Welfare Implications of a Reduction in Government Payments: The Role of Fringe Benefits

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Abstract

In the past three decades, farm families have relied on government payments and off-farm income to reduce income risk and increase total household income. Studies have shown that, as income effect dominates, government payments tend to reduce off-farm labor of farm operators and spouses. But that may not be true if one accounts for fringe benefits associated with off-farm employment. Additionally, with looming budget deficits and the possibility of a reduction in decoupled government payments, farm families may be facing an altered economic environment. Our study addresses this issue by examining the links between government farm program payments and the ever-important role of fringe benefits in the off farm employment of farm couples. Result from farm-level data actually show that the marginal effect of government payments on hours worked off-farm will decrease in magnitude when accounting for fringe benefits, *ceteris paribus*. These results support the notion that farm households' welfare loss stemming from reduced decoupled payments may be overstated when models exclude fringe benefits from the estimation of off-farm labor supply.

Keywords: agricultural policy, decoupled government payments, fringe benefits, farm households, Tobit, welfare loss

JEL codes: J43, J22, Q12, Q18

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1. Introduction

There have been two significant trends in agriculture over recent decades: an increased number of hours worked off-farm by farm families and an increase in government payments. According to Ahearn and El-Osta (1992), off-farm labor of farm households can no longer be considered a transitional position; it has become the primary source of income with farming as a secondary source of income. In 1998, off-farm income was six times greater than cash farm income and comprised nearly 80% of total household income (USDA, 2010; El-Osta, Mishra, and Morehart, 2008). Today off-farm income comprises more than 90 percent of the total household income.[2]

On the other hand, government program payments have also played an important role in the development of agricultural households. Over the last 10 years government payments have comprised nearly 30% of farm net income, on average. During this period the federal government has distributed an average of $18.2 billion annually to farmers in the form of direct government payments (USDA, 2010). These types of payments include direct payments for commodity programs, decoupled payments, counter-cyclical payments, marketing loan benefits, emergency/disaster payments, tobacco transition payments, and conservation program payments. At the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), now World Trade Organization (WTO), members agreed to limit expenditures on domestic agricultural subsidies with certain exceptions: decoupled payments. They decided to decrease the levels of coupled payments relative to decoupled payments (Burfisher and Hopkins, 2003). The United

[2] The average farm household earned $72,671 from off-farm sources and $11,769 from the farming activity (USDA, 2010).

States got on board with this in the 1996 Farm Bill, where they marked the adoption of decoupled payments with the adoption of Production Flexibility Contract (PFC) payments.

Since then, however, times have changed. The U.S. is facing huge budget deficits and higher unemployment in the labor market. Austerity measures have taken priority not only in the U.S but also in many Western European countries; the focus of many of these economies is on eliminating waste in government spending. As part of recent Farm Bill debates, there has been considerable discussion of eliminating decoupled payments[3] and this has led to a wave of studies assessing the impact of decoupled payments on off-farm labor allocation (Ahearn, El-Osta, and Dewbre 2006; El-Osta, Mishra, and Ahearn 2004; Mishra and Goodwin 1997; Goodwin and Mishra 2004). One important consideration omitted from most of the above-mentioned studies is the role of fringe benefits in farm household's labor allocation decisions, specifically healthcare insurance coverage. These considerations are especially important today with the hotly debated and rapidly changing agricultural and healthcare policies.

Farms, like most small businesses, suffer from the prohibitively high costs of providing fringe benefits, in particular health insurance coverage, to employees. In December 2009, employers were found to spend an average of $27.42 per hour for total employee compensations with benefits comprising $8.00, which is 29.2% of the cost (BLS, 2009). Many self-employed individuals or their spouses are employed elsewhere primarily to provide retirement and health insurance benefits to their family without having to fund these benefits through their personal business (Mishra, El-Osta, and Ahearn, 2012). Further considering the documented risk and financial stress associated with farming, it is reasonable to expect the farm household to

[3] "According to the Senator from Michigan, the across-the-board sequestration cuts that are scheduled for 2013 could be between 16-18 billion dollars for agriculture and nutrition programs. As for changes to the commodity title, Stabenow says they include: the elimination of direct payments, a new revenue plan and new target prices, and well as building the farm safety around crop insurance and other risk management programs" (Hoosier Ag. Today, 2011).

undertake similar behavior. A 2004 Economic Research Service (ERS) survey of farm operators and spouses provided significant evidence that the reason for off-farm labor, particularly with regards to the spouse, was obtaining health insurance (USDA 2005).

