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IZA DP No. 15834

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ABSTRACT

Market Facilitation Program Payments, Employer-Sponsored Health Insurance Coverage and Off-Farm Employment*

About two-thirds of U.S. farm households are employed off the farm. Off-farm sources represent 85 percent of the income earned by the average farm household and have turned into their main source of health insurance coverage. Farmers receive various government farm program payments, including the recently added Market Facilitation Program (MFP) payments. These payments have an unintended consequence on labor supply by farm operator households. Using farm household-level data from the 2019 Agricultural Resource Management Survey, this study investigates the impact of employer-sponsored health insurance coverage and participation in MFP on off-farm labor allocation decisions of U.S. farm families. Results from our empirical model show that farm families are 52% more likely to work off the farm if off-farm jobs provide employer-sponsored health insurance coverage. More importantly, results show that MFP payments have a significant and negative effect on the off-farm employment of U.S. farm-operator households.

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

Keywords: Agricultural Resource Management Survey, government subsidies, employer-sponsored health insurance coverage, off-farm employment

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Introduction

Approximately three out of four farmers are self-employed in their farming businesses (Mishra *et al.*, 2002). However, farm families (operators and spouses) also are employed off the farm in two-thirds of farm households (Chang and Mishra, 2008; Ahearn *et al.,* 2013). The 2015 Agricultural Resource Management Survey (ARMS)[2] data of USDA shows that individuals in farm operator households are just as likely to have health insurance coverage as the general U.S. population. Farm household members are almost as likely as the general U.S. population to receive employment-based health insurance through a third-party employer. The Bureau of the Census reports that 90.9 percent of the U.S. population had some form of health insurance for any part of 2015, compared with 89.3 percent of the members of farm operator households.[3] Farm households without the operator or spouse working at a nonfarm job are the least likely to have health insurance coverage. U.S. farmers can purchase health insurance coverage through individual, non-group, and small group markets (Sundaram-Stukel and Deller, 2009); nonetheless, this category mainly comprises those who operate large units reporting $250,000 or more in farm sales (Ahearn *et al.,* 2013). These farm operator households are often eligible to receive health insurance coverage from a government program. They tend to be elderly—nearly all U.S. citizens age 65 or older have some coverage through Medicare.

The connection between farm and nonfarm economies is essential for farming families. Their economic well-being is intricately connected with income and wealth (from the farm and nonfarm activities, Mishra et al., 2002). However, little has been discussed about the link

[2] 2015 was the last survey that collected information on sources of health insurance in farming population. Since, then the Economic Research Service, USDA ARMS survey abandoned collecting information on sources of health insurance.

[3] 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 because of being in high-risk group (Sundaram-Stukel and Deller, 2009).

between health insurance and the well-being of farming families. Health insurance coverage indicators offer further evidence of the strong ties between the well-being of farm families and the nonfarm economy. Off-farm sources represent 85 percent of the income earned by the average farm household and have turned into their primary source of health insurance coverage. These figures show that the farm population has found the means to obtain health insurance coverage in general.

On an *ad-hoc* basis, Congress and the United States president can authorize government assistance to farmers, including farm program payments. As a result, many studies have investigated how farm program payments[4] impact labor allocation decisions of farm operators, spouses, or both. These studies include Ahearn and El-Osta, 1992; Mishra and Goodwin, 1997; Ahearn, El-Osta, & Dewbre, 2006; El-Osta, Mishra, and Ahearn, 2004; Goodwin and Mishra, 2004; Dewbre and Mishra, 2007; El-Osta, Mishra and Morehart, 2008).

Recently, a new farm program was initiated by the policymakers and the Trump Administration. In August 2018, the Trump Administration using the authority under the Commodity Credit Corporation Charter Act of 1948, created the Market Facilitation Program (MFP).[5] In May 2019, the U.S. Department of Agriculture (USDA) announced plans to assist farmers with MFP by directly targeting various U.S. agricultural products (including corn and soybeans, nuts and fruits, pecans and cranberries, dairy, and hogs). The USDA distributed $14.5 billion[6] in direct payments to farming operations. In sum, the MFP assistance[7] is different from

[4] Government farm program payments that are legislated in the Farm Bills include direct payments (DP), counter-cyclical payments (CCP), loan deficiency payments (LDP), average crop revenue election (ACRE), price loss coverage (PLC), and agriculture risk coverage (ARC), conservation reserve program (CRP) payments).

[5] These programs were established under authorities outside of omnibus farm legislation and therefore are not subject to the same eligibility requirements as farm bill authorized programs.

[6] The 2019 payments were in addition to the approx. $8.6 billion USDA announced it had distributed for 2018.

[7] MFP payments were permissible under Section 5 because they "will provide producers with financial assistance that gives them the ability to absorb some of the additional costs from having to delay or reorient marketing of the new crop due to the trade actions of foreign governments resulting in the loss of exports."

other farm programs because Congress did not authorize it in either the 2018 Farm Bill or in any ad hoc appropriations legislation. In 2019, the U.S. government spent $22.4 billion, the most significant taxpayer transfer to the agriculture sector (in nominal dollars) since 2005, in federal farm program payments (see Figure 1). The MFP initiated by USDA in response to the US-China trade dispute was the main driver for the surge in federal subsidies during this year. In the form of MFP, these additional payments represent an unexpected income for farmers, and thus they may alter the off-farm labor supply of farm families.

This study investigates the impact of employer-sponsored health insurance coverage and government farm program payments—particularly attention to the newly created MFP payments— on off-farm employment of U.S. farm households. We hypothesize that farming families may turn to off-farm job opportunities for health insurance coverage (in the form of fringe benefits). MFP payments that serve as an additional income source may deter farmers and spouses from seeking employment opportunities off the farm—through a wealth effect, leading to more leisure. Similarly, we expect higher counter-cyclical payments—tied to farm production—to deter farm operator households from seeking nonfarm employment opportunities.

