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Employer-Sponsored Health Insurance Coverage, Government Payments, and Labor Allocation: The Case of US Farm-Operator Households

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This study investigates the impact of health insurance coverage and participation in government counter-cyclical, conservation, and risk management programs on off-farm labor allocation decisions among US farm-operator households. Using household-level data, this study employs a simultaneous probit estimation method to estimate the empirical model. Results show that US farm-operator households with employer-sponsored health insurance coverage are also 14% more likely to work off farm. Second, farm families' off-farm work is associated with a 4% increase in health insurance coverage. Counter-cyclical, conservation, risk management payments have a negative and significant effect on US farm-operator households' off-farm work decisions.

Key words: Agricultural Resource Management Survey, beginning farmers, counter-cyclical payments, off-farm labor supply, risk management payments, two-stage simultaneous probit model

Introduction

For most US citizens, health insurance coverage—a mechanism to finance an individual's healthcare expenses—is primarily obtained through employer-sponsored health plans, which are subsidized by employers and offered as an employee benefit. According to the US Census Bureau, 56.4% of Americans (roughly 183 million people) were covered by employer-sponsored health insurance in 2019 (Keisler-Starkey and Bunch, 2020). In fact, the share of Americans covered by employer-sponsored health insurance has remained around 56% since 2015 (Barnett and Vornovitsky, 2016). The high cost of acquiring health insurance is a crucial driver of an employee's decision to receive health coverage through employer-sponsored programs (Jensen and Morrisey, 2001; Garthwaite, Gross, and Notowidigdo, 2014). Economic studies have extensively examined the impact of health insurance coverage on labor market outcomes and, consequently, its implications on the labor force's functioning. For example, high and variable healthcare costs have been shown to impact wage, employment, retirement, welfare receipt, job turnover, and relocation decisions.[1]

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[1] For a comprehensive and extensive examination of the relation between health insurance and the labor market for most US citizens, see Currie and Madrian (1999) or Gruber (2000). For post-ACA studies examining health insurance and labor market decisions, see Baicker et al. (2014). For a comprehensive review of US and international studies examining the relationship between health insurance and the labor market, see Le et al. (2019).

Approximately three out of four farmers are self-employed (Mishra et al., 2002). Unless the spouse has a job off the farm with employer-sponsored health insurance benefits, most self-employed farmers do not have access to employer-sponsored health insurance programs. In two-thirds of farm households,[2] either the principal or spouse (or both) is employed off farm (Ahearn, El-Osta, and Mishra, 2013). American farmers could receive fringe benefits (i.e., health insurance) directly through off-farm employment or indirectly through a spouse or other family member (i.e., a parent, if the farmer is under 26 years of age).[3] Farmers can also purchase health insurance through either the individual nongroup market or the small group market (Sundaram-Stukel and Deller, 2009). Many individual or small group plans are sometimes referred to as catastrophic health insurance plans, with high deductibles (potentially over $10,000), which may cause farmers not to seek preventive healthcare (Inwood, 2017). We find that farmers and ranchers who operate large farms, reporting sales of $250,000 or more, tend to purchase health insurance through the individual or small group markets (Ahearn, El-Osta, and Mishra, 2013). Since the enactment of the Affordable Care Act (ACA) of 2009, farmers have had several health insurance options not previously available to them, namely Medicaid (in states that expanded Medicaid eligibility, if farmers meet those eligibility requirements) and purchasing a plan on the health insurance marketplace. Farmers eligible for public health insurance programs (e.g., Medicare or Medicaid) include the disabled, low-income adults and children, and individuals over age 65. Nearly 40% of farmers are covered by public health insurance programs, with 36.7% covered by Medicare (Miller and Aherin, 2018).

With an average age of over 58 years, the aging farmer population has led to major concerns about the shortage of beginning farmers and ranchers.[4] Beginning farm-operator households in the United States contribute only about 8% of agricultural production. They are more likely to farm on rented land, work off the farm, and have a college degree than other farm operators (Ahearn and Newton, 2009). Access to capital and health insurance are two major obstacles for beginning farmers (Shute, 2011). The Agriculture Improvement Act of 2018 (i.e., the 2018 Farm Bill) expanded access to affordable farmland to support beginning farmers and encouraged a commitment to conservation and stewardship across generations of farmers.[5] If beginning farmers are more concerned with their family's health insurance coverage, then multiple job holding may be the path forward. However, policies like the ACA that provide subsidies for purchasing health insurance coverage, especially for farmers operating small and medium-sized farms, may help beginning farmers enter farming and ensure Americans' food security.

We analyze the implications of the above policies by applying existing theory and models. Specifically, the objectives of this study are twofold. First, we examine the impact of employer-sponsored health insurance coverage on farm families' (operator households) off-farm labor allocation decisions. The earlier studies, as mentioned above, disregarded beginning farmers and examined the US farm population as a whole and their access to affordable health insurance and its implications on labor allocation decisions. Second, we explore the impacts of government payments (i.e., counter-cyclical, conservation, and risk management payments, discussed below) on farm families' labor allocation decisions. We consider conservation payments to farmers as additional income sources. We expect all three types of government payments to deter farmers from seeking off-farm employment opportunities for varying reasons.

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[2] The terms "farm households" and "family farms" are used interchangeably in this study. We follow the USDA ERS definition of family farm as a farm with over 50% of the ownership interest held by the principal operator and relatives. Farms that do not meet these criteria are not considered family farms and are excluded from our analysis.

[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).

[4] According to the USDA's definition, "a beginning farmer or rancher is an individual or entity who has not operated a farm or a ranch for more than 10 consecutive years. This requirement applies to all members of an entity." In this study, we use the word farmers to refer to both farmers and ranchers.

