lowest yields from the calculation (the "Olympic average"). The *AGP* is the simple average of the USDA national marketing year average prices of the crop for the two most recent crop years. State actual revenue (*SAR*) equals the actual state yield per planted acre (*ASY*) multiplied by the higher of the national marketing year average price or 70% of the loan rate.

The farm ACRE guarantee (*FG*) is the benchmark farm yield (*BFY*) multiplied by the ACRE guarantee price (*AGP*), plus federal crop insurance premiums paid per acre by the producer. The *BFY* is the "Olympic" average of the five most recent years of farm yields. Farm actual revenue (*FAR*) is computed the same way as state actual revenue (*SAR*), except that actual farm yield (*AFY*) is used instead of actual state yield (*ASY*).

ACRE payments to producer *i* growing eligible crop *j* in year *t* are calculated as:

(1) $$ACRE_{ijt} = d_{ijt} \times \left(\max\left[0, \min\left\{ \left(0.25 \times SG_{jt}\right), \left(SG_{jt} - ASR_{tj}\right) \right\} \right] \right) \times \frac{BFY_{ijt}}{BSY_{jt}} \times A_{ijt} \times 0.833,$$

where d_{ijt} is an indicator variable equal to one when actual farm revenue is less than the farm ACRE guarantee ($FAR_{ijt} < FG_{ijt}$) and zero otherwise, and A_{ijt} is acres planted to crop *j* in year *t* by producer *i*. Note that the final multiplier in equation (1) is 0.833, which applies for 2009-2011, but 0.85 applies for 2012. Also, the benchmark state yield, state ACRE guarantee, and state actual revenue (*BSY*, *SG*, *SAR*) will vary by state for each crop.

Various limitations apply to ACRE payments. The state ACRE revenue guarantee (*SG*) cannot increase or decrease more than 10% from the previous year. Also, if the total number of acres planted to eligible program crops exceeds the farm's total base acreage (a common occurrence), the producer must annually designate which planted acres are enrolled in ACRE. Thus producers are eligible for ACRE payments for crops actually planted, even if those crops did not establish the original base acres, so that ACRE is not completely decoupled (Mitchell 2009; USDA-FSDA 2009b). Some states have separate state ACRE guarantees (*SG*) for irrigated and non-irrigated land. Payment limitations also apply to ACRE just as for other support payments. See USDA-FSA (2009b) for more details.

Analyzing ACRE Intentions

At the time when the mail survey was conducted, farmers had not made their final ACRE decisions, and so the survey offered multiple response options regarding their intentions to participate in ACRE. Specific response options were to (a) switch to ACRE in 2009, (b) wait and evaluate the ACRE program and possibly switch to ACRE in a later year, or (c) not switch to ACRE during the life of the Farm Bill. Let k index a farmer's choice among these K = 3 options and let Y_i indicate farmer i's observed choice, so that $Y_i = 0$ denotes staying in the traditional commodity program through the life of the current Farm Bill, $Y_i = 1$ denotes waiting and possibly switching in a later year, and $Y_i = 2$ denotes switching to ACRE in 2009.

Given this structure, specify a random utility-multinomial logit model. U_{ik}^* is an unobserved index characterizing farmer i's expected net benefit from choice k, such that

(2) $$U_{ik}^* = \boldsymbol{\theta}_k' \mathbf{X}_i + \varepsilon_{ik},$$

where $\mathbf{X}_i$ is a vector of observable farmer-specific variables, $\boldsymbol{\theta}_k$ is the choice-specific parameter vector to be estimated and ε_{ik} is an error term. Conceptually, as a random utility model, $\boldsymbol{\theta}_k' \mathbf{X}_i$ linearly approximates the decision maker's expected utility. If a farmer chooses option k, U_{ik}^* is the maximum benefit derived from among all K choices:

(3) $$\Pr\left[Y_i = k\right] = \Pr[U_{ik}^* > U_{im}^*] \;\; \forall \; k \neq m.$$

Because U_{ik}^* is unobserved, estimation based on equation (3) uses the observed choice Y_i to indicate which choice k provided the greater perceived benefit to producer i. Hence, as a random utility model, estimation identifies factors significantly influencing the probability of making a particular choice k and not the actual expected benefit farmers derived from that choice.

For empirical tractability, let ε_{ik} be independently and identically distributed with a type I extreme value (Gumbel) distribution, which gives a multinomial logit model:

(4) $$\Pr\left[Y_i = k\right] = \frac{e^{\boldsymbol{\theta}_k' \mathbf{X}_i}}{\sum_{k=0}^{K-1} e^{\boldsymbol{\theta}_k' \mathbf{X}_i}} .$$

Independent variables are farmer-specific, with no alternative- or choice-specific variables implying a conditional logit specification. Since response probabilities must sum to one, a normalization to identify the multinomial logit model is to define a base category for which the parameters equal zero (Greene 2003, p. 721). Here, staying in the traditional program ($k = 0$) is the base category, so that $\boldsymbol{\theta}_0$ is a vector of zeros and the resulting response probabilities become:

(5) $$p_{ik} = \Pr\left[Y_i = k\right] = \frac{e^{\boldsymbol{\theta}_k' \mathbf{X}_i}}{1 + \sum_{k=1}^{K-1} e^{\boldsymbol{\theta}_k' \mathbf{X}_i}} ,$$

for $k = 1, ..., K - 1$. The log-likelihood function for this model can then be expressed as

(6) $$\ln L = \sum_{i=1}^{n} \sum_{k=0}^{K-1} D_{ik} \ln p_{ik}(\mathbf{X}_i, \boldsymbol{\theta}_k) ,$$

where $D_{ik} = 1$ if alternative k is chosen by individual i, and 0 otherwise, so that only one of the D_{ik}'s equals 1 for each i. Given the chosen base category, estimated parameter vectors $\boldsymbol{\theta}_1$ and $\boldsymbol{\theta}_2$ for the decision to wait ($k = 1$) and to switch to ACRE ($k = 2$) are interpreted relative to the decision to stay in the traditional program through the life of the 2008 Farm Bill ($k = 0$).

