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IZA DP No. 15262

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ABSTRACT

Health Insurance Coverage, Government Payments, and Labor Allocation*

The aging of the farmer population has led to concern about a shortage of beginning farmers and ranchers. This study investigates the impact of health insurance coverage and participation in government and private insurance programs on off-farm labor allocation decisions of beginning farm-operator households in the United States. We use farm household-level data from the 2015 Agricultural Resource Management Survey and the simultaneous Probit estimation method to estimate our empirical model. Results show that beginning farm-operator households with health insurance coverage from off-farm jobs are 14% more likely to work off the farm. Our analysis also depicts a negative relationship between the receipt of counter-cyclical, conservation, risk management payments, and off-farm work by beginning farm-operator households.

JEL Classification: C34, I13, J22, J38, J43, Q12, Q18

Keywords: Agricultural Resource Management Survey, beginning farm-operator household, counter-cyclical payments, risk management payments, health insurance coverage, off-farm labor supply, two-stage simultaneous probit model

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Introduction

The principal source of health insurance for U.S. citizens under age 65 is employer-sponsored programs. Economic studies have extensively examined the impact of health insurance coverage on labor market outcomes and its implications on the labor force's functioning. For example, the high and variable healthcare costs have been shown to impact wage, employment, retirement, welfare receipt, and job turnover and relocation decisions.[2] Studies also emphasize that the high cost of acquiring health insurance is a crucial driver of employees' decision to receive health coverage through employer-sponsored programs (e.g., Jensen and Morrisey, 2001; Garthwaite *et al.*, 2014). Approximately three out of four farmers are self-employed (Mishra *et al.*, 2002), and the majority of them do not have access to an employer-sponsored health insurance program. U.S. farmers can purchase health insurance through the individual, non-group markets, and the small group market (Sundaram-Stukel and Deller, 2009). In that category, we find primarily farmers and ranchers who operate large farms reporting sales of $250,000 or more (Ahearn *et al.,* 2013). Eligible for public health insurance programs (e.g., the Affordable Care Act) are the disabled, low-income parents, and people over age 65. An alternative for American farmers would be to receive fringe benefits directly through off-farm employment or indirectly dependent on a household member.[3] Note that two-thirds of farm households, either the principal operator or the spouse, are employed off-farm (Ahearn *et al.,* 2013).

[2] For a comprehensive and extensive examination of the relation between health insurance and the labor market, we refer the reader to the study of Currie and Madrian (1999).

[3] There are occasions where not all family members in the household have health insurance coverage. Studies have documented cases where farm households are more likely to be uninsured than the average US household (e.g., Jensen, 1983; Zheng and Zimmer, 2008). In addition, farmers can be denied coverage (Sundaram-Stukel and Deller, 2009).

However, when it comes to beginning farm-operator households[4], the focus group of this study. Some unique features of beginning farmers in the U.S. are that they contribute about 8% of agricultural production, are more likely to have rented land, and receive most of their family income from off-farm sources. Finally, operators and spouses on beginning farms are more likely to work at off-farm jobs and businesses and have a college degree than their counterparts (Ahearn and Newton, 2009). They are less likely to have health insurance coverage than established farm-operator households. Since the 1992 Farm Bill—Agricultural Credit Improvement Act—Congressional concern about the increasing age of U.S. farmers and ranchers led to the creation of loan programs and Federal/State financing partnerships for beginning farmers and ranchers. Data from the U.S., 2007–2017, reveals that the number of farmers in the United States fell by 4.3%, while the average age of principal farm operators rose by 1.2%. In addition, the number of beginning farmers fell by an incredible 20% over the same period. Policymakers have responded to the perceived needs of beginning farmers and ranchers by designing programs targeted to them.

The 2018 Farm Bill dictates that provisions for beginning and socially disadvantaged farmers and ranchers consistently provide enhanced support across most legislation's titles (see 2018 Farm Bill).[5] The new Farm Bill ensures equitable access to financial capital and federal crop insurance.[6] As a result, USDA's Farm Service Agency's (FSA) Beginning Farmers and Ranchers Loans provides subsidies on loan rates for small-scale ranchers or farmers whose operations are less than 10 years old.[7] Many states have "Beginning Farmer Loan Programs" or

[4] According to USDA's definition, "*a beginning farmer or rancher is an individual or entity who has not operated a farm or a ranch for not more than 10 consecutive years. This requirement applies to all members of an entity*". In our paper, we use the word farmers for either farmers or ranchers.
[5] See https://sustainableagriculture.net/wp-content/uploads/2017/11/BFROA-Summary.pdf
[6] Risk Management Agency offers benefits include exemption from paying certain administrative fees, a higher premium subsidy, and less stringent yield and production history requirements
[7] Under the new Bill the Farm Service Agency (FSA) should raise the cap on FSA Direct Ownership Loans to $500,000, adjusted annually by regional farmland inflation rate.

other loan or grant programs for beginning farmers or ranchers. The 2018 Bill also encourages commitment to conservation and stewardship across generations.[8] The aging of the farmer population has led to concern about a shortage of beginning farmers and ranchers. New farmers, including beginning farmers, often bring skill sets to complement and enhance traditional management and production technologies. Two decades later, the issue of beginning farmers and their entry into farming is still an issue that is being debated in the U.S Congress (see 2002, 2008, 2014, 2018 Farm Bills)[9]. The 2018 Farm Bill expanded beginning farmers' access to affordable farmland. Finally, in a report, the National Young Farmers Coalition (Shute, 2011) noted capital and health insurance as two major obstacles for beginning farmers.