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

The study adds to the existing literature in several ways. First, this study simultaneously sheds light on the impact of participation in government payments on off-farm labor supply and employer-sponsored health insurance. Second, this study uses the 2015 USDA Agricultural Resource Management Survey (ARMS), a recently available unique dataset that includes information on employer-sponsored health insurance coverage and farm households' sources of health insurance. The 2015 ARMS data cover the 5 years since the passage of the ACA,[6] which has broader implications on health insurance coverage for the uninsured. Finally, from a policy perspective (as debated in the last three farm bills), the study provides useful information on beginning farmers' entry into farming and one of the biggest barriers to entry—health insurance coverage.[7]

We use 2015 farm-level data from the ARMS and a two-stage simultaneous probit method to estimate our empirical model. The 2015 ARMS collected information on farm families' health insurance coverage and off-farm work allocation. Our estimates suggest that farm-operator households that reported off-farm work are 4% more likely to report employer-sponsored health insurance coverage than those who reported no off-farm work; farm-operator households that reported employer-sponsored health insurance coverage are 14% more likely to report off-farm work. Moreover, our analysis reveals a negative relationship between receiving counter-cyclical, conservation, risk management payments and off-farm work among farm-operator households. Finally, on the issue of beginning farmers, this study reveals that large farms (> $250,000 in gross sales) operated by beginning farmers are 2.4% more likely to report employer-sponsored health insurance coverage compared small farms (< $50,000 in gross sales) operated by beginning farmers.

Background and Health Insurance Coverage of US Farm Families

Importance of Health Insurance

Despite the prominent role of employer-sponsored programs, few agricultural economics studies have examined the importance of health insurance. McNamara and Ranney (2002) studied the health insurance coverage trends in the US hired farm labor using Current Population Survey data from 1995 to 1999. Their paper measured the levels of health insurance coverage and examined parameters that may affect purchasing health insurance. Controlling for socioeconomic and demographic characteristics (including income, education levels, and ethnicity), they reported that hired farmworkers were more likely to be without health insurance coverage. Zheng and Zimmer (2008) analyzed US farmers' health consumption considering their insurance status.[8] Using the 1996–2001 waves of the Medical Expenditure Panel Survey, they documented that approximately 19% of farmers between the ages of 18 and 64 were uninsured. In addition, 29% of self-employed farmers were in the same age bracket. Data from the ARMS reveals that 57% of farmers and their families were covered by employer-sponsored health insurance in 2011, increasing to 58% in 2015 (US Department of Agriculture, 2011, 2015). These numbers are slightly better than the employer-based health insurance coverage of all Americans, reported above.

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[6] The ACA was signed into law on March 23, 2010. The ACA required every American to have health insurance and assists those who cannot afford a plan. After that, several changes were made to the ACA law. Additionally, several court cases that challenged the constitutionality of the ACA followed. Finally, in June 2012, the US Supreme Court upheld the major provisions of the ACA. Actual enrollment into Health Insurance Marketplace began on October 1, 2013. See https://www.ncbi.nlm.nih.gov/books/NBK241401/ for a detailed timeline of the ACA.

[7] Ideally, we would like to have a separate analysis with beginning farmers, but a rigorous analysis could not be performed due to thinness in the data.

[8] 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.

Impact of Government Payments on Off-Farm Labor Supply

Government support for farming in the form of price and income support programs was implemented almost 9 decades ago, circa 1933. Government subsidies provided financial assistance to farms, farm people, and rural areas. The government support or payments have been defined and redefined over the ensuing years but essentially retain the initial goal of providing subsidies to farming households (see Mishra et al., 2002; McFadden and Hoppe, 2017).

Multiple-job holding by farm households has also been a subject of research for decades (Hallberg, Findeis, and Lass, 1992). Mishra et al. (2002) documented multiple-job holding in US agriculture, government payments, and off-farm work. The 1996 Farm Bill ushered in decoupled payments (payments not tied to production decisions) and provided significantly more support to the conservation program. A strand of literature focuses on the influence of decoupled payments on off-farm labor supply decisions. Like fringe benefits, conservation payment receipts can be considered additional income, providing incentives for farm households to decrease off-farm labor supply. For example, Ahearn, El-Osta, and Dewbre (2006), using ARMS data for the years 1996 and 1999, reported that production flexibility contracts (PFC), loan deficiency payments (LDP), and market loan assistance (MLA) payments, both individually and in aggregate, reduce the probability of a farmer engaging in off-farm work. Estimation results for farm spouse are more ambiguous. Finally, D'Antoni and Mishra (2013) examined the welfare implications of decoupled payments and found that the marginal effect of decoupled payments on hours worked off farm decrease in magnitude when accounting for fringe benefits, *ceteris paribus*. However, these studies failed to discuss the impact of health insurance coverage on off-farm labor allocation in the presence of government subsidies and beginning farm-operator households.

Farm Household Labor Allocation and Health Insurance Coverage

The link between health insurance and labor allocation among farm households has not received adequate attention. Using farm data collected from 800 Tennessee and Mississippi farms, an early study by Jensen and Salant (1986) was one of the first to demonstrate the positive correlation between fringe benefits and the number of hours farmers work off farm. Still, the authors did not account for potential interdependence in health insurance and farm households' labor allocation decisions. A study by Ahearn, El-Osta, and Mishra (2013) is more extensive in scope, using data from the 2010 Agricultural Resource Management Survey (ARMS). They investigated the role of health insurance coverage and US farm families' decision to work off the farm. They attributed the high rate of health insurance coverage among farm households to farm family members' holding multiple jobs. In particular, farm operators and spouses who reported off-farm employment were 3.2 percentage points more likely to report health insurance coverage than operators and spouses with no off-farm employment. They also reported that fringe benefits were a fundamental reason for participation in the off-farm labor market. D'Antoni, Mishra, and Khanal (2014) estimated the effect of health insurance coverage on labor allocation using copulas to test the labor allocation dependence. Their research utilized data from the 2006–2008 ARMS. Treating health insurance as a component of (off-farm) income, an endogenous variable, the authors found that greater fringe benefits tended to increase the number of hours worked off the farm by primary operators and spouses.