Survey Design and Data Description

Data for this study are from a survey of randomly-sampled commercial-sized crop producers in Mississippi, North Carolina, Texas and Wisconsin. The USDA-National Agricultural Statistics

Service (USDA-NASS) was contracted to conduct a mail survey using the population of farms in its database. To be included, producers had to produce at least one of the following crops: corn, cotton, grain sorghum, soybeans, rice, or wheat. Farms were stratified into five categories based on gross sales, with each stratum representing approximately 20% of the population, and then the lowest stratum was excluded to focus the survey on commercial farms. Six thousand surveys were mailed (1,200 in Mississippi, 1,500 in North Carolina, 1,650 in both Texas and Wisconsin) on March 23, 2009. Post card reminders were mailed one week after the initial mailing and a second survey was sent to non-respondents about one month after the initial mailing.

Because the survey predated the ACRE sign-up deadline, farmers were asked to report their anticipated ACRE decision for the one FSA farm (i.e., farm serial number) they were asked to consider. Given the flow of information in the agricultural media and outreach efforts occurring during this period, it is likely that some respondents reevaluated their ACRE choice as the sign-up deadline approached. However, a great deal of attention had been given to the ACRE choice at the time of the survey. For example, the national FSA factsheets on the ACRE program came out on March 19, 2009 (USDA-FSA, 2009b). Hence, we believe these data are an accurate snapshot of producer thinking during a period of intense interest in the ACRE program. At the time the survey was initially mailed, USDA had announced sign-up would end on June 1, 2009, but that deadline was later extended to August 14, 2009.

Farmers returned 1,380 surveys with usable information (a 23% usable response rate). Comparing respondent demographics to published 2007 Census of Agriculture summaries (USDA-NASS 2007), the survey sample population was representative of the full population. The average respondent age was 58.7 versus the Census average of 57.1. Respondent farms contained more total acres than the Census average, but were within half of a standard deviation in all four states, which is as expected, since the survey sample omitted smaller farms. Finally, the national average debt-to-asset ratio for agricultural producers was 12.8% in 2009 (USDA-ERS 2010), while the respondent average ratio was 13.8%.

The survey response data were augmented by data from the 2007 Census of Agriculture (USDA-NASS 2009) for each respondent's county. New variables included the average farm size in each respondent's county in 2007, plus the proportion of farms in each respondent's county renting land and/or buildings in 2007 and the proportion receiving government payments other than conservation payments and commodity credit loans in 2007.

Table 1 reports summary statistics for the data used in the analysis. The dependent variable is farmer intentions about 2009 ACRE participation (*ACRE Decision*). At the time of the survey, only 2.8% of producers answered that they intended to switch to ACRE in 2009. A much larger 31.3% stated that they might switch to ACRE in later years, while 65.9% reported that they intended to stay in the current program for the life of the Farm Bill. Actual 2009 ACRE sign-up in Mississippi, North Carolina, Texas, and Wisconsin was 2.2%, with Wisconsin sign-up the highest among these four states at 7% of base acres (USDA-FSA 2009a).

Estimation used farmer-specific independent variables from the survey ($\mathbf{X}_i$) to identify factors driving the ACRE participation decision. *ACRE Pays More* captures each farmer's assessment of expected returns with ACRE versus traditional commodity programs over the course of the current Farm Bill. *ACRE Risk Protection* indicates whether a farmer believes that ACRE provides additional risk protection, as perceived risk management benefits likely influence the ACRE decision. Based on these survey data, only 3% of producers perceived that the ACRE program would pay more and only 8% believed ACRE would afford greater risk protection than traditional commodity support programs. Estimation included indicator variables for the farmer's self-described willingness to accept risk (*Risk Averse*) and for perceived risks from farm programs (*Farm Program Risk*), as previous studies found that risk preferences play a role in evaluating the benefits and costs of ACRE participation (Cooper 2009; Woolverton and Young 2009). About half of survey respondents described themselves as much less willing to accept risk compared to other farmers, while 31% expected significant income risk from farm program changes over the next five years.

Demographic variables capture effects from inherent attitudes toward farm programs or exposure to different information sources. These included an indicator variable for membership in farm organizations such as the National Farmers Organization, the Farmers Union or the Grange (*Farmer Organization*), total cropland acres (*Farm Size*), and indicator variables for the primary crop (*Corn*, *Soybeans*, *Cotton*) and state. Only 3% of respondents reported membership in the identified farm organizations. Average farm size in the sample was 724 acres. Texas and Wisconsin producers each reflect about 30% of respondents, with North Carolina and Mississippi each providing approximately 20% of respondents. When asked to identify a primary crop, corn was identified by 29% of respondents, soybeans by 19%, and cotton by 7%.

Indicator variables reflect producer assessments of yield and price variability effects on income risk (*Yield Variability Risk*, *Price Variability Risk*). Respondents used a five-category Lickert scale to describe their perceived potential for each source of variability to affect their income risk (5 = high potential and 1 = low potential), which were coded so that a 4 or 5 meant that the factor was perceived as a major source of income risk. Among all respondents, 64% described crop yield variability as a major source of income risk in the next five years, while 78% described crop price variability as a major source of income risk in the next five years.

Estimation also included the proportion of farms in each respondent's county that received government payments other than conservation payments and commodity credit loans and the proportion renting land and/or buildings (*Program Participation*, *Rent Participation*). Across all respondents, on average 40% of farms in respondents' counties received government payments and 25% of farms in respondents' counties rented land and/or buildings. Finally, the county average farm size across all respondents (*County Farm Size*) was 503 acres.