Herein lies the objectives of this study. First, to examine the impact of health insurance coverage on beginning farm-operator households' off-farm labor allocation decisions. The studies, as mentioned earlier, examine the U.S. farm population as a whole, disregarding the more sensitive group of beginning farmers in accessing affordable health insurance and its implications on labor allocation. We hypothesize that beginning farmers with less than ten consecutive years of experience may buy expensive health insurance in the private market and turn to off-farm job opportunities. Secondly, to examine the impacts of government payments, counter-cyclical, conservation and risk management payments, on off-farm labor allocation of beginning farm-operator households. We consider conservation payments as additional income sources. On the one hand, we expect higher conservation payments to deter beginning farmers from seeking off-arm employment opportunities—wealth effect. Thus, leading to more leisure consumption. On the other hand, we expect higher counter-cyclical payments and risk

[8] The 2018 Farm Bill increases the existing set-aside from 5 to 15 percent within theEnvironmental Quality Incentives Program and the Conservation Stewardship Program (Beginning Farmer and Rancher Opportunity Act (H.R. 4316)

[9] 2018 Farm Bill established a definition of Veteran Farmer or Rancher that gives the same benefits for Veterans as begnnign farmers or ranchers.

management payments—tied to farm production—to deter beginning farm operators from seeking nonfarm employment opportunities. Finally, we use the two-stage simultaneous probit method to estimate our empirical model.

We use 2015 farm-level data from the Agricultural Resource Management Survey (ARMS). The 2015 ARMS collected information on farm families' health insurance coverage and off-farm work allocation. Besides, 2015 marks four years from the beginning of the Affordable Care Act (ACA) and a sluggish uptick in the nonfarm economy. Our estimates suggest that beginning farm-operator households who reported off-farm work are about 4% more likely to report health insurance coverage; the families of a beginning farmer who report health-insurance coverage are 14% more likely to report off-farm work. Moreover, our analysis depicts a negative relation between receipt of counter-cyclical, conservation and risk management payment and off-farm work by beginning farm-operator households.

The remainder of the paper is organized as follows. Section 2 provides the background and Section 3 presents the conceptual framework. Section 4 presents data and main observations from the 2011 ARMS, the latest year of our dataset. Section 5 shows the estimation framework and section 6 discusses the results. The last section summarizes and concludes.

Background

Despite to the predominant role of employer-sponsored programs, few agricultural economics studies have examined the importance of health insurance (e.g., McNamara and Ranney, 2002; Zheng and Zimmer, 2008). McNamara and Ranney (2002) study the trends of U.S. hired farm labor health insurance coverage using Current Population Survey data from 1995 to 1999. Their paper measures the levels of health insurance coverage and examines parameters that may affect purchasing health insurance. They report that hired farmworkers are more likely to be without health insurance coverage after controlling for socioeconomic and demographic

characteristics, including income, education levels, and ethnicity. Zheng and Zimmer (2008) analyze U.S. farmers' health consumption[10] considering their insurance status. Using the 1996 to 2001 waves of the Medical Expenditure Panel Survey, they document that approximately 19 percent of farmers between ages 18 and 64 are uninsured. In addition, 29 percent of self-employed individuals are in the same age bracket.

Moreover, the link between health insurance and labor allocation of farm households has not received adequate attention. Papers that examine that link include Jensen and Salant (1986), Ahearn *et al.* (2013), and D'Antoni *et al.* (2014). The early study by Jensen and Salant (1986) is one of the first to demonstrate the positive correlation between fringe benefits and the number of hours farmers work off-farm. Their study is based on farm data collected from 800 Tennessee and Mississippi farms. Still, they did not account for potential interdependence in health insurance and labor allocation decision of farm households. Ahearn *et al.* (2013) investigate the role of health insurance coverage and the decision to work off the farm by farm families in the U.S. Their study is more extensive in scope, using data from the 2010 Agricultural Resource Management Survey (ARMS). They attribute the high rate of health insurance coverage of farm households to farm family members' multiple job holdings. Mainly, farm operators and spouses who report off-farm labor are 3.2 percentage points more likely to report health insurance coverage. Besides, they state that fringe benefits are a fundamental reason for participation in the off-farm labor market. D'Antoni *et al.* (2014) estimate the effect of health insurance coverage on labor allocation using copulas to test the labor allocation dependence. Their research utilizes data from the 2006 to 2008 ARMS. Treating health insurance as a component of (off-farm) income,

[10] Consumption measures include utilization of health insurance captured by the total number of visits to health providers and expenditures account for total health care expenditures.

an endogenous variable, the authors found that greater fringe benefits tend to increase the hours worked off the farm by primary operators and spouses.