Uninsured Farm Households Compared to US Population

Interestingly, data collected by the 2010 ARMS survey showed that only about 13% of farm families were uninsured compared to about 16% of the entire US population (US Department of Agriculture,

2011).[9] The situation was reversed by 2015, when about 11% of farm families reported being uninsured compared to 9.1% of the U.S population (US Department of Agriculture, 2019). The above finding indicates that farm households face slightly higher health-related financial risks than the general population. Although farm operators are mainly self-employed, most farm households have an operator or spouse employed off the farm. In 2002, Mishra et al. found that farm families have above-average income and wealth, which increase with farm size. Farm families' average income from all sources increased from $82,450 in 2010 to about $120,742 in 2015 (see Table 1). During the same period, the off-farm income component increased from $70,491 in 2010 (about 85% of the total income) to about $95,826 (about 79%). Thus, we observe a 6% decrease in the share of off-farm income in total family income during 2010 and 2015, partly attributed to sluggish economic growth.

Consistent with Mishra et al. (2002), the reliance on off-farm income is not surprising: Most US farms are classified as small farms; the 10% of US farms classified as large farms produce 90% of US agricultural output. Nonetheless, the off-farm income component remains the dominant income source, and two-thirds of off-farm income comprises income from wages and salaries. Given the reliance on off-farm income and the nonfarm economy, most farm families, like the general US population, acquire health insurance through off-farm work.

Health Insurance Coverage and Off-Farm Work in 2015

In 2015, more than half of farm household members had health insurance coverage from an employment-based plan. Table 1 reports insurance coverage and off-farm work attributes among farmers, their spouses, and both in 2015 using two age groups: under 65 and 65 and older. Like all US households, farmers 65 and older tend to receive some health insurance coverage from Medicare. Older adults mainly receive Medicare Part A (coverage for hospitalizations). Still, they must also purchase supplemental insurance or qualify for additional Medicaid insurance to cover doctor visits. In the elderly group without off-farm work, about 92% of the family members have coverage from any source, compared to about 78% for the younger group. The younger group reported farming (78%) as their primary occupation, compared to 57% in the older group. Younger families, where neither the operator of the spouse worked off the farm, are more likely to buy health insurance from private sources than receive health insurance through public sources (Table 1). Farm households with no off-farm work still receive health insurance through employer-sponsored plans.[10] The younger group without off-farm work has higher total medical expenses ($8,025), which appear to be due to higher insurance premiums ($5,040).

Finally, Table 1 shows that the largest group in the study, comprising 52% of farms in our sample (married, family farms), is families with the farm operator under 65 years of age where either the farmers or the spouse (or both) works off the farm. In this group, only 36% of operators reported farming as their primary occupation, and about 24% of operators are beginning farmers, having less than 10 years of farming experience (Table 1). Additionally, younger farm families with off-farm work are more likely to have employer-based health insurance coverage. Farm families operating large farms (> $250,000) are less likely (35%) to work off farm than other families; perhaps they are fully employed on the farm. These families are more likely to buy health insurance coverage directly from insurance providers than farm families operating small farms (< $50,000).

[9] The 2015 survey is the most recent source of data on this topic; insurance coverage data were previously included in ARMS in 2011. Since 2015, detailed health insurance questions have not been included in the ARMS.

[10] In Table 1, employer-based health insurance includes health insurance through off-farm work of farm operator or spouse, an employer (or former employer) from the spouse's off-farm work, other employer or group sponsored policies (e.g., purchased through a co-operative, union, or farm organization), or the farm business. It would also include health insurance coverage from a previous nonfarm employer.

Table 1. Characteristics and Insurance Coverage of Farm Operator Households, by Off-Farm Work and Operator Age, 2015

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

Notes: Superscript letters indicate the estimate of a continuous variable, based on the jackknife method of variance estimation, differs statistically from those in the indicated column at a level of significance ranging from 1% to 10%.
[1]Includes payments from Direct Counter-cyclical Payment Program (DCP), revenue payments from Average Crop Revenue Election Program (ACRE) for the crop year 2014, Loan Deficiency Payments (LDPs), and Marketing Loan Gains (MLGs).
[2]Includes payment received for all commodities placed under Commodity Credit Corporation (CCC) loans.
[3]Includes payments from Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP) and other US federal conservation.
[4]Includes payments from Price Loss Coverage (PLC), County-Agricultural Risk Coverage (ARC-CO), Individual - Agricultural Risk Coverage (ARC-IC), Agricultural Disaster Payments, Margin Protection Program for Dairy (MPP - Dairy) and the Dairy Product Donation Program (DPDP) other federal, state, or local program payments.
Coefficient of Variation = (Standard Error/Estimate) × 100. Single asterisk (*) indicates that 25 < CV ≤ 50.
Source: 2015 USDA Agricultural Resource Management Survey.

A Conceptual and Estimation Framework

We employ a unitary labor supply model in which the household is considered a single decision agent (Huffman, 1991; Singh, Squire, and Strauss, 1986). The farm-operator household is comprised of the farm operator (O) and spouse (S). Employing this type of model allows us to acknowledge the contributions of the on-farm labor supply of other household members (i.e., the principal operator's spouse). Consider a household that maximizes a single period, joint utility (U) over income (I) and leisure of each family member (L^o) and (L^s) (Singh, Squire, and Strauss, 1986; Ahearn, El-Osta, and Dewbre, 2006).[11] We assume that $U(\cdot)$ is a twice-differentiable, (quasi) concave utility function that has 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: off-farm labor, I_E; self-employment, on-farm activities, I_F; and unearned income, V. For such a household, the utility maximization problem takes the form

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

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 operators and spouses, respectively. Equations (4) and (5) give the budget constraint and the nonnegativity constraints, respectively. Total income is defined as the sum of income from the operator's off-farm labor ($w_E^o E^o$), spouse's off-farm labor ($w_E^s E^s$), farm profits (π_F), and V other sources of nonlabor income (e.g., government payments, employer-sponsored health insurance). We define farm profits, π_F, as the value of farm production, $P_f f(\cdot)$, minus input costs, ZX_f, where H is human capital (H^o for operator and H^s for spouse) and R denotes location-specific attributes. Therefore,

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

The production function is assumed to be concave, continuous, and twice differentiable. We consider a fixed human capital factor of production for both household members for the short-term period that we examine (e.g., Jovanovic, 1982; Wydick, 1999). We expect that factor to positively affect (managerial) decision making at the farm and the household level. Additionally, 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 of labor market wages, which 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 the full off-farm wage is a function of both the hourly wage, w, and fringe benefits, f_b, which include 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 $Fw_E^s(w_E^s, f_b)$, respectively. Since we do not observe individual wages and are investigating off-farm work (if operator, spouse, or both work of the farm) as noted in the above unitary labor supply, the current study assumes that the farm-operator's household includes one total wage rate, including fringe benefits. We solve the above equations to derive the first-order conditions of the model and 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

[11] The terms "farm household" and "beginning farm-operator household" are used interchangeably in the modeling section.

in farming. Finally, note that off-farm wage is nondecreasing in wages and fringe benefits. For instance, an increase in health insurance benefits received off farm will increase f_b. Therefore, increasing fringe benefits (health insurance) will increase the off-farm labor supply of beginning farm-operator households.