ACRE Enrollment Analysis and Data

The mail survey collected detailed information regarding farmer attitudes and ACRE enrollment intentions, but actual ACRE decisions were not made until 4 to 5 months after the mail survey was completed. Unfortunately, it was not feasible to conduct a follow-up survey of the same farmers to compare reported ACRE intentions to actual enrollment decisions and to determine if the factors affecting ACRE intentions had the same effect on actual enrollment. However, for most counties in these four states, the USDA Farm Service Agency provided actual 2009 ACRE enrollment rates (i.e., the proportion of eligible base acres in each county that elected to enroll in ACRE in 2009). We link these enrollment data and the mail survey data to examine the effect of the same attitudinal factors on actual ACRE enrollment decisions.

ACRE enrollment rates must be between 0 and 1 and, in this case, the rates are highly censored: 343 of the 444 counties had rates of 0. Given the extent of censoring, we use a two-limit Tobit model (Gould et al. 1989, Fernandez-Cornejo and McBride. 2002, Jensen et al. 2007). Let y_i^* be a latent variable for the proportion of county *i*'s base acres that enrolled in ACRE in 2009, which depends linearly on a vector of covariates $\mathbf{Z}_i$:

(7) $$y_i^* = \boldsymbol{\alpha}'\mathbf{Z}_i + \tau_i u_i \,.$$

Here $\boldsymbol{\alpha}$ is a parameter vector, u_i is an independently and normally distributed, mean-zero error, and τ_i is the standard deviation of the error for county i. The observed ACRE enrollment rate, y_i, is a censored variable that depends on the latent variable y_i^*:

$$(8) \qquad y_i = \begin{cases} 0 & \text{if } y_i^* \le 0 \\ y_i^* & \text{if } 0 < y_i^* < 1 \\ 1 & \text{if } y_i^* \ge 1 \end{cases}.$$

For heteroscedasticity, we use an exponential function: $\tau_i = \exp(\boldsymbol{\omega}'\mathbf{W}_i)$, where $\boldsymbol{\omega}$ is a parameter vector and $\mathbf{W}_i$ is a sub-vector of regressors contained in the main covariate vector $\mathbf{Z}_i$. For a heteroscedastic, two-limit Tobit model, the marginal effect of regressor $Z_k \in \mathbf{Z}_i$ is (dropping the county index i):

$$(9) \qquad \frac{\partial \mathrm{E}[y \mid Z]}{\partial Z_k} = \left(\Phi\left(\frac{1-\boldsymbol{\alpha}'\mathbf{Z}}{\tau}\right) - \Phi\left(\frac{0-\boldsymbol{\alpha}'\mathbf{Z}}{\tau}\right)\right)\theta_k + \left(\phi\left(\frac{1-\boldsymbol{\alpha}'\mathbf{Z}}{\tau}\right) - \phi\left(\frac{0-\boldsymbol{\alpha}'\mathbf{Z}}{\tau}\right)\right)\frac{\partial \tau}{\partial Z_k}.$$

With homoscedasticity, or if Z_k is not a heteroscedasticity regressor in $\mathbf{W}$ ($Z_k \notin \mathbf{W} \subseteq \mathbf{Z}$), the second term is zero. With the exponential form for the heteroscedasticity function, if Z_k is a heteroscedasticity regressor in $\mathbf{W}$ ($Z_k \in \mathbf{W} \subseteq \mathbf{Z}$), then $\frac{\partial \tau}{\partial Z_k} = \omega_k \tau$.

Regressors for the analysis were of three types: aggregated farmer attitudinal data from the mail survey, county-level data from the 2007 Census of Agriculture (USDA-NASS 2010), and crop measures based on 2010 planted acres in each county (USDA-NASS 2011). Two data sets were developed using different aggregations of the mail survey data.

The average of seven indicator variables for farmer attitudes from the mail survey (*ACRE Pays More, ACRE Risk Protection, Farm Program Risk, Risk Aversion, Farmer Organization, Yield Variability Risk, Price Variability Risk*) were calculated as measures of farmer attitudes in the county or region around each county. As most counties had few survey responses – only 61 counties had responses from 5 or more farmers, these averages were subject to large sampling error. To create larger samples, counties were aggregated to the crop reporting district (CRD) level (USDA-ERS 2000). Sample sizes for CRDs ranged from 5 to 58, with data available for 35 CRDs. Hence, two data sets of farmer attitudes were used as regressors, using either CRD-level or county-level averages, with far fewer observations in the county-level data set. Due to privacy restrictions, FSA released enrollment data only for 444 of the 488 counties in these four states. CRD-level farmer attitude data were available for 381 of these counties and crop acreage data were available for 317 of these 381 counties. Though county-level farmer attitude data were available for 61 counties, crop acreage data were only available for 59 of these counties.

Table 2 summarizes ACRE enrollment rates and regressors for both data sets. For the CRD-level data set, the average county enrollment rate in these four states was 2.0% of eligible base acres, with enrollment rates exceeding zero for 100 of the 317 counties (31.5%). For the county-level data set, the average enrollment rate was 4.3%, with 37 of the 59 counties (62.7%) having positive enrollment rates. These actual enrollment rates are comparable to the 2.8% of growers who reported in the mail survey that they intended to switch to ACRE in 2009 (*ACRE Decision* in Table 1).

Regressors again included county average farm size, the proportion of farms renting land and/or buildings, and the proportion receiving government payments (*County Farm Size, Rent Participation, Program Participation*) from the 2007 Census of Agriculture (USDA-NASS 2009). State indicator variables were also constructed for each county. Crop acreage shares and a crop specialization index were used as alternatives for the primary crop information from the mail survey (*Corn, Soybeans, Cotton*). Total 2010 planted acreage in each county for corn, soybeans, cotton, wheat, sorghum, rice, peanuts, barley and oats was used to calculate crop acreage shares (USDA-NASS 2011). Table 2 shows that the average acreage share for corn was almost 27% and almost 24% for soybeans, while the average for cotton was 12% and more than 25% for wheat, implying an average share of 12.4% for the remaining minor crops. To measure crop specialization, a Herfindahl-Hirschman index was calculated for each county using the acreage shares for all nine crops. The averages in Table 2 indicate fairly specialized counties, focusing on only a few crops.