Another strand of literature focuses on the influence of decoupled payments on and off-farm labor supply decisions. Like fringe benefits, conservation payments receipts can be considered additional income providing incentives to decrease off-farm labor supply (Ahearn, El-Osta and Dewbre, 2006; D'Antoni and Mishra, 2013). For example, Ahearn *et al.* (2006) used ARMS data for the years 1996 and 1999, reporting that production flexibility contract (PFC), loan deficiency payments (LDP), and market loan assistance (MLA) payments, individually and in aggregate, reduce the probability of the farmer to work off the farm. The estimation results for the spouse are more ambiguous. Finally, D'Antoni and Mishra (2013) examined the welfare implications of decoupled payments. They find that the marginal effect of decoupled payments on hours worked off-farm will decrease in magnitude when accounting for fringe benefits, *ceteris paribus*. However, the studies mentioned above fail to discuss the impact of health insurance coverage on off-farm labor allocation in beginning farm-operator households.

Conceptual Framework

We employ a unitary labor supply model where the household is considered a single decision agent. The beginning farm-operator household is comprised of the farm operator (O) and spouse (S). By doing so, we can acknowledge the contributions of the on-farm labor supply of other household members, in this case, the spouse of the principal operator. Consider a household that maximizes a single period, joint utility (U) over income (I) and leisure of each family member (L^0) and (L^S) (Singh, Squire, and Strauss, 1986; Ahearn, El-Osta, and Dewbre, 2006).[11] We assume that $U(.)$ is twice differentiable, (quasi) concave utility function that has positive first-order derivatives in terms of its arguments. Each member is assumed to allocate

[11] Farm household and beginning farm-operator household is used interchangeably in the modeling section.

time (T) to on-farm activities (F), off-farm work (E), and leisure (L). Income can originate from three main sources; income from off-farm labor I_E, income from self-employment, on-farm activities, I_F, and unearned income V.

For such a household, the utility maximization problem takes the form

$$Max\ U_{E^o,F^o} = U(I, L^o, L^s) \tag{1}$$

subject to:

$$L^o + F^o + E^o = T^o \tag{2}$$

$$L^s + F^s + E^s = T^s \tag{3}$$

$$w_E^o E^o + w_E^s E^s + \pi_F + V = I \tag{4}$$

$$L^o, F^o, E^o \geq 0 \qquad L^s, F^s, E^s \geq 0 \tag{5}$$

Equations (2) and (3) are the time constraint expressions for farm operator and spouse, respectively. The budget constraint is given by (equation 4), and non-negativity constraints are depicted in (expression 5). The full income is defined as the sum of income from the operator's off-farm labor $(I_E^0 = w_E^o E^o)$, spouse's off-farm labor $(I_E^S = w_E^s E^s)$, farm profits (π_F), and other sources of non-labor income (including employer-sponsored health insurance) minus the total income (I).

We define farm profits (π_F) as the value of farm production, $P_f f(.)$, minus the input costs, vX_f, where H is human capital, and R denotes location-specific attributes. Therefore,

$$\pi_F = P_f f\left(F^o, F^s, X_f, H^o, H^s, R\right) - vX_f \tag{6}$$

The production function is assumed to be concave, continuous, and twice differentiable. We consider a fixed human capital factor of production for both members of the household for the short-term period we examine (e.g., Knight, 1957; Jovanovic, 1982; Wydick, 1999). We expect that factor to positively affect (managerial) decision-making at the farm and at the household level. In addition, human capital is positively related to off-farm labor prospects and can affect

the off-farm wage. We consider the household to be a price taker in the labor market wages and are determined exogenously, $w_E^o(H^0) = w_E^o$ and $w_E^s(H^s) = w_E^s$.

Here we should note that full off-farm wage is a function of both the hourly wage, w, and fringe benefits, f_b (which includes health insurance and retirement savings). Therefore, w_E^o, and w_E^s, can be further defined as $Fw_E^o(w_E^o, f_b)$ and $Fw_E^s(w_E^s, f_b)$. Since we do not observe individual wages and investigating off-farm work (if operator, spouse or both work of the farm) or as noted above unitary labor supply, we assume that the beginning farm-operators household faces one full wage rate that includes fringe benefits. We solve the above equations to derive the first-order conditions of the model; provide the optimality conditions where the marginal product of each output equals its price. For each household, the marginal substitution rate between consumption and leisure to its market wage equals the marginal product of self-employment in farming. Finally, note that off-farm wage is non-decreasing in wages and fringe benefits. For instance, an increase in health insurance benefits received off-farm will increase f_b. Therefore, in our case, increasing fringe benefits (health insurance) will increase the off-farm labor supply of beginning farm-operator households.

Data

We use ARMS data. The ARMS, which is representative of all farm households, is conducted annually by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS).[12] The survey collects data on farm financial indicators (e.g., farm income, expenses, assets, and debt) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households. The survey's target population is farm operators representing agricultural production in the 48

[12] For more detail, see http://www.ers.usda.gov/Briefing/ARMS/

contiguous states. Each survey is collected from a single senior farm operator who makes most day-to-day management decisions.