We propose that health insurance decisions lead to off-farm labor supply choice and vice versa. In other words, both observable and unobservable factors that determine a farmer's decision to obtain health insurance also influence the farmer's decision to provide off-farm work. We also want to look at the impact of government subsidies on labor and insurance decisions. The model predicts that increasing subsidies decreases individual demand for off-farm labor, but only to the extent that individually purchased insurance is affordable enough to justify reducing off-farm work. Our predictions are therefore ambiguous, and we look to the data for insights. To examine the off-farm labor supply of operators and spouses, with particular attention to the role of health insurance, we use a simultaneous equation probit model, which is suitable for evaluating the impact of the explanatory variables while accounting for jointly determined decisions (Boyer, Adams, and Borisova, 2014). Let Y_{1i}^* be the unobserved latent dependent variable indicating off-farm work by farm family (operator and/or spouse) of the ith (where $i = 1, \ldots, n$) family. The observed off-farm work variable is represented by Y_{1i} and takes a value of 1 if the farm family supplies hours to off-farm work and 0 otherwise. Specifically,

$$
\begin{aligned}
Y_{1i}^* &= \alpha_1 Y_{2i}^* + \beta_1' \boldsymbol{X}_{1i} + \varepsilon_{1i}, \\
Y_{1i} &= \begin{cases} 1, & Y_{1i}^* > 0 \\ 0, & Y_{1i}^* \leq 0 \end{cases},
\end{aligned} \tag{7}
$$

where Y_{1i}^* is an unobserved latent variable that captures the decision of the farm family to get health insurance coverage, $\boldsymbol{X}_1$ is a vector of explanatory variables and ε_1 is a random disturbance term. Farm families' unobserved attributes (e.g., ability, health issues, affordability, riskiness) may affect the decision to obtain health insurance and work off farm. Thus, these decisions are likely to be jointly determined. Therefore, the following equations represent the health-insurance participation decision of a farm family:

$$
\begin{aligned}
Y_{2i}^* &= \alpha_1 Y_{1i}^* + \beta_1' \boldsymbol{X}_{2i} + \varepsilon_{2i}, \\
Y_{2i} &= \begin{cases} 1, & Y_{2i}^* > 0 \\ 0, & Y_{2i}^* \leq 0 \end{cases},
\end{aligned} \tag{8}
$$

where Y_{2i}^* is the unobserved latent dependent variable indicating employer-sponsored health insurance coverage (operator and/or spouse) of the ith family (where $i = 1, \ldots, n$). In equations (7) and (8), latent variables Y_{1i}^* and Y_{2i}^* represent hidden utility functions that are derived from the conceptual model.[12] Specifically, Y_{1i}^* represents the utility gain from providing off-farm work compared to not providing it, and Y_{2i}^* represents the utility gain from having employer-sponsored health insurance coverage compared to not having it. In their study, Perry and Rosen (2001) used the 1996 Medical Expenditure Panel Survey and a probit model to examine the effect of self-employment on the likelihood of health service utilization. Using the two-stage predictor substitution (2SPS), the authors found that self-employed families can afford healthcare from sources other than insurance. In another study, Olson (2002) used a two-stage instrumental variable procedure to estimate health insurance's effect on husbands' and wives' labor supply. The authors found that wives were willing to accept a job with employer-sponsored health insurance that paid 20% less than they would have received in positions without employer-sponsored health insurance. Toward

[12] See Parker (2005) for the formal derivation of the empirical model (simultaneous probit model) from the theoretical framework.

the end of the 2000s, Terza, Basu, and Rathouz (2008) argued for the two-stage residual inclusion (2SRI) method as an alternative to the classical two-stage instrumental variable or 2SPS method to address endogeneity in empirical research in health economics and health services research.

Finally, consistent with Mallar (1977), Maddala (1983), and Zimmer (2001), Ahearn, El-Osta, and Mishra (2013) used the simultaneous probit modeling technique to estimate the impact of health insurance on the off-farm labor supply of farm operator households.[13] This study also used a simultaneous probit modeling approach to study the effect of health insurance coverage on farm families' off-farm work.[14] The simultaneous probit model is appropriate to address the possible endogeneity between the farmers' decision to provide off-farm work and their choice to get health insurance. Thus, equations (7) and (8) follows a two-stage process by estimating reduced-form probit equations:

$$
\begin{aligned}
Y_{1i}^{**} &= \Theta_1' \boldsymbol{X}_i + \gamma_{1i}, \\
Y_{2i}^{**} &= \Theta_2' \boldsymbol{X}_i + \gamma_{2i},
\end{aligned} \tag{9}
$$

where $\boldsymbol{X}_i$ is a vector of all exogenous variables in equation (9). The second-stage estimation replaces the predicted latent values from the reduced-form equation (9) and replaces with conforming endogenous variables:

$$
\begin{aligned}
Y_{1i}^{*} &= \alpha_1 \hat{Y}_{2i}^{**} + \beta_1' \boldsymbol{X}_{1i} + \gamma_{1i}, \\
\Pr(Y_{1i} = 1) &= \boldsymbol{\Omega}\left(\alpha_1 \hat{Y}_{2i}^{**} + \beta_1' \boldsymbol{X}_{1i}\right) = \boldsymbol{\Omega}\left(\phi_1' X_{1i}\right),
\end{aligned} \tag{10}
$$

$$
\begin{aligned}
Y_{2i}^{*} &= \alpha_2 \hat{Y}_{1i}^{**} + \beta_2' \boldsymbol{X}_{2i} + \gamma_{2i}, \\
\Pr(Y_{2i} = 1) &= \boldsymbol{\Omega}\left(\alpha_2 \hat{Y}_{1i}^{**} + \beta_2' \boldsymbol{X}_{1i}\right) = \boldsymbol{\Omega}\left(\phi_2' \boldsymbol{X}_{2i}\right),
\end{aligned} \tag{11}
$$

where $\boldsymbol{\Omega}$ is the cumulative standard normal distribution function. The error terms follow a bivariate normal distribution, $BVN(0,0,1,1\rho)$, where ρ is the correlation between two latent variables, Y_{1i}^{*} and Y_{2i}^{*}.