Averages for the farmer attitude data from Tables 1 and 2 show consistent opinions across all three data sets for the size of ACRE payments relative to current programs, the risk protection provided by ACRE, and the importance of price variability for the next five years (*ACRE Pays More*, *ACRE Risk Protection*, *Price Variability Risk*). Opinions about the importance of yield variability over the next five years were not as consistent (*Yield Variability Risk*). The largest differences between the data sets concerned beliefs about farm program risk and self assessments of risk aversion (*Farm Program Risk*, *Risk Aversion*). On average, well more than half of the farmers in both county enrollment data sets believed that farm program risk would be a major source of income risk over the next five years, but less than a third held the same option in the mail survey. Similarly, a substantially smaller proportion of the growers in the county enrollment data sets considered themselves risk averse – on average less than 20% versus almost 50% for the mail survey. Membership in the specified farmer organizations essentially doubled between the mail survey and the two county enrollment data sets, but remained uncommon in all three data sets (*Farmer Organization*). These comparisons indicate that the types of farmers in the counties represented by the county enrollment data tend to be less risk averse and more concerned about farm program risk than in the full mail survey.

Estimation Results

Table 3 reports parameter estimates for the multinomial logit regression and, as a robustness check, parameter estimates for a multinomial probit regression. As the multinomial probit does not require the independence of irrelevant alternatives (IIA) assumption for valid results, similar parameter estimates for the two models suggests that the IIA holds and that the multinomial logit results are valid (Greene 2003, p. 727). A Hausman test of no significant difference between the parameter estimates for the two models had a chi-square statistic less than 0.01, strongly indicating that the null hypothesis could not be rejected. Another test compares parameter estimates for the multinomial logit model with all alternatives to multinomial logit models with one alternative removed (Greene 2003, p. 274). Results are not reported, but parameter estimates and p values were similar to those in Table 3, supporting the IIA assumption and the multinomial logit results. Also, Hausman tests comparing both reduced models to results in Table 3 had chi-square statistics of 0.07 and 0.01, further supporting the multinomial logit results.

Table 4 reports parameter estimates for the two-limit Tobit models using both CRD-level and county-level aggregation of farmer attitude variables. Tests support the heteroscedastic models over homoscedastic models for both cases, so only heteroscedastic results are reported. The likelihood ratio statistic was 10.74 with two degrees of freedom for the CRD-level data and 20.37 with one degree of freedom for the county-level data; both imply p values strongly supporting the heteroscedastic models. For the CRD-level data set, all regressors were included initially in the heteroscedastic function, but most coefficients were insignificant. Regressors were dropped in logical groups (e.g., crop shares, farmer attitudes, state indicator variables) from the heteroscedastic function if likelihood ratio tests did not support their inclusion until the final model included only *County Farm Size* and *Crop Specialization*. For the county-level data set, the homoscedastic model did not converge until state indicator variables were dropped. Also, estimation did not converge with both *County Farm Size* and *Crop Specialization* as heteroscedastic regressors, so each was alternately dropped and the model with the greatest maximized value of the likelihood function was chosen.

As an additional robustness check, a fractional logit model was estimated (Papke and Wooldridge 1996). Results are not reported, but did not substantively differ from the two-limit Tobit results – most of the marginal effects were of similar magnitude and many of the same marginal effects were significant. However, the maximized value of the quasi log-likelihood function was much lower than the maximized value of the log-likelihood function for the two-limit Tobit model, likely due to the substantial censoring of participation rates at zero.

ACRE Intentions

Table 5 reports the marginal effect of each variable on the probability of the outcomes, calculated as the average of the marginal effect for each sample observation. *ACRE Pays More, ACRE Risk Protection*, *Farmer Organization*, and *Cotton* have significant marginal effects at the 5% level on farmer plans to switch to ACRE in 2009. The estimated probability of planning to switch to ACRE increases if producers believed that ACRE tends to pay more and if they believed ACRE provides more risk protection, consistent with the logic that those believing that ACRE provides more benefits would more likely report intending to switch to ACRE. Members of the identified farm organizations on average had lower estimated probabilities of planning to switch to ACRE. These organizations typically support commodity programs relying on loan deficiency payments rather than on direct and counter-cyclical payments (NFO 2011; NFU 2011), so these intentions for ACRE sign-up are consistent with membership. Growing cotton (relative to the omitted sorghum-rice-wheat category) on average reduces the estimated probability of planning to switch to ACRE. This result is not surprising, as cotton growers, and southern producers in general, typically receive larger direct payments and derive a greater proportion of their farm income from program payments (USDA-ERS 2011; Campiche and Harris 2010; Woolverton and Young 2010).

Few variables in Table 5 have significant marginal effects on intentions to wait and decide later about ACRE. On average, the probability of waiting and possibly switching later is lower for producers describing themselves as more risk averse (significant at the 5% level). Relative to Mississippi growers, Wisconsin growers likely have higher probabilities of waiting and possibly switching later, as the marginal effect is essentially significant at the 10% level. Interestingly, producers who perceive price variability as a major source of income risk on average have higher probabilities of waiting and possibly switching to ACRE (p value = 0.12).

Marginal effects are not reported for planning to stay with the current commodity programs because the significant marginal effects are the same as for one or both of the other outcomes, and the magnitude of these marginal effects completely offset the marginal effects for the other outcomes. This result occurs because of the "adding up" property of probabilities – probabilities for all three outcomes must sum to one.