The purpose of this paper is to examine the links between government payments and the perennially fundamental role of fringe benefits in household income. Many are asking if a reduction in government payments, particularly decoupled payments, could be beneficial to farm families. Prior literature has not explicitly discussed implications of fringe benefits in the context of government policy—specifically, how labor allocation decisions are influenced or the migration of labor away from agriculture is slowed. If government payments are reduced at the same time farm households begin to receive fringe benefits, this reduction may actually increase off-farm labor allocation of farm operators and spouses[4]. The following null and alternative hypotheses succinctly state the purpose of this research:

H_o: The marginal effect of government payments on hours worked off-farm will not change when accounting for fringe benefits.

H_a: The marginal effect of government payments on hours worked off-farm will change in magnitude when accounting for fringe benefits.

Using 2006-2008 Agricultural Resource Management Survey (ARMS) data and bivariate Tobit modeling techniques for off-farm labor supply, we find that the null hypothesis can be rejected. We conclude that incorporating fringe benefits into the model decreases the magnitude of the marginal effect of government payments, both coupled and decoupled, on off-farm labor supply.

[4] Assuming that both total time and leisure are fixed, one can easily show that a reduction in decoupled payments would increase time working off the farm, assuming that greater levels of income are preferred to less. This is consistent with the fact that farm families earn more than 90% of their income from off-farm sources (wages and salaries being the majority share, Mishra et al., 2002).

This empirically supports the notion that existing models may overestimate the welfare lost by the farm family stemming from decreased decoupled payments.

2. Literature Review

During the past three decades, off-farm activities have provided a critical income source to a majority of farm households in the United States and Western European countries (e.g., Mishra et al. 2002; Ahearn, El-Osta & Dewbre, 2006). Off-farm provision has been largely responsible for: (1) closing the income gap between farm and nonfarm households (El-Osta, Mishra and Morehart, 2007; Mishra et al. 2002; Holden et al. 2004; Woldehanna, Lansink and Peerlings, 2000); (2) food consumption and nutrition (Chang and Mishra, 2008); and (3) farm input usage (Mishra, Nimon and El-Osta, 2005; Chang, Mishra & Livingston, 2011). There have been multiple studies that address the factors influencing the farm family's decision to participate in off-farm labor and off greatest relevance to this article is the literature on how government payments affect off-farm labor supply. Using Agricultural Resource Management Survey (ARMS) data, Ahearn et al. (2006) and El-Osta et al. (2008) found that government payments tended to increase the number of hours operators work on the farm and decrease the hours devoted to off-farm labor, regardless of the payment type—coupled or decoupled. The study further found that government payments had a positive effect on the total number of hours worked. Ahearn, El-Osta, and Dewbre (2006) also showed government payments have a negative effect on off-farm labor participation of farm operators and spouses. Using data from Kansas farm households (more homogenous and local in nature) Mishra and Goodwin (1997) indicated that government payments were negatively related to off-farm participation.

El-Osta, Mishra, and Morehart (2008) further explore this issue by assessing the role of commodity related government payments on the off-farm labor allocation decision of the farm operator and spouse. The results of this study demonstrated that a $10,000 increase in expected government payments increased by 9% the probability that only the wife will work off-farm and decrease by 8.6% the probability that both husband and wife will work off-farm. The decreased likelihood of both working off-farm is expected, but the authors provide an interesting explanation for the odd result of wives becoming increasingly likely to work off-farm. They explain that the off-farm labor participation by the wife, when only the wife is working off-farm, is not undertaken solely for monetary reasons. They state that off-farm work is undertaken to secure some “non-pecuniary” benefits such as health insurance coverage. This conclusion is supported by Jensen and Salant (1985) who found a positive relationship between fringe benefits and the hours worked off-farm. Using a large cross-sectional data (2006 ARMS) Mishra, El-Osta, and Ahearn (2012) estimate the impact of the source of health insurance on health care expenditures of farm households in the United States and found that farm households purchasing individual health insurance directly from vendors are likely to spend more on health care than those with other sources of health insurance.