To analyze these issues, we use farm-level data from the 2019 Agricultural Resource Management Survey (ARMS) combined with a two-stage residual inclusion (2SRI) method to estimate our empirical model. Our estimates suggest that farm-operator households are 52% more likely to work off the farm if off-farm jobs provide employer-sponsored health insurance coverage. We also find a negative and significant effect of MFP payment on off-farm employment of U.S. farming households. Perhaps, suggesting that unexpected income from MFP payments reduced the incentives to work off the farm. The contribution of this study is twofold. First, unlike previous studies, this is the first study to analyze the impact of MFP payments on off-farm employment in the presence of employer-sponsored health insurance coverage from off-

farm work. Note that the income gap between farm and nonfarm families has narrowed because of earnings from off-farm sources[8]. Second, in contrast to previous literature, this study uses the latest year of the ARMS dataset (2019). Hence, it captures the effects of the Affordable Care Act (ACA) of 2010, a sluggish uptick in the nonfarm economy, and an increasing urgency of deglobalization and incidences of trade wars.

The remainder of the paper is organized as follows. Section 2 provides the background information, and Section 3 presents the conceptual framework. Section 4 offers data and main observations from the 2019 ARMS, the latest year of ARMS dataset availability. Section 5 shows the estimation framework, and section 6 discusses the results. The last section provides a summary and conclusion.

Background

Employer-sponsored programs play a crucial role in the health insurance coverage of millions of Americans. Nonetheless, only a handful of agricultural economics studies have studied their importance. Using population survey data from 1995 to 1999, McNamara and Ranney (2002) measured the levels of health insurance coverage and examined covariates that may affect the decision to purchase health insurance. After controlling for socioeconomic and demographic characteristics, including income, education levels, and ethnicity, they report that hired farmworkers are less likely to have health insurance coverage. Zheng and Zimmer (2008) used the 1996-2001 Medical Expenditure Panel Survey to analyze U.S. farmers' health consumption.[9] The authors document that approximately 19 percent of farmers and 29 percent of self-employed individuals, between 18 and 64, in the U.S. were uninsured.

[8] See Ahearn, Johnson and Strickland (1985), Findeis and Reddy (1987) and Mishra et al. (2002).
[9] 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.

Papers that examine the link between employer-sponsored health insurance coverage and labor allocation decision include Jensen and Salant (1986), Ahearn *et al.* (2013), and D'Antoni *et al.* (2014). Jensen and Salant (1986) used farm data collected from 800 Tennessee and Mississippi farms and found that fringe benefits and the number of hours farmers work off-farm were positively correlated. This study, however, did not account for potential interdependence in farm families' health insurance coverage and labor allocation decision. Ahearn *et al.* (2013) used data from the 2010 Agricultural Resource Management Survey (ARMS) to explore the role of health insurance coverage and the decision to work off the farm among farm families in the U.S. They found that fringe benefits were an important reason for participating in the off-farm labor market. Still, more importantly, they found that farm operators and spouses who reported off-farm labor were 3.2 percentage points more likely to report health insurance coverage. Finally, D'Antoni *et al.* (2014) estimate the effect of health insurance coverage on labor allocation using data from the 2006 to 2008 ARMS. Treating health insurance coverage as a component of off-farm income, this study finds that greater fringe benefits increased the hours worked off the farm by operators and spouses.

Various studies also focus on the effects of government farm program payments on off-farm labor supply decisions. Like fringe benefits, farm program payment receipts can be considered additional income that disincentivizes off-farm labor supply (Ahearn, El-Osta and Dewbre, 2006; D'Antoni and Mishra, 2013). For example, Ahearn *et al.* (2006) used 1999 and 1996 ARMS data. They showed that production flexibility contract (PFC), loan deficiency payments (LDP), and market loan assistance (MLA) payments, individually and in aggregate, reduced the probability of off-farm work by the farm operator. At the macro-level, Barkley (1990), while studying labor migration from agriculture, found no effect of government payments on labor migration from agriculture (between 1940 to 1985). In contrast, using

aggregate U.S. data (from 1993 to 2007), D'Antoni, Mishra, and Barkley (2012) found that direct payments increased labor migration out of agriculture. Note that the above two studies focused on labor migration from the agricultural sector.

Another strand of literature has analyzed the labor supply of farm families in the presence of government support programs (see Ahearn and El-Osta, 1992; Mishra and Goodwin, 1997; Ahearn, El-Osta, & Dewbre, 2006; El-Osta, Mishra, and Ahearn, 2004; Goodwin and Mishra, 2004; Dewbre and Mishra, 2007; El-Osta, Mishra and Morehart, 2008). The above studies, using cross-sectional data, investigated the impact of government programs on the off-farm labor supply of farmers and spouses. These studies concluded that increased decoupled payments (direct payments) led to a decline in the off-farm labor supply of farm operators and spouses. Finally, D'Antoni and Mishra (2013) examined the welfare implications of decoupled payments on the off-farm labor supply of farmers and spouses. They found a decreasing marginal effect of decoupled payments on hours worked off-farm after accounting for fringe benefits, *ceteris paribus*. However, the impact of employer-sponsored health insurance coverage on labor allocation of farm households in the presence of newly enacted MFP payments—in addition to counter-cyclical payments[10], conservation payments[11], and disaster payments— has not received adequate attention by the studies above.

Conceptual Framework

We employ a unitary labor supply model where the household is considered as 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

[10] Includes payment from Loan Deficiency Payment (LDPs), Marketing Loan Gains (MLGs).
[11] Includes payments from Conservation Reserve Programs (CRPO), Conservation Stewardship Program (CSP), and all other Federal conservation programs.