ACRE Enrollment Rates

Table 6 reports marginal effects for each variable on the proportion of base acres in each county that enrolled in ACRE in 2009. With farmer attitudes aggregated to the CRD level, seven of the eighteen regressors had significant marginal effects at the 5% level, with two more significant at the 10% level. With attitudes aggregated to the county-level, only two of the fifteen marginal effects were significant at the 5% level, with three more at the 10% level and another three at the 15% level. Significant marginal effects had the same signs for both data sets.

When interpreting the magnitude of the marginal effects in Table 6, note that most regressors are proportions (Table 2). For example, considering the marginal effect of *Yield Variability Risk*, if the proportion of farmers believing that yield variability risk will be a major source of risk increases by 10 percentage points (i.e., by 0.10), then the estimated increase in the proportion of county base acres enrolling in ACRE is 0.002 and 0.0278 for the CRD-level and county-level data sets, respectively.

The marginal effects for the farmer attitudinal variables indicate that areas where farmers believed *Yield Variability Risk* would be a major source of income risk had higher ACRE enrollment rates. Interestingly, the marginal effect for *Farmer Organization* implies that areas with higher membership in the identified organizations had higher ACRE enrollment rates. For the county-level data set, most of the farmer attitudinal variables have marginal effects with low p values (< 0.14). Counties where more farmers considered themselves *Risk Aver*se had higher ACRE enrollment rates, as did counties where farmers believed *Farm Program Risk* will be a major source of income risk. Surprisingly, areas where more farmers believed that *ACRE Pays More* than current commodity support programs had lower ACRE enrollment rates.

Marginal effects for *Program Participation* and *County Farm Size* indicate that counties where more farmers participate in current commodity support programs have higher ACRE enrollment rates, as do counties with larger average farm sizes. Potentially, farmers in counties with greater participation in farm programs have more institutional knowledge about farm programs, greater capacity to evaluate program changes and/or possibly received greater educational attention from extension and commodity groups. Counties where more farmers rent land and/or buildings had lower ACRE enrollment rates (*Rent Participation*), likely due to greater transaction costs of getting landlords to sign ACRE election forms.

Counties with a larger *Cotton Share* had significantly lower enrollment rates, while those with a larger *Wheat Share* had significantly higher enrollment rates. These results are consistent with cotton growers preferring to stay with the existing commodity programs in 2009, likely due to the large 'cost' of giving up the relatively larger direct payments for cotton and price expectations that made counter-cyclical payments more likely, while the reverse is true for wheat growers (USDA-ERS 2011; Woolverton and Young 2010; Flanders and Wailes 2010; Barnaby 2010; Campiche and Harris 2010). The negative marginal effect for *Crop Specialization* implies that counties specializing in producing fewer crops had lower ACRE enrollment rates. Potentially, because farmers in such counties likely had a smaller "portfolio effect" for their crop income, they were more reluctant to give up direct payments for the more uncertain ACRE payments. Finally, for the CRD-level data set, growers in Wisconsin had lower ACRE enrollment rates after controlling for all other variables.

Discussion

Comparing the results in Table 5 for the analysis of farmer intentions regarding their ACRE decision to the results in Table 6 for the analysis of actual county-level ACRE enrollment rates, we assess how the same factors affected farmer intentions and actual decisions regarding ACRE, focusing on variables with significant marginal effects in both analyses.

Farmers identifying themselves as primarily cotton growers had lower probabilities of planning to sign up for ACRE and counties with a greater cotton acreage share had lower ACRE enrollment rates. These results are consistent with the larger direct payments for cotton growers and the greater dependence of southern farm income on commodity programs (USDA-ERS 2011; Woolverton and Young 2010). Also, cotton prices were such that loan deficiency and counter-cyclical payments seemed much more likely than for grain crops, hence the reluctance of cotton growers to sign up for ACRE (Flanders and Wailes 2010).

Among the state indicator variables, only *Wisconsin* is significant in both analyses, with consistent marginal effects in both. Wisconsin farmers were more likely to respond that they planned on waiting and evaluating the ACRE program, and thus were less likely to stay with the current program (Table 5). This greater tendency to wait would imply a lower ACRE sign-up rate, which is consistent with the estimated negative marginal effect for *Wisconsin* in Table 6.

ACRE Pays More, *Farm Organization*, and *Risk Averse* have significant marginal effects in both analyses, but with opposite signs. As the farmer samples for these attitudinal variables differed (Tables 1 and 2), we re-estimated the multinomial logit model analyzing farmer intentions for ACRE using only observation for farmers from the same 59 counties as used for the two-limit Tobit analysis of ACRE enrollment rates. Results are not reported, but marginal effects for these three variables had the same signs as in Table 5 and similar p values. Given these results, we interpret the opposite marginal effects as evidence that grower beliefs about and understanding of ACRE were rapidly evolving between the time of the mail survey in the spring and the actual ACRE decision in August.

Results for *ACRE Pays More* imply that the likelihood a farmer planned to switch to ACRE increased if a farmer believed that ACRE would pay more (Table 5), but as the proportion of growers in a county who believed ACRE would pay more increased, the actual ACRE enrollment rate for the county decreased (Table 6). The negative marginal effect is difficult to interpret. During the summer before the sign-up deadline, educational efforts intensified and grower beliefs apparently changed. Possibly, growers who thought ACRE would pay more at the time of the mail survey, and hence planned to switch, were more likely to change their plans by the sign-up deadline, so that actual sign-up was lower than their intentions indicated.

Membership in the specified farm organizations also had opposite marginal effects. Intentions to sign up for ACRE were lower if farmers were members, but actual county enrollment rates were higher as membership in these organization increased in the county or region. As these organizations generally support programs relying on higher loan rates, not direct and county-cyclical payments (NFO 2011; NFU 2011), the negative marginal effect is consistent with expectations, but interpretation of the positive marginal effect is difficult. Potentially farmer beliefs changed between the time of the mail survey and the actual ACRE decision. Initially, members of these organizations provided mail survey responses generally consistent with the policy positions of these organizations, but by the ACRE decision deadline, members were more likely to follow the recommendations of commodity groups or extension economists, who had greatly increased educational efforts as the ACRE deadline approached.