Equations (10) and (11) are a simultaneous equation probit model that is internally consistent and estimable under standard identification assumptions; in particular, the system is identified if at least one variable, Λ_1, appears in $\boldsymbol{X}_1$ but not $\boldsymbol{X}_2$, and if at least one variable, Λ_2, appears in X_2 but not in X_1. The coefficients of interest in this simultaneous equation model, α_1 and α_2, capture interdependent health and labor choices that are predicted to arise in US farm-operator households. An important implication of the simultaneous equation model is that ignoring interdependence in health and labor choices when it is actually present (i.e., assuming independence and estimating single-equation estimations of equations 10 and 11) can produce misleading inferences (Parker, 2008). In probit models, the coefficients cannot be interpreted as elasticities. Thus, we use the marginal effects to interpret the findings from the above model. Using Greene (2008, p. 775), one can derive the marginal impact on the jth ($j = 1, 2$) binary model in equations (10) and (11) is a measure of the instantaneous effect that a change in the kth explanatory variable has on the predicted probability $\Pr(Y_j = 1)$ when the remaining explanatory variables are held constant. As such, the marginal effect is computed as the derivative of the conditional mean function with respect to x given by

[13] Unlike Ahearn, El-Osta, and Mishra (2013), who used 2010 ARMS data, our focus is on the role of health insurance and government payments—namely counter-cyclical payments, conservation payments, and risk management payments—on off-farm work by farm families.

[14] Note that some variables that are included in one equation were excluded from the other, and vice versa. For instance, the "sole proprietorship" variable (believed to influence the decision to obtain health insurance coverage but not the off-farm work decision) was included in the health insurance coverage equation only. Similarly, the "total household income in 2014" variable (which influences the decision to work off farm but not the decision to purchase health insurance coverage) was included in the off-farm-work equation only.

$$\frac{\partial E\left(Y_j \mid x_j\right)}{\partial x_{jk}} = \frac{\partial \mathbf{\Omega}\left(\phi_j' x_j\right)}{\partial x_{jk}} \phi_{jk} = \varphi\left(\phi_j' x_j\right) \phi_{jk}, \tag{12}$$

where $\phi(\cdot)$ is the standard normal density of the cumulative standard normal function, $\mathbf{\Omega}(\cdot)$.

Table 2 shows the summary statistics of the variables of farm families' off-farm work and health insurance purchase decisions. Finally, the ARMS has a complex, stratified, multiframe design; therefore, each observation in the ARMS represents several similar farms. The particular number is the survey expansion factor (or the inverse of the surveyed farm's probability of surveying, Dubman, 2000). The expansion factors are most helpful and recommended when the complete survey is used. Generalizations about the entire population of farms are 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), but there is no 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. Like El-Osta (2011), we employ a bootstrapping technique rather than the jackknife procedure to remedy design problems in this subsample.

Data

We use 2015 ARMS data, a nationally representative survey of farm households in the 48 contiguous states. The ARMS is conducted annually by the US Department of Agriculture Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS).[15] The survey collects farm financial indicators (e.g., farm income, expenses, assets, and debt) as well as operating characteristics of farm businesses, attributes of farm operator households, and costs of producing agricultural commodities. Table 2 presents the list of variables with respective summary statistics used in our labor supply model and econometric estimation is presented. The final sample of married, family farm households for this off-farm labor study is 7,806.[16]

The analysis in this study focuses on employer-sponsored health insurance through off-farm employment of either the farm operator or spouse, or both. We include household characteristics (e.g., operator age,[17] race, gender, educational attainment of farmers and spouses, beginning farmer status, household size, and presence of children), income characteristics, government payments received, and county-level data from the 2014 Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) files and Census Local Area Unemployment Statistics (LAUS) unemployment files.

Our analysis also includes farm characteristics (e.g., ownership type, farm specialization, census region) and local labor market characteristics (e.g., county unemployment rate and employment shares by industry sector). The majority of farms in our sample are located in the Southern region (44%), followed by the Midwest region (36%) of the United States; 89% of the farm are operated as sole proprietorships. This study uses a dummy variable in the empirical model to assess the impact of beginning farm operators (i.e., those with fewer than 10 years' experience managing the farm operation) on the decision to supply labor off the farm and insurance coverage. Table 1 reports that about 17% of the sample farm operators could be classified as beginning farmers.

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

[16] The sample size is twice that was used by Ahearn, El-Osta, and Mishra (2013).

[17] Recent research conducted by the Population Reference Bureau (2018, p. 37) revealed that a growing share of Americans are working beyond their 65th birthday, a reversal that began in the mid-1980s. Among the factors influencing older people's decisions to postpone retirement over the past 25 years, this study cites "declining availability of employer-provided health insurance for retirees" is discussed as one of the main drivers in this study."