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).[12] We assume that $U(.)$ is twice differentiable, (quasi) concave utility function with positive first-order derivatives in terms of its arguments. Each member is assumed to allocate time (T) to on-farm activities (F), off-farm work (E), and leisure (L). Income can originate from three primary 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

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

subject to:

$$L^o + F^o + E^o = T^o \quad (2)$$

$$L^s + F^s + E^s = T^s \quad (3)$$

$$w_E^o E^o + w_E^s E^s + \pi_F + \Phi = I \quad (4)$$

$$L^o, F^o, E^o \geq 0 \qquad L^s, F^s, E^s \geq 0 \quad (5)$$

Equations (2) and (3) are the time constraint expressions for farm operators and spouses, respectively. The budget constraint is given by (equation 4), and non-negativity constraints are depicted in equation 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 Φ other sources of non-labor income, including employer-sponsored health insurance and government payments. Farm profits (π_F) is the value of farm production, $P_f f(.)$, minus the input costs, ΓX_f, where H is human capital, and R denotes location-specific attributes. Therefore,

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

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

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 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 employer-sponsored 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 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 rate of substitution 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 coverage) will increase the off-farm labor supply of farm families (operator and spouse), resulting in higher off-farm employment.

Data

This study uses data from the most recent 2019 ARMS survey. Conducted annually by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS),

ARMS represents all farm households.[13] It surveys farm operators from the 48 contiguous states and studies commodities covered under farm support legislation. It contains information on farm operator households, production practices, resource use, and farm financial indicators (including farm income, expenses, assets, and debt). Summary statistics of farm operator households are presented in Table 1. Farm-operator household generally receives insurance coverage through off-farm employment. About 49% of farm families obtain health insurance coverage through off-farm work (column 6). Health insurance from off-farm jobs covers about 76% of younger farm households (column 2). Interestingly about 43% of older farm households (head 65 or older) also receive health insurance through off-farm work.

Turning our attention to 2019 health care expenses, Table 1 reveals that farm-operator households spent on average $8,652 for health insurance premiums and out-of-pocket health costs. These healthcare expenses are about twice as much as the healthcare expenses in 2011, where farm-operator families spent on average $4,925 for health insurance premiums and out-of-pocket health costs.[14] Health insurance premiums are lower for farm households whose head is less than 65 and who work off the farm. Table 1 shows that younger farm families (less than 65) with off-farm employments spend about 20% of the living expenses on healthcare, slightly lower than the average farm family (22%).

Like the average farm family, farm families with off-farm work tend to operate small farms (<$50,000 in gross farm income). Likewise, these farm operators are likely to report non-farming as their primary occupation. However, farm families with no off-farm employment tend to operate large farms. About 31% of younger farm families (less than 65) have $250,000 or more gross farm income. Thus, it is not surprising that a vast majority (88%) of farm operators in

[13] For more detail, see http://www.ers.usda.gov/Briefing/ARMS/
[14] These figures are calculated by the authors employing 2011 ARMS data.

this category (column 3, Table 1) are likely to report farming as their primary occupation. We use a dummy variable for farm households where either the farm operator or spouse is 65 years of age or older since these individuals are covered through Medicare. When it comes to income and wealth of farm households, Table 1 reports that, consistent with expectations, in 2019, farm households with off-farm work earned the majority of their income from off-farm sources (wages, salaries, and off-farm business income). Column 2 of Table 1 shows that the average off-farm income of farm families with off-farm work earned about $135,492 (about the same as an average farming family). In contrast, they only earned $22,068 (similar to the average farm family) from farming activities. In contrast, farm families that did not work off the farm earned about $32,515 (mostly in off-farm business income), significantly less than the average farm family. However, farm families that did not work off the farm earned about two-thirds of their family income ($60,147) from farming activities, about three times more than the average farm family.

The lower part of Table 1 compares government payments by broad program categories for farm operator families classified by off-farm work status in 2019. For instance, in 2019, farm families with off-farm work received about $1,269, slightly less than the average farm family ($1,586) from CRP. In contrast, farm families with no off-farm work received about $2,369 from CRP. Interestingly, farm families with no off-farm work, those operating large farms, received about $12,342 in MFP payments, about two-and-a-half times more than the average farming family. On the other hand, Table 1 shows that the average MFP payment received by farm families with off-farm work was about $4,548, slightly lower than the average farming family but about 2.7 times less than the average farm family without off-farm work. Lastly, in 2019 the median household net worth for farm families with off-farm work was about $795,948, lower

than the median farm family in the U.S. ($978,223) and about 1.6 times less than the median farm family without off-farm work (last row, Table 1).

Table 2 presents summary statistics of the main variables used in our econometric estimation and labor supply model. To represent the off-farm labor supply latent variable, we use an indicator variable = 1 if the operator, spouse, or both worked off the farm, 0 otherwise. Age, age squared, education, household size, and whether they obtain health insurance from an off-farm source[15] are used as the main variables representing household characteristics. We use lagged household income[16] in the second stage estimation. One can argue that lagged household income can influence both family income expectation and thus labor allocation decisions. For instance, as most families do, maintaining consumption at the current level would require a steady income (kind of permanent income). We also control for farm, location, and year-specific variables in our analysis, along with operator and spouse-specific variables. Farm-specific variables include an indicator for dairy farms (labor-intensive nature of these farms), farm size, farm organization, counter-cyclical payments (CCP), conservation reserve program (CRP) payments, disaster payments, and MFP payments. Variables representing ERS farm resource regions (for more details, see Figure 2) are used as location-specific controls for crops, production, and marketing cycles. The Heartland region acts as the reference region in our study. Finally, the study uses local labor market conditions that directly influence the labor allocation decisions of farm families.