Interpreting the opposing results for the *Risk Averse* marginal effect relies on a similar explanation. Farmers describing themselves as more risk averse for the mail survey were more likely to report planning to stay with current commodity programs, but actual county enrollment rates in ACRE were higher in areas where more farmers described themselves as risk averse. Based on their initial understandings of the ACRE program, farmers considering themselves more risk averse generally took the conservative approach of not planning to switch to ACRE. Later, after educational efforts had changed farmer understanding of ACRE, these more risk averse farmers had higher ACRE enrollment rates, apparently believing that it provided greater reductions in income variability.

Conclusion

We analyze farmer sign-up for the Average Crop Revenue Election (ACRE) program, the new commodity support program created by the 2008 Farm Bill, using a mail survey of farmer intentions regarding the ACRE decision and actual county-level ACRE enrollment rates. Based on several analyses indicating higher expected net returns under ACRE, producer sign-up for ACRE was less than anticipated by many land grant economists, producer groups and agencies.

Our empirical results suggest that initial farmer plans to switch to ACRE in 2009 were primarily driven by producer perceptions of whether or not ACRE would pay more than existing programs and whether or not it would provide more risk protection. On the other hand, planning to stay with existing programs in 2009 and possibly switching to ACRE later was driven more by producer risk aversion and perceptions about the effect of yield and price variability on income risk in the coming years. Membership in organizations such as National Farmers Union, National Farmers Organization, and the Grange was consistently and strongly associated with intending to stay with existing programs in 2009. Consistent state and crop effects were also found. Texas and Wisconsin producers were more likely to plan to wait and possibly switch to ACRE later and cotton growers consistently and strongly intended to stay with existing programs in 2009, likely due to the large 'cost' of giving up the relatively larger direct payments for cotton and price expectations that made counter-cyclical payments more likely.

Our empirical analysis of actual, county-level ACRE enrollment rates suggests that crop effects were again important – cotton areas had low enrollment rates, wheat areas had high enrollment rates, and counties with more diversity in crops had higher enrollment rates. In addition, regions where farmers believed yield variability would be an important source of risk also had higher enrollment. Programmatic knowledge and transactions costs also mattered for

ACRE enrollment. Counties with greater participation in current farm programs had higher ACRE enrollment rates, as more growers were likely more familiar with how farm programs worked and/or received more educational efforts. Similarly, as all owners and operators must sign ACRE election forms, counties with a greater proportion of farmers renting land and/or buildings had lower enrollment rates.

Many regressors measuring farmer beliefs and attitudes were significant in both analyses, indicating the key role that attitudes and beliefs play in decisions about farm programs. In some cases, however, similar regressors showed opposite effects, which we interpret as evidence that farmer beliefs about and understanding of ACRE were rapidly evolving during the months immediately preceding the ACRE deadline. The mail survey was administered 4 to 5 months before the eventual ACRE deadline in August. During this time, extension services, commodity and farm groups, the USDA Farm Service Agency and the farm media all had various efforts to explain ACRE and its benefits to growers. As a result, we recommend interpreting the mail survey results as an analysis of the factors affecting ACRE intentions a few months before actual decision had to be made, at a time when farmer beliefs and understanding were in flux.

These results lead us to conjecture about what many economists and policy analysts failed to foresee about ACRE participation – programmatic intangibles arising from uncertainty and administrative complexity (Lubben and Novak 2010). The ACRE decision was clearer for farmers focused on some crops (e.g., cotton and wheat). However, the fact that many producers did not follow recommendations – to sign up for ACRE because expected returns would exceed returns from traditional programs – runs contrary to the often accepted notion that producers are simply rent seeking in farm program participation. This paper takes a first step toward understanding why. Anecdotes of not being able to obtain clear programmatic answers from the

USDA Farm Service Agency (FSA) at the time of our survey suggest that producers may have perceived a significant value to deferring the decision until greater program clarity and more experience were obtained. Also, anecdotes of farmers operating more than 40 farm serial numbers and having to try to obtain signatures from numerous landlords in order to enroll in ACRE suggest that transactions costs were also important (Zarley Taylor 2010). Interestingly, ACRE participation has not significantly increased over the life of this Farm Bill (Paulson 2011).

Over time, a variety of forces have pushed farm policy toward a more complex revenue-based commodity program, rather than separate price and yield risk management programs that have dominated for many years. Given the tight budget situation leading up to the 2008 Farm Bill debates, rent-seekers may have played "budget scoring games" by proposing a complex ACRE program that they knew would likely pass muster with the Congressional Budget Office. In the end, our results suggest that the next Farm Bill debate needs to consider whether farm program complexity has reached a point that those intended to benefit from the policy cannot effectively evaluate and utilize the farm program options offered. Perhaps more effort should be devoted to examining simpler revenue-based commodity support programs that are easier for farmers and non-farm landlords to understand (Babcock 2010).

Finally, as economists, we may need to be more cognizant of farm program uncertainty in our policy assessments. Perceiving farm policy as simply an exercise in rent-seeking, those asking for the ACRE program may have pushed to create a program that would pay in high-price scenarios, but in the end created something difficult for USDA to implement and nearly impossible for producers to fully comprehend. However, viewing these programs as tools to provide risk protection, economists perhaps need to step back and recognize that producers face not only price and yield risk, but increasingly another risk – farm program uncertainty.