Table 2. Weighted Means of Variables Used in Simultaneous Probit Regression, Farm Operator Households, 2015

	Health Insurance Converage		Off-Farm Work by Operator, Spouse, or Both		Full Sample
	Yes (=1)	No (=0)	Yes (=1)	No (=0)	
Operator and household characteristic					
Age: < 35 years (%)	4	n/a	5	2*	4
Age: 35–54 years (%)	28	34*	34	13	28
Age: 55–64 years (%)	33	20*	38	19	32
Age: > 65 years (%)	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 (=1; 0 otherwise)	0.96	0.92	0.97	0.94	0.96
Operator gender, female (=1; 0 otherwise)	0.09	0.03#	0.09	0.06	0.08
Beginning farmer (=1; 0 otherwise)	0.2	0.2*	0.2	0.1	0.2
Presence of children under 6 (=1; 0 otherwise)	0.09	0.23#	0.11	0.06*	0.09
Total household income ($)	133,070	86,222	139,631	111,282	131,357
Counter-cyclical payments[1] ($)	900.5	609.2*	686.8*	1,382.5	889.8
Commodity Credit Corporation loans[2] ($)	826.5*	136.9*	867.7*	640.2*	801.3*
Conservation Programs payments[3] ($)	1,387.4	594.1*	1,309.2	1,477.9	1,358.4
Risk Programs payments[4] ($)	2,588.7	1,000.6*	2,343.6	2,984.6	2,530.7
Farm characteristics					
Farm org: sole proprietorship (=1; 0 otherwise)	0.89	0.93	0.89	0.89	0.89
Farm specialization: dairy (=1; 0 otherwise)	0.02	0.09*	0.02*	0.04	0.02
State average wage rate, hired labor ($)	13.24	13.25	13.23	13.24	13.24
Region: Northeast (=1; 0 otherwise)	0.06	0.16*	0.06	0.07	0.06
Region: Midwest (=1; 0 otherwise)	0.36	0.37	0.36	0.34	0.36
Region: West (=1; 0 otherwise)	0.14	0.09*	0.13	0.16	0.14
Region: South (=1; 0 otherwise)	0.44	0.38	0.45	0.43	0.44
Off-farm labor market area characteristics					
Unemployment rate, 2014 (%)	6.1	6.0	6.06	6.18	6.1
County employment, construction, 2014 (%)	5.0	4.0	5.0	5.0	5.0
County employment, government, 2014 (%)	20	17	20	20	20
County employment, manufacturing, 2014 (%)	13	16	13	14	13
County employment, natural resources, 2014 (%)	4.0	4.0	4.0	4.0	4
County employment, services, 2014 (%)	58	59	58	58	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

Notes: [1]Includes payments from Direct Counter-cyclical Payment Program (DCP), revenue payments from Average Crop Revenue Election Program (ACRE) for the crop year 2014, Loan Deficiency Payments (LDPs), and Marketing Loan Gains (MLGs).
[2]Includes payment received for all commodities placed under CCC loans.
[3]Includes payments from Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP) and other US federal conservation.
[4]Includes payments from Price Loss Coverage (PLC), County-Agricultural Risk Coverage (ARC-CO), Individual - Agricultural Risk Coverage (ARC-IC), Agricultural Disaster Payments, Margin Protection Program for Dairy (MPP - Dairy) and the Dairy Product Donation Program (DPDP) other federal, state, or local program payments.
Coefficient of Variation = (Standard Error/Estimate) × 100. Single asterisk (*) indicates that $25 < CV \leq 50$. Pound sign (#) indicates that $50 < CV \leq 75$.
Source: 2015 USDA Agricultural Resource Management Survey.

The 2015 ARMS survey queried respondents on their income and payments received from the government during that year. In this study, we include four types of government payments. First, counter-cyclical payments (CCP) are government payments to the farmer based on the base acre crops. Producers are eligible for the payment if the national average market price of their base acreage crops falls below the established target price for that crop. CCP includes the Direct Counter-cyclical Payment Program (DCP), revenue payments from the Average Crop Revenue Election Program (ACRE), Loan Deficiency Payments (LDPs), and Marketing Loan Gains (MLGs). Second, Conservation Reserve Payments (CRP) are government payments to the farmer for various conservation and land stewardship practices. CRP includes payments from the Conservation Reserve Program (CRP), the Environmental Quality Incentives Program (EQIP), the Conservation Stewardship Program (CSP), and other US federal conservation programs. Third, the Commodity Credit Corporation (CCC) is a government-owned and operated entity created in 1933 to stabilize, support, and protect farm income and prices. The CCC assists agricultural producers through loans, purchases, payments, and other operations and makes available materials and facilities required to produce and market agricultural commodities. Finally, Risk Management Payments (RMP) are government income support payments to the farmer on a commodity-by-commodity basis when market prices fall below a reference price. RMP include payments from Price Loss Coverage (PLC), County-Agricultural Risk Coverage (ARC-CO), Individual-Agricultural Risk Coverage (ARC-IC), Agricultural Disaster Payments, Margin Protection Program for Dairy (MPP-Dairy), the Dairy Product Donation Program (DPDP), and other federal, state, or local program payments.

Table 1 reveals that the average farm family received annually (in 2015) about $890 in counter-cyclical payments, $801 in commodity credit corporation loans. These payments are tied to farm production and are likely to impact off-farm labor allocation decisions of farm operators and spouses. Most of the annual payments received by the farm families in 2015 originated from conservation payments (on average, $1,358). Since most of the conservation programs' payments do not require farm production, we conclude that conservation payments are decoupled from production and are treated as a pure wealth effect for farm families. Finally, this study includes payments received by farm families under the risk management programs. In 2015, farm households' average annual risk management payments were about $2,530 (Table 2). Like the counter-cyclical payments, we argue that risk management payments are tied to farm production and thus affect labor allocation decisions. We assume these government payments influence the decision to purchase insurance only via their effect on working off the farm. In other words, the impact of these payments on the decision to buy employer-sponsored health insurance is assumed to be captured by the "latent off-farm work participation" variable included in the health insurance model.

Results and Discussion

Table 3 reports parameter estimates and marginal effects for the simultaneous probit model of health insurance coverage and off-farm work, using maximum likelihood and robust variance estimation.[18] In column 3 of Table 3 (marginal effects), the first equation of the simultaneous probit model reveals a positive and significant association, at the 5% level of significance, between off-farm work by the farmer or spouse and the likelihood of health insurance coverage. We find that reporting off-farm work is associated with a 4.0-percentage-point increase in the likelihood of reporting health insurance coverage. This estimate is slightly higher (4.0 vs. 3.2) than the estimates obtained by Ahearn, El-Osta, and Mishra (2013). Similarly, from the second equation of the simultaneous probit model, marginal effects reveal a positive and significant association at the 5% level of significance between health insurance coverage and the likelihood of off-farm work by the farmer

[18] The results of the reduced-form probit regression for health insurance coverage and off-farm work are not presented here but can be obtained from the authors.