ARMS is a probability survey. Therefore, each of its observations is vital as it represents several comparable farms and many other elements of the population (ARMS uses a stratified, multi-frame design). Expansion factors are used to expand the individual responses up to an

[15] The specific ARMS survey question asks respondents under the age of 65 whether they have insurance coverage from an off-farm job

[16] The ARMS survey asks participants about the income earned during the previous year.

estimate for the entire population. Thus, they represent the inverse of the probability of the surveyed farm being selected for surveying (Dubman, 2000). For example, an expansion factor of 547 means that one respondent in the ARMS represents 547 farms in the population. Given the well-known limitations[17] of expansion factors, for calculating the variance, we follow El-Osta (2011) and employ a bootstrapping technique rather than the jackknife procedure to remedy design problems.[18] Finally, since ARMS is cross-sectional data, heteroscedasticity bias can arise in the model. The use of bootstrapping method remedies the above issue.

Econometric Framework

Previous studies have examined the effect of self-employment on the probability of health service utilization. Perry and Rosen (2001) used a simple binary model and found that self-employed people can finance access to health care from sources other than insurance. They found a weak link between insurance and utilization of various health services (e.g., doctor visits, flu shots, hospital stays, prescription medication, chiropractor visits, optometrist visits, breast exams, etc.). They also found that self-employed people, considerably less likely to be insured, have the same utilization rates as wage-earners (employer-sponsored health insurance plans). However, the authors do not resolve the endogeneity issues related to income and employment.[19]

Two-stage instrumental variables approaches have been widely used in empirical health economics research to address potential endogeneity concerns. The two-stage predictor substitution (2SPS) and the two-stage residual inclusion (2SRI) are the most commonly used

[17] The expansion factors are most useful and recommended when the complete 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).

[18] 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.

[19] The authors argue that income and health status are linked, and the causality is not known.

methods[20]. The first stage of the 2SPS estimator is identical to that of the 2SRI. Both methods entail estimating in the first stage an equation in which the potential endogenous regressor is the dependent variable. However, in the 2SPS, the predicted values from the first-stage regression replace the endogenous regressor in the second stage. In contrast, in the 2SRI method, the second stage model estimation includes residuals from the first-stage regression along with the observed values of the endogenous regressor. Using a 2SPS 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. Nevertheless, Terza, Basu, and Rathouz (2008) show that the 2SRI estimator is generally consistent while the 2SPS estimator is not.

In this study, we are interested in studying the impact of employer-sponsored health insurance coverage on the off-farm work decisions of farm families. To address possible endogeneity concerns, we follow Terza, Basu and Rathouz (2008) and use the 2SRI method. In the first stage, we estimate a *health coverage from the off-farm work* equation:

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

where Y_{hci} is an indicator variable equal to 1 if the farm-operator household has employer-sponsored health insurance coverage through off-farm work, X_{hci} is a vector of exogenous explanatory variables that influence health insurance coverage and μ_{hci} is the error term. To generate consistent estimates that will be used later in the second stage, we estimate Equation (7) as a linear probability model[21] using ordinary least squares (OLS).

[20] Some studies that have used 2SRI include Shea et al. (2007), Shin and Moon (2007), and Lindrooth and Weisbrod (2007).

[21] Using the predicted probability from a nonlinear model as an instrument in the second stage is not recommended. Angrist and Krueger (2001) argue that it is preferable to treat the dichotomous dependent variable in the first stage as a linear probability.

In the second stage, we estimate *off-farm employment by farm families (operator and spouses) outcome* equation:

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

where Y_{OFWi} is off-farm employment work, X_{OFWi} is a vector of exogenous explanatory variables that affect off-farm work, $\widehat{Y_{\mu}}$ 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 not all off-farm jobs provide fringe benefits (health insurance). For the parameters of the *off-farm employment* equation (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 the off-farm work decision of farm families. Our instrumental variable is access to high-speed Internet. We posit a relationship between high-speed Internet and employer-sponsored health insurance coverage. 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.

Results and Discussion

Appendix Table A1 reports parameter estimates for the linear probability model of employer-sponsored health insurance coverage, using OLS and robust variance estimation methods. Recall that the residuals from the first stage (equation 7) and the employer-sponsored health insurance coverage (binary variable) variable are used to estimate equation 8. Our interest is in the estimates obtained from equation 8. Table 3 reports parameter estimates for the probit model of off-farm employer-sponsored health insurance coverage and off-farm employment by U.S. farm families, using maximum likelihood and robust variance estimation methods. The estimated model demonstrated good predictive capability as indicated by McFadden pseudo R^2 values of

0.53 for our model linking employer-sponsored health insurance coverage and off-farm work status of U.S. farm operator households. Table 3 also reports the predicted marginal effects of factors affecting the probability of off-farm work by farm operator households, evaluated at their mean levels (Column 3, Table 3).

As expected, employer-sponsored health insurance coverage positively affects off-farm employment of U.S. farm operator households. The marginal effect of the employer-sponsored health insurance coverage by the off-farm work variable (Table 3) indicates that employer-sponsored health insurance coverage from off-farm work increases off-farm work by about 52% among farm-operator households (operator, spouse, or both). Our estimate is larger than Ahearn, El-Osta and Mishra (2013), who found that reported health insurance coverage likely increased off-farm work of farm families by about 19%. Unlike Ahearn, El-Osta and Mishra's study (2013), the current study only focuses on employer-sponsored health insurance coverage, uses recent data (2010 vs. 2019) that was collected after the enactment of the Affordable Care Act of (2010). Our results support the positive association of employer-sponsored health insurance coverage from off-farm work and increased wages by inducing 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 of fringe benefits, like health insurance, on labor supply (*see* Ahearn, El-Osta and Mishra, 2013; D'Antoni *et al.*, 2014). Note that Ahearn, El-Osta, and Mishra studied all married farm households under 65, using the 2SPS method. Additionally, the authors used 2010 ARMS data. However, our sample includes farm-operator families under 65, the 2019 AMS survey, and the 2SRI method.