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Table 1. Survey Variable Descriptions and Summary Statistics

Variable	Description	Mean	Standard Deviation
ACRE Decision	= 0 if stay in current program for the life of the farm bill (65.9%) = 1 if stay in current program in 2009 but possibly switch later (31.3%) = 2 if switch to ACRE in 2009 (2.8%)	0.37	0.54
ACRE Pays More	= 1 if believe average annual payments for ACRE are more than for the current program	0.03	0.17
ACRE Risk Protection	= 1 if believe ACRE program provides more risk protection than current programs	0.08	0.28
Farm Program Risk	= 1 if believe changes in farm programs will be a major source of income risk in the next five years	0.31	0.17
Risk Averse	= 1 if much less willing to take risk relative to other farmers	0.49	0.50
Farmer Organization	= 1 if member of National Farmers Union, National Farmers Organization, or The Grange	0.03	0.17
Yield Variability Risk	= 1 if believe crop yield variability will be a major source of income risk in the next five years	0.64	0.48
Price Variability Risk	=1 if believe crop price variability will be a major source of income risk in the next five years	0.78	0.42
Farm Size	Total cropland (1,000 acres) in farming operation	0.72	1.00
Program Participation	Proportion of county's farms in 2007 in commodity support programs[a]	0.40	0.17
Rent Participation	Proportion of county's farms in 2007 paying cash rent for land or buildings[a]	0.25	0.11
County Farm Size	County average farm size (1,000 acres) in 2007[a]	0.50	0.88
Corn	= 1 if primary crop is corn	0.29	0.45
Soybeans	= 1 if primary crop is soybeans	0.19	0.39
Cotton	= 1 if primary crop is cotton	0.07	0.25
North Carolina	= 1 if farm in North Carolina	0.19	0.39
Texas	= 1 if farm in Texas	0.32	0.47
Wisconsin	= 1 if farm in Wisconsin	0.28	0.45

[a]Source 2007 Census of Agriculture (USDA-NASS 2010).

Table 2. Variable Descriptions and Summary Statistics for County Analysis

Variable	Description	CRD-Level Mean	CRD-Level St. Dev.	County-Level Mean	County-Level St. Dev.
Enrollment Rate	Proportion of county base acres enrolled in ACRE in 2009	0.020	0.048	0.043	0.058
	Proportion of respondents who:				
ACRE Pays More	Believe ACRE payments are more than for current programs	0.033	0.047	0.058	0.061
ACRE Risk Protection	Believe ACRE provides more risk protection than current programs	0.101	0.106	0.106	0.076
Farm Program Risk	Believe changes in farm programs will be a major source of income risk in the next five years	0.583	0.213	0.577	0.181
Risk Averse	Are much less willing to take risk relative to other farmers	0.163	0.098	0.180	0.114
Farmer Organization	Are members of National Farmers Union, National Farmers Organization or The Grange	0.059	0.094	0.063	0.089
Yield Variability Risk	Believe yield variability will be a major source of income risk in the next five years	0.464	0.203	0.521	0.142
Price Variability Risk	Believe price variability will be a major source of income risk in the next five years	0.715	0.175	0.769	0.115
Program Participation	Proportion of county farms receiving farm program payments other than conservation payments[a]	0.358	0.196	0.475	0.125
Rent Participation	Proportion of county farms renting land, buildings and/or grazing[a]	0.241	0.102	0.296	0.104
County Farm Size	Average size (1,000 acres) of farms in county[a]	0.654	1.073	0.410	0.394
Corn Share	Share of crop acres planted to corn[b]	0.269	0.287	0.422	0.246
Soybean Share	Share of crop acres planted to soybeans[b]	0.236	0.268	0.315	0.212
Cotton Share	Share of crop acres planted to cotton[b]	0.120	0.246	0.062	0.159
Wheat Share	Share of crop acres planted to wheat[b]	0.252	0.307	0.122	0.152
Crop Specialization	Herfindahl-Hirschman index calculated with corn, soybean, cotton, wheat, sorghum, rice, oats, barley, and peanut acreage shares[b]	0.577	0.252	0.459	0.108
North Carolina	= 1 if county in North Carolina	0.240	0.428	0.119	0.326
Texas	= 1 if county in Texas	0.442	0.497	0.169	0.378
Wisconsin	= 1 if county in Wisconsin	0.180	0.385	0.508	0.504

[a]Source 2007 Census of Agriculture (USDA-NASS 2010).
[b]Source 2010 crop acreage data (USDA-NASS 2011).

Table 3. Multinomial Logit and Probit Parameter Estimates

	Multinomial Logit		Multinomial Probit	
Variable	Coefficient	p-value	Coefficient	p-value
A. Outcome = Wait ($Y_i = 1$)*				
ACRE Pays More	0.235	0.517	0.211	0.484
ACRE Risk Protection	0.323	0.159	0.291	0.134
Farm Program Risk	0.137	0.395	0.113	0.406
Risk Averse	-0.378	0.043	-0.316	0.042
Farmer Organization	-0.548	0.136	-0.482	0.116
Yield Variability Risk	-0.229	0.186	-0.198	0.177
Price Variability Risk	0.311	0.093	0.268	0.088
Farm Size	-0.031	0.746	-0.025	0.741
Program Participation	-0.307	0.655	-0.229	0.688
Rent Participation	-0.300	0.766	-0.299	0.720
County Farm Size	-0.146	0.238	-0.118	0.200
Corn	0.148	0.599	0.141	0.559
Soybeans	0.105	0.738	0.110	0.682
Cotton	-0.619	0.071	-0.517	0.066
North Carolina	0.100	0.709	0.087	0.696
Texas	0.301	0.333	0.266	0.311
Wisconsin	0.434	0.093	0.367	0.090
Intercept	-0.842	0.049	-0.750	0.040
B. Outcome = Switch ($Y_i = 2$)*				
ACRE Pays More	2.279	<0.001	1.635	<0.001
ACRE Risk Protection	2.703	<0.001	1.743	<0.001
Farm Program Risk	-0.282	0.595	-0.106	0.744
Risk Averse	0.562	0.368	0.362	0.273
Farmer Organization	-16.052	<0.001	-12.852	<0.001
Yield Variability Risk	0.035	0.952	0.029	0.928
Price Variability Risk	0.660	0.289	0.358	0.318
Farm Size	0.236	0.360	0.161	0.304
Program Participation	-0.264	0.929	-0.190	0.901
Rent Participation	-3.559	0.347	-2.395	0.277
County Farm Size	-0.059	0.957	-0.229	0.781
Corn	0.914	0.449	0.561	0.403
Soybeans	1.579	0.195	0.925	0.181
Cotton	-12.034	<0.001	-10.166	<0.001
North Carolina	0.581	0.449	0.435	0.318
Texas	-0.992	0.393	-0.624	0.334
Wisconsin	0.397	0.708	0.280	0.655
Intercept	-5.233	<0.001	-3.345	<0.001
Log-Likelihood	-593.85		-592.61	
Pseudo R-squared	0.089		---	