Table 3. Estimated Coefficients and Predicted Marginal Effects of Factors in Simultaneous Probit Models: Health Insurance Coverage and Off-farm Work Status, 2015

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

Continued on next page...

Table 3. – continued from previous page

	Health Insurance Coverage		Off-Farm Work by Operator, Spouse, or Both	
Variables	**Coefficient**	**Marginal Effect**	**Coefficient**	**Marginal Effect**
Conservation payments			−0.066	−0.018***
			(0.025)	
Risk management payments			−0.056	−0.015***
			(0.015)	
Dairy farm			−0.056	−0.198***
			(0.142)	
County average wage rate			−0.001	−0.001
			(0.057)	
Northeast region[c]	−0.373	−0.033	0.164	0.044
	(0.282)		(0.225)	
Midwest region	−0.241	−0.018	0.217	0.060**
	(0.204)		(0.102)	
Southern region	−0.264	−0.019	0.257	0.071**
	(0.193)		(0.122)	
County unemployment rate, 2014 (%)	0.027	0.002	−0.024	−0.007
	(0.039)		(0.017)	
County employment in manufacturing, 2014 (%)	−0.319	−0.022		
	(0.569)			
County employment in construction, 2014 (%)	1.666	0.113		
	(1.471)			
County employment in government, 2014 (%)	0.764	0.053		
	(0.619)			
County employment in natural resources, 2014 (%)	−0.684	−0.047		
	(0.831)			
RHO (ρ)	0.326***			
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.

or spouse (column 5, Table 3). We find that farm families (operators and spouses) who reported health insurance coverage are 14.4 percentage points more likely to report off-farm labor allocation decisions. This estimate is significantly lower (14.4 vs. 19.2) than Ahearn, El-Osta, and Mishra's (2013) estimates.

A possible reason for these differences could be Medicaid expansion and the health insurance marketplace under ACA. Farm families at the margin, who would have taken an off-farm job for health insurance, may have shifted to another mechanism (e.g., the health insurance marketplace) for health insurance coverage. Another explanation could be the sluggish recovery of the nonfarm

economy after the Great Recession of 2008. Rural labor markets did not return to prerecessionary low unemployment levels until almost mid-2015 (Hertz et al., 2014). Off-farm employment and structural changes in the off-farm market may be a reason for the lower likelihood of employment opportunities for farm families.[19] The estimated effects seem small when compared to self-employed nonfarm households with employer-sponsored health insurance coverage. Still, the findings are interesting because it shows the intertwining of government subsidies, labor allocation, and insurance coverage from employer-based health insurance. Unlike self-employed nonfarm households, self-employed farming households have multiple job holdings (namely farm and nonfarm work) and receive government subsidies for production agriculture (farm work). Thus, through subsidies, government interventions in agriculture have broader implications for farming households regarding employment and both farm and nonfarm and health insurance coverage than self-employed nonfarm households. In addition, the estimated correlation coefficient in the bivariate probit model (ρ) was statistically significant at the 1% level of significance. This finding provides further evidence that there is a correlation between the off-farm work and employer-sponsored health insurance coverage equations and that the simultaneous equation approach is appropriate.

Panel A of Figure 1 shows the marginal effects of health insurance on the probability of off-farm work. Panel B indicates the marginal effect of off-farm work by operator and spouse on the likelihood of having employer-sponsored health insurance coverage. Indeed, the columns reveal that the marginal effect of employer-sponsored health insurance coverage on the likelihood of off-farm labor allocation (panel A) is stronger than the marginal effect of off-farm work on the probability of having employer-sponsored health insurance coverage (panel B). These results support the positive association between health insurance coverage and increased wages by inducing farm-operator households 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 association between employer-sponsored health insurance coverage and off-farm work by farmers and their spouses (see Ahearn, El-Osta, and Mishra, 2013; D'Antoni, Mishra, and Khanal, 2014).

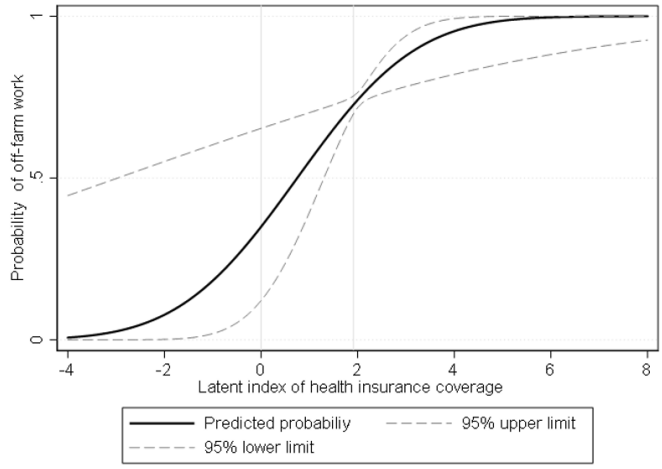
In other variables, Table 3 reveals that beginning farmers with large farms (> $250,000 in gross sales) are more likely (2.4 percentage points) to have health insurance coverage than beginning farmers with small farms (< $50,000 in gross sales). There are several potential explanations for this finding. Beginning farmers with large farms could have health insurance coverage through their farming business or they could afford to buy private insurance through their farm earnings. Results in column 3 of Table 3 reveal that farm families operating large farms are 2.8 percentage points more likely to have health insurance coverage than those working small farms (< $50,000 in gross sales).