As expected, we found an inverted *U*-shaped relationship between the operator's age and the likelihood of off-farm work by farm-operator households.[22] An additional year in the operator's age increases the likelihood of off-farm work by 1.5 percentage points, and its coefficient is statistically significant at the 1% level of significance. Thus, the operator age squared term has a negative and significant effect on off-farm work by farm-operator households. Other things being equal, this implies that the likelihood of off-farm work increases until the operator's age reaches a maximum of 47 years,[23] then declines as the operator grows older. This nonlinear effect of age on participation in off-farm work is consistent with the literature (e. g., Gould and Saupe, 1989; Huffman and El-Osta, 1997; El-Osta, Mishra and Morehart, 2008). Household size was found positive and statistically significant at the 1% level of significance. An additional household member increases the likelihood of off-farm work by farm families by 1.4 percentage points. This finding is 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 MFP payments on off-farm work by farm-operator households. Indeed, consistent with the theory and expectations mentioned above, MFP payments had a negative and significant effect on off-farm work by farm families. The marginal effect implies that an additional dollar in MFP payments decreases farm families' probability of off-farm work by about 0.3 percentage points. Indeed, MFP payments were unexpected and could be considered a wealth effect because they could be considered decoupled. Any farmer affected by the US-China trade war and produced the entitled commodities were eligible to receive the payments. Thus, it is no surprise that the MFP payments had the same effects as decupled payment effects on labor allocation decisions of farm

[22] We dropped spouse age from the regression because of with age of the operator.
[23] El-Osta, Mishra, and Morehart (2008) report a peak age of 44 for all farm operators.

families. The effect of decoupled payments on labor allocation decisions has been previously established in the literature (see Chang and Mishra, 2008; Ahearn, El-Osta, and Dewbre, 2006; El-Osta, Mishra and Ahearn, 2004). These findings suggest that if the goal of policymakers is to increase the number of farmers or replace retiring farmers, then MFP payments could be used as a policy tool in attracting new and beginning farm-operator households to take up farming business.

Results in Table 3 also indicate that farm-operator households specializing in dairy farming tend are less likely (11 percentage points) to work off the farm. This result is expected because dairy farming is more labor-intensive than many other farming operations. This is consistent with Ahearn, El-Osta, and Dewbre (2006), and Mishra and Goodwin (1997). Result also suggests that an additional acre of farm size decreases the likelihood of farm-operator households working off the farm by 1 percentage point. Indeed, this is consistent with the notion that large farms specialize in commodity crops that receive commodity program payments. Additionally, large farms tend to be located away from major employment areas (like cities, urban and suburban areas) and thus would require significant investment in transportations costs (vehicle and gas costs, maintenance costs). This is consistent with Mishra and Goodwin (1997), Mishra et al. (2002), Goodwin and Mishra (2004), Mishra, Fannin, and Joo (2014). Lastly, the regional location of the farm is also an essential factor in determining off-farm work by farm-operator households. Results show that farm-operator households located in the Northern Great Plains are less likely (about 8 percentage points) to work off the farm when compared to the Heartland region. This is because farms in the Northern Great Plains region tend to be large farms, specializing in cash grains, wheat and these farming enterprises are more likely to be large farms and receive government farm program payments (Mishra et al., 2002).

Summary and Conclusions

For U.S. farming families, health insurance coverage is a significant concern. For farm households, as in the general population, the most common source of health insurance is employment-based. Receiving health insurance through a third-party employer is as common for farm household members as it is for the general U.S. population. The average farm household receives 85 percent of its income from off-farm sources, and off-farm work has become the primary source of health insurance coverage. Off-farm work has provided additional income and much-needed fringe benefits like health insurance coverage. Thus, farm operators and spouses are involved in multiple labor allocation decisions. However, the presence of government farm subsidies complicates the labor allocation decisions of farming families.

Recall that farm program payments, enacted in the 1930s, were in response to variable income, commodity prices, and vagaries of weather to stabilize and increase the incomes of rural families. However, an added wrinkle to those farm program payments has been the addition of temporary MFP payments. The MFP payments, created in response to the U.S.-China trade dispute, a form of direct payment, provided unexpected income for farming families. This study informs the debate of farm program payments, health insurance coverage from off-farm work, and their unintended consequence on labor allocation decisions of farming families. Specifically, the study examined the role of employer-sponsored health insurance, and MFP payments play, among others, in impacting the farm operator, spouse, or both (farm family) off-farm work decisions. The study used the 2019 ARMS survey and the 2SRI method. This study showed that employer-sponsored health insurance benefits increased the likelihood of off-farm work by farm families. 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 and beginning farmers. In particular, if 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.

Additionally, the study showed that MFP payments decreased the likelihood of off-farm work decisions by farm families. Specifically, in families where off-farm work tends to be undertaken solely by the operator, spouse by both. Therefore, increased levels of farm subsidies as witnessed by MFP payments might have the unintended effect of lowering farm families' likelihood of off-farm work. Thus, if policymakers want to retain farming households and encourage new entrants into the farming business, government payment policies could meet those goals. Thus, government program payments could serve as a tool in managing farming risks and increasing the welfare of farm families.