Looking at a snapshot of our data, the 2015 ARMS, and focusing on sources of insurance, we notice the prevalence of employment-based health insurance coverage for farm-operator households followed by the government-provided and direct purchases. Farm-operator household members are more likely to receive insurance coverage through off-farm employment; our analysis shows that 57% of farm household members are the case. We compare our results to the U.S. population and observe those farm households are more likely than the general population to directly purchase their health insurance from an insurance company (17.1% versus 9.8%). In addition, farm-operator household members are less likely to receive health coverage from a government-sponsored program than the U.S. population (25.9% versus 32.2%). Still, the share of farm-operator household members with no form of health insurance is less than that of the overall U.S. population (9.3% and 15.7%, respectively).

For our empirical analysis, we use ARMS data 2015. We exclude farm households where either the beginning farm operator or spouse is 65 years of age or older since these individuals are covered through Medicare. That results in a sample size of 2,273 beginning farm-operator households. We also exclude beginning farm-operator households with missing observations on hours worked off-farm or reporting hours per week worked on or off-farm greater than 140 hours (75 farm-operator households). This applies to farm operators that report 140 worked at either location separately or additively. In other words, any operator or spouse responding that they on average sleep fewer than four hours per night is assumed to have incorrectly completed the survey and is therefore dropped from the present study.

The list of variables with respective summary statistics used in our labor supply model and econometric estimation is presented in Table 1. For our off-farm labor supply latent variable,

we use as indicators the hours per week worked off-farm by the operator and spouse, respectively. Household characteristics include age, age squared, education, household size, off-farm wage, and whether they obtain health insurance from an off-farm source. The specific ARMS survey question asks respondents under the age of 65 whether they have insurance coverage from an off-farm job; 62 percent of beginning farm-operator households report health insurance coverage through off-farm employment.

In addition to the operator and spouse-specific variables, we account for farm, location, and year-specific variables in our analysis. Farm-specific variables include an indicator for dairy farms (which are specified due to the labor-intensive nature of these farms), farm efficiency, decoupled and coupled government payments, total farm sales, and an indicator for a young beginning farm operator. Location-specific variables include ERS farm resource regions (for more detail, see Figure 3). This variable is used as a proxy for local labor market conditions, growing crops, and production and marketing cycles that can impact labor allocation decisions. The Mississippi Portal is used as a reference region in our study. Because we utilize a pooled sample, indicator variables to specify year are also included. The reference year is 2009.

The ARMS has a complex, stratified, multi-frame design. Therefore, each observation in the ARMS represents many similar farms, the particular number being the survey expansion factor (or the inverse of the probability of the surveyed farm being selected for surveying, Dubman, 2000). The expansion factors are most helpful and recommended when the full survey is used, generalizations about the entire population of farms is made based on the results, or a simple univariate analysis is conducted. Under this scenario, the recommended method for calculating the variance is the delete-a-group jackknife procedure (Dubman, 2000). There is not clear or unanimous support for using the jackknife approach when using subsets of the data or complex, multivariate analyses. Goodwin and Mishra (2006) argue that it is not clear whether

stratification alters the likelihood function beyond the simple weights and whether it is appropriate to apply the predefined jackknife replicated weights to subsamples of the ARMS data. So, similar to El-Osta (2011), we employ a bootstrapping technique rather than the jackknife procedure to remedy design problems in this subsample.

Estimation strategy

We examined the effect of health coverage on off-farm work by beginning farm-operator operators and spouses. Perry and Rosen (2001) examined the impact of self-employment on the probability of health service utilization. They found that self-employed can finance access to health care from sources other than insurance. Using two stages, instrumental variable approach Olson (2002) investigated the effect of health insurance on labor-market participation. He found that wives with owner-employer health insurance would accept a 20% wage discount in the presence of health insurance benefits.

Two-stage instrumental variables approaches have been widely used in empirical health economics research to address endogeneity: two-stage predictor substitution (2SPS); and two-stage residual inclusion (2SRI). Although the latter has not been used in health economics, it has been used in other studies. These include Shea et al. (2007), Shin and Moon (2007), and Lindrooth and Weisbrod (2007). However, the first study by Terza, Basu, and Rathouz (2008) used it in the context of health economics. They show that the 2SRI estimator is generally consistent while the 2SPS estimator is not. We will follow their methodology in this study. Note that both 2SPS and 2SRI methods entail estimating an equation in which the endogenous regressor, in our case, health insurance coverage (coverage from off-farm work), is the dependent variable. For example, in the 2SPS, the predicted values from the first-stage regression replace the endogenous regressor in the second stage. In the 2SRI method, the first-stage residuals, rather than the first-stage fitted values, are included in the second stage, and the

observed values of the endogenous regressor. Adopting a two-stage least squares method in our study means that we first estimate a health coverage equation:

$$Y_{hci} = \beta_{hc} X_{hci} + \mu_{hci} \quad (7)$$

where Y_{hci} is a health coverage indicator variable (=1 if the beginning farm-operator household has health insurance coverage through off-farm employment), X_{hci} is a vector of explanatory variables that affect health insurance coverage, β_{hc} are unknown parameters to be estimated and μ_{hci} is the error term. Angrist and Krueger (2001) argue that treating the dichotomous dependent variable as a linear probability and estimating Equation (7) using ordinary least squares is preferable. Using the predicted probability from a nonlinear model as an instrument for health insurance coverage in the second stage is not recommended because the first-stage functional form must be correctly specified to generate consistent estimates in the second stage. The first stage of the 2SRI estimator is identical to that of the 2SPS. We first estimate Equation (7) as a linear model using OLS. The second-stage off-farm work by beginning farm operator household outcome equation under 2SRI is:

$$Y_{OFWi} = \alpha Y_{hci} + \beta_{hc} X_{OFWi} + \delta \widehat{Y_{\mu}} + \gamma_{hci} \quad (8)$$

where Y_{OFWi} is a binary off-farm work indicator variable, X_{OFWi} is a vector of explanatory variables that affect health insurance coverage, $\widehat{Y_{\mu}}$ are the residuals obtained from the estimation of Equation 7, α, β_{hc} and γ are unknown parameters to be estimated and γ_{hci} is the error term. Note that Smith and Blundell (1986) show that the *t*-statistic for the estimate of δ is an asymptotically efficient test for the exogeneity of gambling in the health outcome equations. If δ is not statistically significant, then health insurance coverage is exogenous. Terza, Basu, and Rathouz (2008) favor using the 2SRI method over the 2SPS method to estimate nonlinear models with endogenous regressors. Finally, for the parameters of the off-farm work equations (Equations 8) to be consistently estimated, a variable must be included in the first-stage health

insurance coverage equation (Equation 7) that is not included in Equation (8). This variable should explain variation in health coverage but be uncorrelated with off-farm work. Our instrumental variable is based on the number of household members with health insurance and high-speed Internet access. We posit the existence of a relationship between the number of family members covered by health insurance and connection to high-speed internet and health insurance coverage. The primary determinant examined in this study is the impact of health insurance coverage on the off-farm work decisions of beginning farm-operator households. We use the two-stage residual inclusion (2SRI) method, as proposed by Terza, Basu and Rathouz (2008), as an alternative to the classical two-stage instrumental variable method or 2SPS method. The explanatory variables of these regressions included a vector of all the exogenous variables in equations (7) and (8).

Results and Discussion

Table 2 reports parameter estimates and marginal effects for the probit model[13] of health insurance coverage and off-farm work, using maximum likelihood and robust variance estimation methods (table 3 shows the first-stage OLS estimates). Recall that the residuals from the first stage and the health insurance coverage variable are used to estimate equation 8. The estimated model demonstrated good predictive capability as indicated by McFadden pseudo R^2 values of 0.22 for the health insurance coverage and off-farm work status of beginning farm-operator households.

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[13] Using Greene (2008, p 775) one can derive the marginal effect in the j^{th} (j=1, 2) binary model in equation (8) is a measure of the instantaneous effect that a change in the k^{th} explanatory variable has on the predicted probability $\Pr\left(Y_j = 1\right)$ when the remaining explanatory variables are held constant. Such an effect is computed as the derivative of the conditional mean function with respect to x given by $\frac{\partial E\left(Y_j \mid x_j\right)}{\partial x_{jk}} = \frac{\partial \Phi\left(\xi_j' x_j\right)}{\partial x_{jk}} \xi_{jk} = \phi\left(\xi_j' x_j\right)\xi_{jk}$ where $\phi(.)$ is the standard normal density of the cumulative standard normal function $\Phi(.)$.

[13] For more detail, see http://www.ers.usda.gov/Briefing/ARMS/

As expected, health insurance coverage positively affects off-farm employment of beginning farm-operators households (operator and/or spouses). The marginal effect of the health insurance coverage variable (Table 2) on off-farm work indicates that health insurance coverage from off-farm work increases off-farm work by about 41% among beginning farm-operator households. Figure 4 compares the predicted health insurance coverage and off-farm work probabilities by beginning farm-operator households. Our results support the positive association between health insurance coverage and increased wages by inducing beginning farm-operator household members to supply labor to off-farm work. In this case, off-farm work provides workers with employer-sponsored health insurance as part of a compensation package. Moreover, our finding is consistent with previous studies reporting a positive and significant effect (*see* Ahearn, El-Osta and Mishra, 2013; D'Antoni *et al.*, 2014). Recall, Ahearn, El-Osta, and Mishra studied all married farm households under 65 using the 2SPS method. However, our sample is only for beginning married farm-operator households under 65, using the 2SRI method.

Variables operator age and operator age squared, for example, are found to be of the expected opposite signs, indicating an inverted U-shaped relationship between the age of the operator and the likelihood of off-farm work beginning in farm-operator households.[14] Although the age of the operator variable has a positive coefficient, it is statistically insignificant. On the other hand, the operator age squared variable has a negative and significant effect on off-farm work by beginning farm-operator households. This also means, other things being equal, that the likelihood that the beginning farm operator working off-farm alone increases throughout the operator's life until it reaches a maximum at 30 years of age based on point estimates[15], then

[14] Because of collinearity between age of the operator and age of the spouse, we dropped spouse age from the regression.
[15] El-Osta, Mishra, and Morehart (2008) in their study report peak age of 44 for all farm operators.

declines as the operator grows older. The findings of the nonlinear effect of age on participation in off-farm work are consistent with other studies, e. g., Gould and Saupe (1989); Huffman and El-Osta (1997); El-Osta, Mishra and Morehart (2008). The coefficient on spouse education is positive and statistically significant at the 10% significance level. Consistent with expectation, spouses' higher levels of schooling positively impact the likelihood of their participation in off-farm work. Findings here are consistent with Chang and Mishra 2008; Ahearn, El-Osta, and Dewbre 2006; El-Osta, Mishra and Ahearn, 2004.