Note: N = 881; base outcome is stay with current program through 2008 Farm Bill ($Y_i = 0$); omitted state variable is Mississippi and omitted crops are sorghum, rice, and wheat.

Table 4. Parameter Estimates for Two-Limit, Heteroscedastic Tobit

	--- CRD Level[a] ---		--- County Level[b] ---	
Variable	Coefficient	p-value	Coefficient	p-value
ACRE Pays More	-0.143	0.335	-0.450	0.062
ACRE Risk Protection	-0.018	0.876	0.127	0.548
Farm Program Risk	0.048	0.385	0.214	0.061
Risk Averse	0.119	0.277	0.659	0.006
Farmer Organization	0.316	0.005	0.362	0.139
Yield Variability Risk	0.308	<0.001	1.026	<0.001
Price Variability Risk	-0.069	0.444	-0.057	0.848
Program Participation	0.418	<0.001	0.290	0.042
Rent Participation	-0.262	0.014	-0.307	0.068
County Farm Size	0.000	0.984	0.001	0.985
Corn Share	0.087	0.179	0.099	0.668
Soybean Share	0.095	0.228	-0.036	0.875
Cotton Share	-0.309	0.007	-0.645	0.138
Wheat Share	0.197	0.003	0.131	0.673
Crop Specialization	-0.142	0.009	0.562	0.005
North Carolina	-0.014	0.685	---[c]	---[c]
Texas	0.022	0.653	---[c]	---[c]
Wisconsin	0.083	0.020	---[c]	---[c]
Intercept	-0.353	0.005	-1.087	0.003
<u>Standard Deviation</u>				
Intercept	-3.205	<0.001	-7.677	<0.001
Crop Specialization	1.488	0.001	9.145	<0.001
County Farm Size	-0.379	0.006	---[c]	---[c]
Log-Likelihood	83.5137		65.1989	

[a]Farmer attitude variables from mail survey aggregated to Crop Reporting District (CRD) level; N = 317, with 100 > 0; omitted state variable is Mississippi; omitted crop shares are sorghum, rice, oats, barley, and peanuts.
[b]Farmer attitude variables from mail survey aggregated to county level; N = 59, with 37 > 0; omitted crop shares are sorghum, rice, oats, barley, and peanuts.
[c]Not estimated due to model non-convergence.

Table 5. Multinomial Logit Marginal Effects

	Outcome = Wait ($Y_i = 1$)		Outcome = Switch ($Y_i = 2$)	
Variable	Marginal Effect[a]	p-value	Marginal Effect[a]	p-value
ACRE Pays More	0.029	0.690	0.046	0.001
ACRE Risk Protection	0.044	0.337	0.054	<0.001
Farm Program Risk	0.031	0.352	-0.007	0.521
Risk Averse	-0.083	0.029	0.015	0.259
Farmer Organization	0.024	0.766	-0.331	<0.001
Yield Variability Risk	-0.048	0.180	0.003	0.826
Price Variability Risk	0.059	0.122	0.011	0.387
Farm Size	-0.008	0.668	0.005	0.334
Program Participation	-0.062	0.665	-0.003	0.962
Rent Participation	-0.032	0.879	-0.072	0.363
County Farm Size	-0.030	0.274	<0.001	>0.999
Corn	0.023	0.694	0.018	0.483
Soybeans	0.008	0.897	0.032	0.212
Cotton	-0.026	0.731	-0.247	<0.001
North Carolina	0.016	0.775	0.011	0.478
Texas	0.071	0.270	-0.023	0.345
Wisconsin	0.087	0.103	0.005	0.835

[a]Note: reported values are the average of producer-specific marginal effects, not marginal effects evaluated at regressor means.

Table 6. Marginal Effects for Two-Limit, Heteroscedastic Tobit

	------ CRD-Level ------		------ County-Level ------	
Variable	Marginal Effect	p-value	Marginal Effect	p-value
ACRE Pays More	-0.009	0.373	-0.122	0.066
ACRE Risk Protection	-0.001	0.876	0.034	0.521
Farm Program Risk	0.003	0.415	0.058	0.117
Risk Averse	0.008	0.314	0.178	0.022
Farmer Organization	0.020	0.034	0.098	0.137
Yield Variability Risk	0.020	0.013	0.278	0.018
Price Variability Risk	-0.004	0.428	-0.016	0.854
Program Participation	0.027	0.008	0.078	0.091
Rent Participation	-0.017	0.071	-0.083	0.138
County Farm Size	0.004	0.097	0.000	0.985
Corn Share	0.006	0.222	0.027	0.691
Soybean Share	0.006	0.281	-0.010	0.870
Cotton Share	-0.020	0.038	-0.174	0.075
Wheat Share	0.013	0.030	0.036	0.706
Crop Specialization	-0.023	0.007	-0.005	0.960
North Carolina[a]	0.003	0.696		
Texas[a]	-0.006	0.647		
Wisconsin[a]	-0.025	0.002		

[a]Calculated as the change in the estimated ACRE enrollment rate when indicator variable switches from 0 to 1, with continuous regressors at their sample means and other indicator variables equal to 0.