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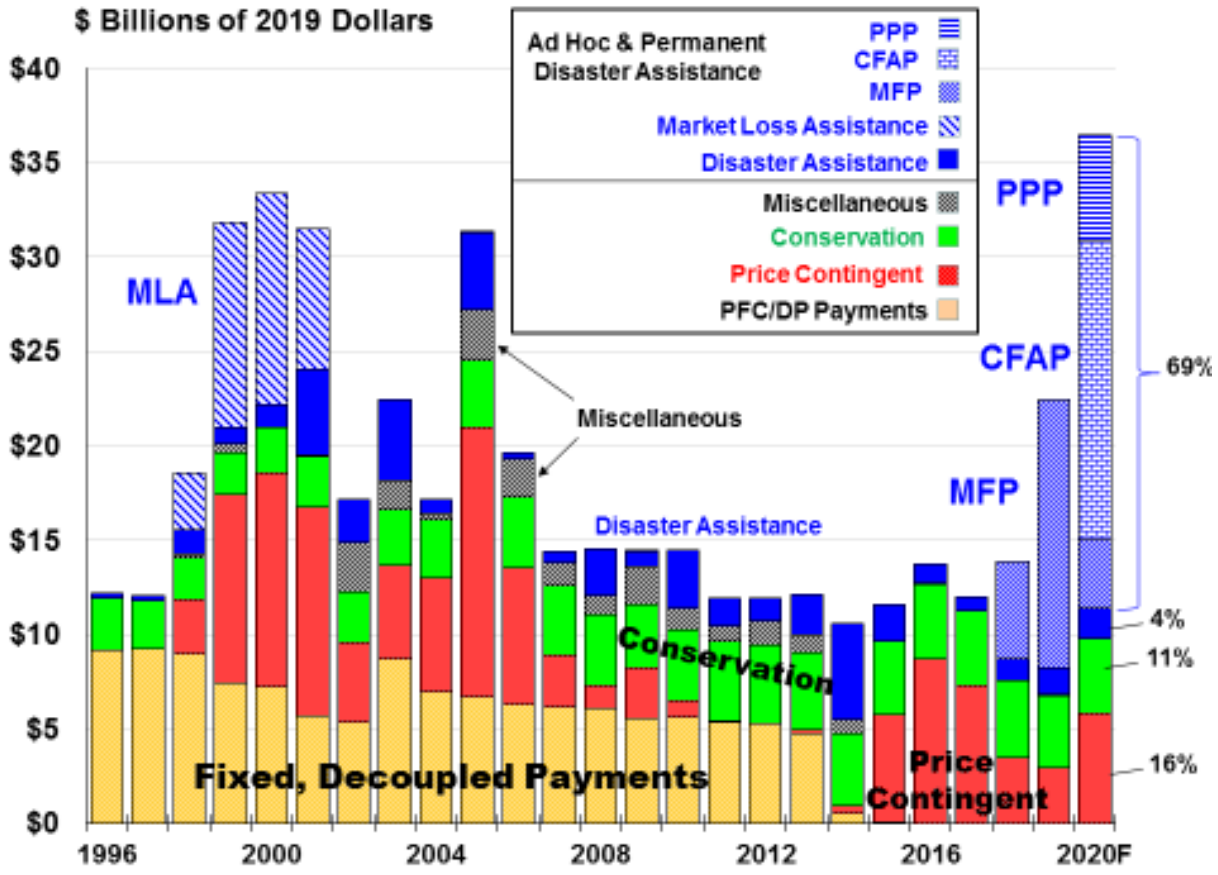
Figure 1: U.S. Government Farm Support, Direct Outlays, 1996 2020F



Source: ERS, "2020 Farm Income Forecast," September 2, 2020. All values are nominal (not adjusted for inflation). Values for 2020 values are forecasts. Government payments as percentage shares (right-hand side) are for 2020.