The second objective of our study was to examine the impact of coupled and decoupled payments on off-farm work by beginning farm-operator households. We find that only the coupled payments variable significantly affected the probability of off-farm work by beginning farm-operator households. Note that we treat coupled payments as a source of farm income (thereby increasing, and we would expect an increase in payments to deter beginning farm-operator households from engaging in off-farm work. The coefficient on coupled payments is negative and statistically significant at the 1 percent significance level. These results imply that an increase ($1,000) in coupled payments decreases the probability of off-farm work (by 1%) by beginning farm-operator households (operator and spouses). This relationship has been previously established in the literature for the off-farm participation decision (Chang and Mishra, 2008; Ahearn, El-Osta, and Dewbre, 2006; El-Osta, Mishra and Ahearn, 2004). We also observe a non-significant impact of decoupled payments on off-farm labor allocation. These findings suggest that if the goal of policymakers is to increase the number of farmers or replace retiring farmers, then decoupled payments could be used as a policy tool in attracting beginning farm-operator households to take up the business of farming.

Results in table 2 indicate that beginning farm-operator households specializing in dairy production tend to have operators and spouses who are less likely to work off the farm. This

result is expected because dairy farming is more labor-intensive than many other farming operations. These findings are consistent with Ahearn, El-Osta and Dewbre, 2006 and Mishra and Goodwin, 1997. The farm's regional location (see figure 3) is also an essential factor in determining off-farm work by beginning farm-operator households. Findings in Table 2 reveal that beginning farm-operator households are located in seven ERS regions (Heartland, Northern Crescent, Northern Great Plains, Prairie Gateway, Eastern Uplands, compared to the Mississippi Portal region Fruitful Rim, and Basin and Range regions) work more off the farm. Farms in the above regions tend to be large farms, specializing in cash grains, wheat, cotton, and cattle. These farming enterprises are suitable for off-farm work (Mishra et al., 2002). On the other hand, farms in the Mississippi Portal region tend to have small farms specializing in livestock and mixed grains.

Summary and Conclusions

The aging of the farmer population has led to concerns about the shortage of beginning farmers and ranchers in the United States. We need a younger generation of farmers because they often bring skill sets to complement and enhance traditional management and production technologies. Attracting and retaining a young generation of farm operators has been a recurrent and persistent struggle in U.S. agriculture. Health insurance coverage is a significant concern for U.S. beginning farm-operator households, as it is for many people involved in farming in the U.S. This study estimated the impact of health insurance coverage on off-farm labor supply decisions for beginning farm-operator households. Additionally, we examine the effects of government subsidies on farming, specifically coupled farm program payments, off-farm work, and health insurance coverage of beginning farm-operator households.

Using farm-level data from 2015 ARMS and the two-stage residual inclusion (2SRI) estimation method, consistent with the popular belief. We found that beginning farm-operator

households with health insurance coverage from off-farm work are 41 percentage points more likely to work off the farm. Therefore, there is a need to incorporate health insurance coverage policies to strengthen and enhance policies designed in the most recent farm legislation to support young beginning farmers. In particular, if the policymakers want to encourage a new generation of farmers to enter the farming business, they have to provide affordable health insurance coverage for the farm-operator household. In the absence of such incentives, it is much more likely that farmers would be devoting more time working off the farm to secure fringe benefits, including health insurance coverage. To this end, programs like Healthy New York and Insure Oklahoma, which enable small business owners to provide affordable health care, should be emulated in other parts of the country.

Moreover, our results highlight the effect of educational attainment on off-farm labor supply since young-beginning farmers with high levels of education tend to have more private-sector job opportunities and, consequently, health insurance coverage. If policymakers intend to replace retiring farmers and ensure young entrepreneurs to pursue farming as their primary occupation. In that case, incentives should be placed on beginning farm-operator households to reduce the financial burden. Farmers' financial responsibility in purchasing private health insurance coverage for their families. To this end, as a part of the Affordable Care Act (ACA), insurance exchanges were created that allow very small business owners access to health care and lower expected prices. Finally, coupled farm payments tend to decrease off-farm work by beginning farm-operator households. Suppose the goal of the policymakers is to retain young farmers on the land and foster rural development. In that case, focus their energy on the farm, and rely on farm income as the primary source of income, then perhaps coupled payments are a good policy incentive.

Although the above study provides insights into an important issue facing policymakers and beginning farmers, there may be a couple of limitations that need to be highlighted, primarily due to data limitations. First, we only considered off-farm work by a family unit (spouses and farm operators) in this study. Second, we do not include information on-farm risk management strategies (crop insurance, etc.). Future research could address the above issues, including farming entry costs.