Nonetheless it can be said with confidence that most studies in the off-farm literature omit fringe benefits from their analyses due to data limitations. Despite a plethora of literature on agricultural policy and its impact on off-farm work, relatively little attention has been paid to the effects of government payments on off-farm labor supply in the presence of fringe benefits. The goal of the following research is to empirically demonstrate the bias in the impact of government payments (both coupled and decoupled) that can result from omitting fringe benefits. We also show the potential policy implications stemming from inference based on these biased estimates.

3. Theoretical Model

The farm household is expected to follow a utility maximization framework where U denotes utility. The utility is a function of leisure ($L_{ei}(L_F, L_O)$) and income (($I(L_F, L_O)$)). Both farm household income and the time devoted to leisure are a function of the time devoted to farm labor (L_F) and off-farm labor (L_O).

$$Max\ U = U(L_{ei}, I) \tag{1}$$

subject to

$$L_{ei} + L_F + L_O - T = 0 \tag{2}$$

$$w_O L_O + \pi_F + V - I = 0 \tag{3}$$

$$L_{ei}, L_F, L_O \geq 0 \tag{4}$$

Utility maximization (equation 1) is subject to the total available hours (T) allocable to leisure, farm labor, and off-farm labor (equation 2), the full income constraint (equation 3), and non-negativity constraints (equation 4). The full income constraint is defined as the sum of income from off-farm labor ($w_O L_O$), farm profits (π_F), and other household non-labor income (V) minus the total income (I). Farm profits are further defined as the value of farm production minus the input costs. Specifically,

$$\pi_F = P_f f\left(L, X_f\right) - r_f X_f \tag{5}$$

where P_f is the price of farm outputs, $f(.)$ is the farm production function, and r_f is a vector of prices for inputs to production X_f. The utility and production functions are assumed to be concave, continuous, and twice differentiable. The farm production function is further assumed to exhibit global concavity and diminishing marginal productivity of farm household labor. It is also assumed that the farmer is a price taker in the off-farm labor market. The first order conditions with respect to off-farm and farm labor from this optimization framework are:

$$\frac{\partial \mathcal{L}}{\partial L_O} \Longrightarrow VMP_{L_O} = MRS_{L_{ei},I} \quad (6)$$

$$\frac{\partial \mathcal{L}}{\partial L_F} \Longrightarrow VMP_{L_F} = MRS_{L_{ei},I} \quad (7)$$

Taken together, the optimum condition is reached where the value marginal product of off-farm work is equal to the value marginal product of farm labor. In equilibrium, the value marginal products will be equal to the respective wages for off-farm and farm labor. Fringe benefits can be viewed as a component of the full off-farm wage (w_O). As employer-sponsored benefits like healthcare insurance coverage becomes more expensive, the marginal returns to off-farm work will increase relative to the marginal returns to self-employment, *ceteris paribus*. Assuming time is currently devoted to off-farm labor, increased off-farm work is expected to result from increased fringe benefits.

This framework underlies both the graphical analysis found here and in Dewbre and Mishra (2007). Figures 1 and 2 depict the effects of a decrease in decoupled government payments on the labor-leisure mix of farmers who currently devote some time to off-farm work. The difference in the two figures is simply the definition of the full off-farm wage. Figure 1 does not include fringe benefits in the model, while Figure 2 includes fringe benefits in the full wage. While the empirical analysis includes coupled payments, the focus of the graphical analysis is limited to decoupled payments because of the current policy relevance.

Decoupled payments affect the theoretical model via a decrease in Other Household Non-Labor Income (*V*). We will assume that decoupled payments work as designed and are completely independent of the production decision; therefore, they will have no effect on hours devoted to farm labor (Dewbre and Mishra 2007; Findeis 2002). Decreased decoupled payments will decrease household income at all points along the household income curve ($Y_A \rightarrow Y_B$). Again, greater levels of income are preferred to lower levels; therefore, the household moves to a lower level of utility ($U_1 \rightarrow U_2$) as decoupled government payment decrease. Time devoted to off-farm labor changes ($L_{O,A} \rightarrow L_{O,B}$) from length B1 to B1+C1 and time devoted to leisure declines from length C1+D1 to D1. In summary, a decrease in exogenous income is expected to increase off-farm labor, decrease leisure, and increase total work hours.