Figure 2: Economic Research Service (ERS) Resource Regions

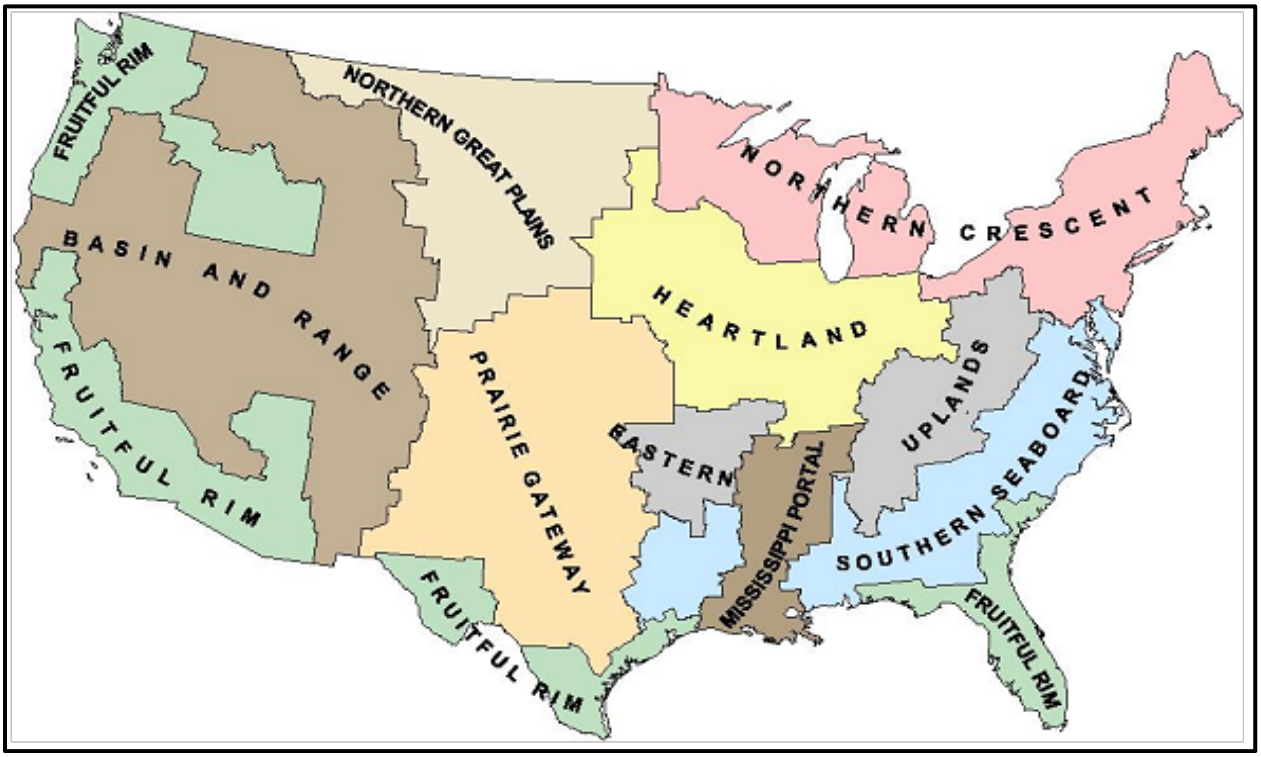


Table 1. Characteristics and insurance coverage of farm operator households, by off-farm work and operator age, 2019

Item	Off-farm work of operator and spouse by the age of principal operator				All
	< 65 and off-farm work (a)	< 65 and no off-farm work (b)	65 and older; off-farm Work (c)	65 and older; no off-farm work (d)	
Sample size	2,210	778	733	1,012	4,733
Number of family farms	379,564	76,928	125,951	124,429	706,873
Percent of farms	53.7	10.9	17.8	17.6	100
Number of household members	1,216,128	228,218	266,638	261,531	1,972,515
Major occupation of operator, percent					
Farm and ranch	26	88	48	82	47
Other	74	na	52	18	53
Gross sales class, percent					
<$50,000	75	53	81	74	73
$50,000 to $249,999	13	16	12	15	14
$250,000 or more	12	31	6	11	13
Health insurance, employer	76.4[b,c,d]	**L**	43.9[c]	#0.2[d]	48.9
Health Expenditures, average, dollars					
Health insurance premiums ($)	5,246	6,302	5,543	5,281	5,420
Out of pocket expenses ($)	3,220	3,029	3,854	2,760	3,231
Total health expenses ($)	8,466	9,331	9,397	8,041	8,652
Health as percent of living expenses ($)	19.6[b,d]	28.4[c,d]	22.5	24.2	21.6
Earnings from farming activities ($)	*22,068[b,c]	60,147[c,d]	*8,105[d]	17,601	22,938
Off-farm income ($)	135,492[b,d]	32,515[c,d]	*273,486[d]	54,228	134,569
Total household income ($)	157,561[b,d]	92,663[d]	*281,591[d]	71,829	157,506
Government payments, average					
Counter-cyclical payments ($)	417	*453.1	*358.8	371.8	402.6
Conservation Programs payments ($)	1,269.2[b,d]	*2,369.4	*1,214.0[d]	2,445.1	1,586.1
Market Facilitation Program payments ($)	4,548.4[b,c]	12,342.2	2,612	4,400.1	5,025.5

Disaster Programs payments ($)	*718.4 [b,c]	1,752.9 [c]	315.7 [d]	*1,232.5	849.7
Household net worth, average ($)	1,427,772 [b,c,d]	2,105,371	2,357,726 [d]	2,180,981	1,799,800
Household net worth, median ($)	795,948[b,c,d]	1,242,500	1,219,914[d]	1,389,153	978,223

Source: 2019 USDA Agricultural Resource Management Survey.

Notes: Superscript letters indicate the estimate of a continuous variable, based on the jackknife method of variance estimation, that differs statistically from those in the indicated column at level of significance ranging from 1% to 10%. Based on 4,733 observations.(4,733 Households). Expansion factor was ver1wt0. Version=1 only. **C**oefficient 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. **na** indicates value is not available due to no observations, an undefined statistic, or reliability concerns. Rounded percent may not add precisely to 100. **L = Legal disclosure edit required. One estimate had less than three observations or had dominance concerns.**

Table 2: Weighted means of variables used in 2SRI probit regression, U.S. farm operator households, 2019

Item	Health Insurance Coverage from off-farm employment		Off-farm Work by Operator, Spouse, or both		All
	Yes (=1)	No (=0)	Yes (=1)	No (=0)	
Operator and Household Characteristics:					
Operator age (years)	53.4	64.2	66.9	55	58.9
Education, operator (years)	14.5	13.8	13.7	14.3	14.1
Education, Spouse (years)	14.6	13.6	13.6	14.3	14.1
Operator race, White (%)	97	94	93	97	96
Operator gender, Female (%)	12	8	*8	11	10
Average household size	2.8	2.7	2.5	2.9	2.8
Households with internet access (%)	78	67	66	75	72
Lagged total household income, 2018 ($)	143,758	122,406	*162,204	155,198	157,507
Countercyclical payments ($)	302.0	498.9	484.6	362.3	402.6
Conservation Programs payments ($)	1,060.0	2,089.9	2,405.9	1,183.3	1,586.1
Market Facilitation Program payments ($)	3,155.6	6,816.2	7,138.5	3,987.1	5,025.5
Disaster Programs payments ($)	515.3	1,170.0	1,383.1	*587.6	849.7
Farm Characteristics:					
Farm organization: sole proprietorship (=1; 0 otherwise)	92.7	88.5	88.3	91.7	90.6
Farm specialization: dairy (=1; 0 otherwise)	*0.6	3.7	4.4	1.1	2.2
Farm classification: Small farm	78	69	66	77	73
Farm classification: Mid-size farm	13	14	15	13	14
Farm classification: Large farm	9	17	19	10	13
Farm size, acres (*average*)	278	516	574	314	400
Region Heartland (=1; 0 otherwise)	0.19	0.24	0.22	0.21	0.22
Region Northern Crescent (=1; 0 otherwise)	0.15	0.11	0.11	0.14	0.13
Region Northern Plain (=1; 0 otherwise)	0.04	0.05	0.07	0.04	0.05
Region Prairie Gateway (=1; 0 otherwise)	0.16	0.12	0.12	0.15	0.14
Region East Uplands (=1; 0 otherwise)	0.2	0.16	0.15	0.2	0.18
Region Southern Seaboard (=1; 0 otherwise)	0.09	0.12	0.13	0.1	0.11
Region Fruitful Rim (=1; 0 otherwise)	0.08	0.1	0.12	0.08	0.09
Region Basin Ring (=1; 0 otherwise)	0.05	0.05	0.05	0.06	0.05