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Table 1. Characteristics and insurance coverage of farm operator households, by off-farm work and operator age, 2015

Item	Operator under 65		Operator 65 and older		All
	Off-farm work (a)	No off-farm work (b)	Off-farm work (a)	No off-farm work (b)	
Sample size	7,874	3,132	2,304	3,373	16,683
Number of family farms	1,061,928	221,682	354,005	394,044	2,031,660
Percent of farms	52.3	10.9	17.4	19.4	100
% 10 years or less farming	23.7	13.1	8.4	7.7	16.8
Number of household members	3,003,380	603,785	712,748	759,927	5,079,841
Major occupation of operator, percent					
Farm and ranch	36	78	40	57	45
Other	64	*22	60	43	55
Gross sales class, percent					
<$50,000	75	43	83	76	73
$50,000 to $249,999	14	22	13	*14	15
$250,000 or more	11	35	5	9	12
% household members with health insurance					
Any insurance	94.6	78.2	93.5	92.1	92.1
Employment-based	74.5	38.5	44.6	23.4	58.4
Private-direct purchase	15.6	29.2	21.9	21.1	18.9
Government provided	8.3	*17.8	58.1	75.2	26.4
Health Expenditures, average, dollars					
Health insurance premiums	4,598	5,040	4,841	4,383	4,647
Out of pocket expenses	2,731	2,985	3,116	3,094	2,896
Total health expenses	7,329	8,025	7,957	7,476	7,543
Health as % of living expenses	14.5	19.9	18.7	23.2	16.9
Household income, average					
Farm income	16,301	95,869	*8,019	23,397	24,916
Off-farm income	114,333	32,074	133,248	48,199	95,826
Total household income	130,633	127,943	141,266	71,596	120,742
Government payments, average					
Countercyclical payments	615	2,056	442	422	705
Commodity Credit Corporation loans	661	1,070	307	455	604
Conservation Programs payments	1,265	1,929	1,019	1,232	1,288
Risk Programs payments	1,964	4,424	1,339	1,539	2,041
Net worth, average	1,180,857	1,843,884	1,683,906	1,538,339	1,410,190
Household net worth, median	720,105	915,700	1,168,643	907,950	833,319

Source: 2015 USDA Agricultural Resource Management Survey.
Coefficient of **V**ariation = (Standard Error/Estimate)*100. ***** indicates that CV is greater than 25 and less than or equal to 50. **#** indicates that CV is greater than 50 and less than or equal to 75.

Table 2: Characteristics and insurance coverage of farm operator households, by health insurance, 2015

	Health Insurance Coverage		Off-farm work by operator, spouse, or both		Full Sample
	Yes (=1)	No (=0)	Yes (=1)	No (=0)	
Operator and Household Characteristics:					
Age: < 35 years old (%)	4	na	5	*2	4
Age: 35-54 years old (%)	28	*34	34	13	28
Age: 55-64 years old (%)	33	*20	38	19	32
Age: 65 years and older (%)	35	*36	23	67	35
Years of Education Operator (years)	14.1	12.4	14.3	13.6	14.1
Years of Education Spouse (years)	14.2	12.3	14.4	13.6	14.1
Operator race, White (%)	0.96	0.92	0.97	0.94	0.96
Operator gender, Female (%)	0.09	#0.03	0.09	0.06	0.08
Beginning farmer (%)	0.2	*0.2	0.2	0.1	0.2
Presence of Children under 6 (%)	0.09	#0.23	0.11	*0.06	0.09
Total household income ($)	133,070	86,222	139,631	111,282	131,357
Countercyclical payments ($)	900.5	*609.2	*686.8	1382.5	889.8
Commodity Credit Corporation loans ($)	*826.5	*136.9	*867.7	*640.2	*801.3
Conservation Programs payments ($)	1387.4	*594.1	1309.2	1477.9	1358.4
Risk Programs payments ($)	2588.7	*1000.6	2343.6	#2984.6	2530.7
Farm Characteristics:					
Farm org: sole proprietorship	0.89	0.93	0.89	0.89	0.89
Farm specialization: dairy	0.02	*0.09	*0.02	0.04	0.02
State average wage rate hired labor ($)	13.24	13.25	13.23	13.24	13.24
Region: Northeast	0.06	*0.16	0.06	0.07	0.06
Region: Midwest	0.36	0.37	0.36	0.34	0.36
Region: West	0.14	*0.09	0.13	0.16	0.14
Region: South	0.44	0.38	0.45	0.43	0.44
Off-farm labor market area characteristics:					
% unemployment rate in 2014	6.1	6.0	6.06	6.18	6.1
% of county employment, construction, 2014	0.05	0.04	0.05	0.05	0.05
% of county employment, government, 2014	0.2	0.17	0.2	0.2	0.2
% of county employment, manufacturing, 2014	0.13	0.16	0.13	0.14	0.13

% of county employment, natural resources, 2014	0.04	0.04	0.04	0.04	0.04
% of county employment, services, 2014	0.58	0.59	0.58	0.58	0.58
Sample size	7,503	303	4,852	2,954	7,806
Farm-operator households	887,567	33,678	652,404	268,840	921,245

Source: 2015 USDA Agricultural Resource Management Survey.
Coefficient of **V**ariation = (Standard Error/Estimate)*100. * indicates that CV is greater than 25 and less than or equal to 50. # indicates that CV is greater than 50 and less than or equal to 75.