The association between the operator's age and the likelihood of off-farm work is positive, but it decreases as the operator gets older. This suggests that, *ceteris paribus*, the likelihood that the farm operator working off-farm alone increases throughout the operator's life until it reaches a maximum and then declines as the operator grows older. This finding is consistent with other studies (e.g., Gould and Saupe, 1989; Huffman and El-Osta, 1997; El-Osta, Mishra, and Morehart, 2008). Consistent with expectations, higher levels of education by spouses are positively associated with the likelihood of health insurance coverage (Table 3, column 3). This is perhaps because spouses with higher levels of educational attainment are more likely to have off-farm jobs (El-Osta, Mishra, and Ahearn, 2004; Ahearn, El-Osta, and Dewbre, 2006; Chang and Mishra, 2008).

Last, marginal effects in column 5 of Table 3 show the association between various government payments and off-farm labor allocation decisions by farm families (operator and/or spouse). Results in Table 3 show that the marginal effect is negative and statistically significant, revealing that an increase in counter-cyclical payments and risk management payments is associated with decreases in the likelihood of off-farm work by operators (3.2 percentage points) and spouses (1.5 percentage

[19] McFadden pseudo-R^2 values are 0.17 and 0.20 for the health insurance coverage and off-farm work status models, respectively. A rule of thumb among practitioners is that the regression model is deemed to have excellent predictive power if the computed value of McFadden pseudo-R^2 falls between 0.20 and 0.40 (Maddala, 1983, p. 39).

(a) Probability of Off-Farm Work



(b) Probability of Health Insurance Coverage

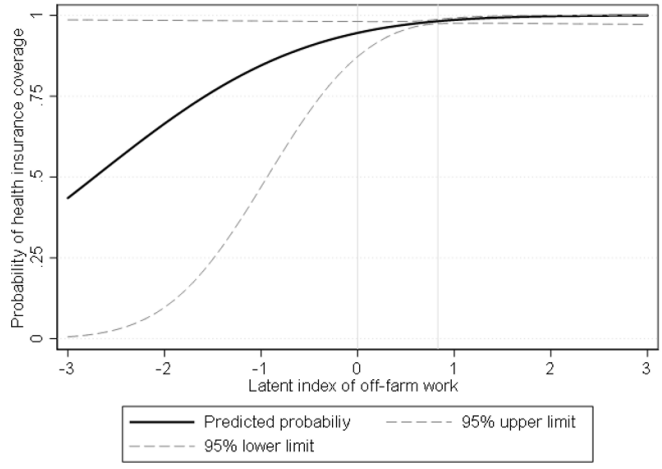


Figure 1. Simulated Probabilities of Health Insurance Coverage and Off-Farm Work by Farmers and Their Spouses, 2015

points). These results confirm earlier findings that production-related farm program payments tend to direct more farm families' labor hours to farm production. We treat counter-cyclical and risk management payments as a source of farm income (i.e., increasing these payments deters farm-operator households from engaging in off-farm work). The marginal effect of conservation payments is negative and statistically significant at the 1% level of significance. The results imply that increasing conservation payments is associated with a 2% decrease in the probability of off-farm work among farm-operator households (operators and spouses). This relationship had been previously established in the literature with respect to the off-farm participation decision (El-Osta, Mishra, and Ahearn, 2004; Ahearn, El-Osta, and Dewbre, 2006; Chang and Mishra, 2008). These findings suggest that if the policy maker's goal is to increase the number of farmers or replace retiring farmers, then government payments could be used as a policy tool to attract beginning farm-operator households to take up the business of farming.

Consistent with and Mishra and Goodwin (1997) and Ahearn, El-Osta, and Dewbre (2006), farm-operator households specializing in dairy are less likely to work off the farm. This result

is expected because dairy farming is more labor-intensive than many other farming operations. Finally, the farm's regional location is also an essential factor in determining off-farm work by farm-operator households. Table 3 reports that, compared to farm families in the West region, farm-operator households located in Midwest and Southern regions are more likely to allocate labor to off-farm work.[20] Farms in the Midwest and Southern 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).

Summary and Conclusions

Data from 2010 and 2015 show that health insurance coverage among farming households increased from 87% to 92% over that period. During the same period, employer-sponsored health insurance coverage increased from 56% to 58% and government-based insurance coverage (mainly Medicare) increased from about 24% to 26%. This is indicative of an aging farming population. Finally, the share of health expenditure as a percentage of living expenses increased slightly, from about 16% in 2010 to 17% in 2015. Most farmers who have primary jobs other than farming are just as likely as other Americans to have health insurance coverage. This study estimated the associations between employer-sponsored health insurance coverage and off-farm labor supply decisions for farm families. Additionally, the study examined the relationship between government farming subsidies, specifically counter-cyclical, risk management, conservation payments, and off-farm labor allocation decisions of operators and spouses. We also investigated the association between being a beginning farmer and the likelihood of having health insurance coverage. The study used farm-level data from the 2015 ARMS, the most recent survey that collected health insurance coverage and sources of health insurance, and a simultaneous probit estimation method to estimate the empirical model.

We found that farm families (operators and spouses) who reported off-farm work are 4.0 percentage points more likely to report employer-sponsored health insurance coverage; farm-operator households with employer-sponsored health insurance coverage are 14 percentage points more likely to work off the farm. Findings also revealed that beginning farmers with large farms (> \$250,000) are more likely to have health insurance coverage than beginning farms with small farms (< \$50,000). Thus, if the policy makers want to encourage a new generation of farmers to enter the farming business, they must provide affordable health insurance coverage for farm-operator households, especially for small and medium-sized farms. In the absence of such incentives, it is more likely that farmers would devote 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 healthcare, should be emulated in other parts of the country. Similar policies could help small farms afford healthcare for their family members and employees. Due to data limitations, we could not examine the marginal impact of hours spent on off-farm employment on outcomes such as farm productivity or farm income. Future research should investigate these issues, which can be considered as unintended consequences derived from the nature of health insurance coverage in the United States. Finally, the study found that government subsidies—both those tied to production as well as income transfer payments—are associated with a decrease in off-farm work by farm-operator households. If policy makers' goal is to retain young farmers and foster rural development, then coupled payments might be a good policy incentive for young farmers.

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[20] As a robustness check, we controlled for farm production regions instead of census regions. Results did not change qualitatively.

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