Region Mississippi Portal (=1; 0 otherwise)	0.04	*0.03	*0.04	0.04	0.04
Off-farm labor market area characteristics:					
% county unemployment rate in 2018	3.95	3.98	4.05	3.92	3.97
% of county employment in construction, 2018	5	5	5	5	0.05
% of county employment in government, 2018	20	20	20	20	20
% of county employment in manufacturing, 2018	14	14	13	15	15
% of county employment in natural resources, 2018	4	4	4	3	4
% of county employment in services, 2018	57	57	58	57	57
Sample size	1,821	2,912	2,071	2,662	4,733
Farm-operator households	345,796	361,076	232,909	473,964	706,873

Source: 2019 USDA Agricultural Resource Management Survey.

Based on 4,733 observations.(4,733 Households). Expansion factor was ver1wt0. Version=1 only.

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. **na** indicates the value is not available due to no observations, an undefined statistic, or reliability concerns. Rounded percent may not add precisely to 100.

Table 3: Parameter estimates and marginal effects of health insurance coverage and off-farm work by farm families, U.S. 2019.

Variables	Off-farm work by operator, spouse or both *(=1; 0 otherwise)*	
	Coefficient (St. Dev.)	Marginal Effect
Constant	-4.670***	NA
	(1.555)	
Employer-sponsored Health insurance coverage	3.489***	0.517***
	(1.178)	
Operator age	0.094***	0.015***
	(0.027)	
Operator age squared	-0.001***	-0.002***
	(0.000)	
Operator education	0.036	0.006
	(0.034)	
Spouse education	-0.010	-0.002
	(0.008)	
Operator race, White	0.291	0.047
	(0.378)	
Household size	0.089***	0.014***
	(0.039	
Total household income, previous year (2018), log	0.183***	0.030***
	(0.046)	
Farm size (acres)	-0.059***	-0.010***
	(0.027)	
Farm organization (=1 sole proprietorship)	0.104	0.016
	(0.170)	
Dairy farm (=1; 0 otherwise)	-0.699***	-0.110***
	(0.254)	
Counter-cyclical payments *(Dollars)*	0.012	0.002
	(0.033)	
Conservation Program payments *(Dollars)*	-0.029	-0.005
	(0.066)	
Market facilitation program payments *(Dollars)*	-0.019*	-0.003*
	(0.009)	
Agricultural disaster payments *(Dollars)*	-0.014	-0.002
	(0.014)	
% County's unemployment rate in 2018	-0.066	-0.010
	(0.065)	
% County's employment in service sector, 2018	-0.799	-0.131
	(0.737)	
% County's employment in manufacturing, 2018	-0.071	-0.012
	(0.843)	
% County's employment in construction, 2018	-3.177	-0.520

	(2.000)	
% County's employment in natural resources, 2018	-2.912	-0.477
	(1.108)	
Farm location in Northern Crescent [b] region	-0.103	0.002
	(0.215)	
Farm location in Northern Great Plains region	-0.054*	-0.079*
	(0.259)	
Farm location in Prairie Gateway region	0.086	0.014
	(0.184)	
Farm location in Eastern Uplands region	0.155	0.026
	(0.250)	
Farm location in Southern Seaboard region	-0.001	-0.000
	(0.232)	
Farm location in Fruitful Rim region	-0.003	-0.000
	(0.212)	
Farm location in Basin and Range region	0.448	0.074
	(0.318)	
Farm location in Mississippi Portal region	-0.234	-0.037
	(0.336)	
First-stage residual	-0.402***	-0.066***
	(0.734)	
N	4,114	
Log-likelihood function	410.72***	
McFadden pseudo-R^2	0.53	

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 Farm Resource Region: 'Heartland'

Appendix Table A1: Parameters estimates of Two-State Residual Inclusion (2SRI) OLS Auxiliary Regression, U.S. farm households, 2019.

Variables	Employer-sponsored health insurance coverage from off-farm work *(=1; 0 otherwise)*
	Coefficient
Constant	0.254
	(0.17)
Operator age	-0.007***
	(0.001)
Operator age 65 and older	-0.264***
	(0.055)
Operator education	0.013*
	(0.007)
Spouse education	0.027***
	(0.008)
Operator race, White	0.184***
	(0.071)
High-speed Internet connection	0.040
	(0.040)
Farm size-Medium ($50,000-$250,000)[a]	-0.093***
	(0.031)
Farm size-Large (>$250,000)	-0.254***
	(0.030)
Farm location in Northern Crescent[b] region	0.077
	(0.056)
Farm location in Northern Great Plains region	-0.054
	(0.060)
Farm location in Prairie Gateway region	0.114*
	(0.050)
Farm location in Eastern Uplands region	0.054
	(0.060)
Farm location in Southern Seaboard region	0.017
	(0.053)
Farm location in Fruitful Rim region	0.021
	(0.045)
Farm location in Basin and Range region	0.047
	(0.077)
Farm location in Mississippi Portal region	0.041
	(0.081)
N	4.565
R^2	0.43

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. [a] Excluded group: farm size, small <$50,000 income. [b] Excluded, Heartland farming region.