Table 3: Summary Statistics and Description of Variables, 2015

Variables	Description	Mean	Std. Dev
Household Characteristics			
Operator age	Reported in years	47.42	11.39
Spouse age	Reported in years	46.88	10.52
Operator education	Maximum years of schooling attained	13.29	1.84
Spouse education	Maximum years of schooling attained	14.53	3.02
Covered members	Number of household members with health insurance coverage	2.68	1.64
Health insurance coverage from off-farm employment	(=1; 0 otherwise)	0.62	0.25
Farm Characteristics			
Dairy farm	(= 1; 0 otherwise)	0.05	0.21
Decoupled payments	Annual payments in $1,000	3.49	19.55
Coupled payments	Annual payments in $1,000	3.24	13.03
Farm sales	Total value of farm sales in $1,000	237	2,921
Region: Heartland	(= 1; 0 otherwise)	0.18	(0.38)
Region: Northern Crescent	(= 1; 0 otherwise)	0.10	(0.30)
Region: Northern Great Plains	(= 1; 0 otherwise)	0.04	(0.20)
Region: Prairie Gateway	(= 1; 0 otherwise)	0.10	(0.29)
Region: Eastern Uplands	(= 1; 0 otherwise)	0.10	(0.30)
Region: Southern Seaboard	(= 1; 0 otherwise)	0.13	(0.33)
Region: Fruitful Rim	(= 1; 0 otherwise)	0.23	(0.42)
Region: Basin and Range	(= 1; 0 otherwise)	0.07	(0.25)
Region: Mississippi Portal	(= 1; 0 otherwise)	0.05	(0.22)
Year dummies			
y2009	(= 1 if data from year 2009; 0 otherwise)	0.35	(0.48)
y2010	(= 1 if data from year 2010; 0 otherwise)	0.34	(0.47)
y2011	(= 1 if data from year 2011; 0 otherwise)	0.32	(0.47)

Source: Agricultural Resource Management Survey (ARMS), 2009, 2010, and 2011

Table 4: Estimated Coefficients and Predicted Marginal Effects of Factors in Simultenouse Probability Models: Health Insurance Coverage and Off-farm Work Status, 2015

Variables	**Health insurance coverage**		**Off-farm work by operator, spouse or both**	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Constant	0.735 (0.854)		-1.580 (0.835)	
Latent off-farm work participation	0.576 (0.328)	0.040**		
Latent health insurance coverage			0.531 (0.196)	0.144***
Operator age <35[a]	-1.003 (0.624)	-0.105	1.449 (0.184)	0.421***
Operator age 35-54	-0.488 (0.519)	-0.034	1.150 (0.141)	0.366***
Operator age 55-64	-0.348 (0.399)	-0.021	0.926 (0.106)	0.313***
Operator educational attainment	-0.006 (0.036)	-0.004	0.042 (0.018)	0.012**
Spouse educational attainment	0.096 (0.037)	0.007***	-0.023 (0.029)	-0.006
Race of head of household	0.162 (0.276)	0.012		
Gender of the head of household	0.280 (0.247)	0.016		
Household size	-0.191 (0.042)	-0.013***	0.075 (0.056)	0.022
Total household income in 2014			-0.001 (0.001)	-0.0002
Beginning farmer	-0.131 (0.171)	-0.002	0.102 (0.115)	0.028
Farm size-Medium ($50,000-$250,000)[b]	0.203 (0.167)	0.013		
Farm size-Large (>$250,000)	0.496** (0.371)	0.028*		
Beginning farmer*Medium farm size	0.239 (0.369)	0.014		
Beginning farmer*Large farm size	0.534 (0.291)	0.024***		
Sole proprietorship	0.052 (0.147)	0.004		
Counter-cyclical payments			-0.116 (0.021)	-0.032***
CCC-Loan payments			-0.010 (0.025)	-0.003

Conservation payments			-0.066 (0.025)	-0.018***
Risk management payments			-0.056 (0.015)	-0.015***
Dairy farm			-0.056 (0.142)	-0.198***
County wage rate			-0.001 (0.057)	-0.001
Northeast region	-0.373 (0.282)	-0.033	0.164 (0.225)	0.044
Midwest region	-0.241 (0.204)	-0.018	0.217 (0.102)	0.060**
Southern region	-0.264 (0.193)	-0.019	0.257 (0.122)	0.071**
% County's unemployment rate in 2014	0.027 (0.039)	0.002	-0.024 (0.017)	-0.007
% County's employment in manufacturing 2014	-0.319 (0.569)	-0.022		
% County's employment in construction 2014	1.666 (1.471)	0.113		
% County's employment in government 2014	0.764 (0.619)	0.053		
% County's employment in natural resources 2014	-0.684 (0.831)	-0.047		
McFadden pseudo-R^2	0.17		0.20	

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level.
The significance of an estimated parameter is based on robust asymptotic standard error measurement of the corresponding coefficient. The computation of the marginal effect for a continuous variable is done based on footnote (4), with the remaining explanatory variables held fixed at their weighted mean levels.
For a dummy variable, the marginal effect is computed as the difference in the probability of purchasing health insurance coverage or of working off the farm when the value of the binary variable is 1 and when it is 0 with all other explanatory variables in the respective models held at their weighted means (see Greene, 2008, p. 775).
[a] Excluded group: operators age 65 or older.
[b] Excluded group: farm size, small <$50,000 income.
[c] Excluded "farming region, West.