Comparing Figures 1 and 2, the only change to our initial conditions is a more steeply sloped linear portion of the income curve. This reflects an increase in the off-farm wage stemming from the inclusion of fringe benefits in the full off-farm wage. For the same decrease in decoupled payments found in Figure 1, we find that the increase in off-farm hours worked is smaller in Figure 2. This reflects a less elastic off-farm labor supply curve when considering fringe benefits. This makes sense intuitively considering that one of the primary drivers of off-farm labor is securing insurance coverage for the farm family. Considering the alternatives are either no insurance coverage or increased financial burden on the farm business, a rapid adjustment in off-farm labor to changes in exogenous income should not be expected.

The above discussion has focused on the effects of decoupled government payments through the farm household model. Now consider an aggregate view via the market demand curves for leisure and farm labor, as well as the market supply curve for off-farm labor (Figures 3 and 4). In this representation, we will maintain our assumption that farm labor is unchanged by decreases in decoupled payments.

In Figure 3, a small decrease in decoupled government payments shifts the demand curve for leisure downward, which results in a decrease in the reservation wage (W^* to W^A) and a greater range of prices over which the off-farm labor supply curve can be defined. For all wages below the reservation wage, the farm operator or spouse will not engage in off-farm labor. The line segment representing off-farm labor supply excluding fringe benefits extends from L'L to

L'L''. Likewise, the line segment representing off-farm labor supply including fringe benefits extends from $L^{*}L$ to $L^{*}L^{**}$.

The shaded areas in Figure 2 represent changes in welfare for the farm family. With regards to the off-farm labor supply depiction, a loss of potential producer surplus in the off-farm labor market is represented by B and C. When the reservation wage changes from W^{*} to W^{A}, the required compensation at which farmers will work off-farm falls. Their actual compensation off-farm is unchanged at W^{*}, so they are earning an off-farm wage higher than their minimum requirement. These gains in producer surplus in the off-farm labor market offset losses in total welfare in the leisure/farm labor market. In Figure 3, we see that the loss in total welfare (A) is partially offset by the gain in producer surplus (B) when fringe benefits are excluded. When fringe benefits are included as a component of the off-farm wage, the off-farm labor supply loses elasticity, the gain in producer surplus increases from B to B+C and the net loss in welfare decreases. This implies that the negative impact on the farm household resulting from declining decoupled payments may be overstated when fringe benefits are omitted. These expectations depend on the relative contribution to household income of fringe benefits and government payments.

As magnitude of government payments grows relative to fringe benefits, the implications for the farm labor markets will change. In other words, the income and substitution effects will change in prominence. Figure 4 depicts a relatively larger decrease in government payments than shown in Figure 3. In this case, significantly lower decoupled payments will induce farmers to forego leisure and allocate greater hours to farm labor. Perhaps farm households previously used the payments to employ more hired labor. Now with less exogenous income, the farm household must employ fewer hired workers and trade their own hours of leisure for greater hours of farm labor. This results in a rightward shift in the supply of farm labor (S_F).

The combination of the rightward farm labor supply shift and downward shift in demand leisure result in a significantly lower reservation wage. This results in greater gains in producer surplus. In Figures 3 and 4, notice that the shaded areas labeled B and Y are identical in size. Further notice the growth in the area of Z relative to C. This implies that as the size of the decrease in decoupled payments grows, the potential cost of omitting fringe benefits grows as well. In Figure 4, notice the net welfare loss if excluding fringe benefits is W-X-Y. Including fringe benefits, however, it appears the X+Y+Z is approximately equal to W. Thus, even for larger declines in payments, the expected results are decidedly different when fringe benefits are excluded.

4. Empirical Model

The goal of the empirical model is to determine how including fringe benefits in the off-farm labor supply model impacts marginal effect of government payments. We choose to model the determinants of off-farm labor supply of the farm operator and spouse using a bivariate Tobit model rather than independent Tobit models. The decision to use joint modeling techniques was guided by the results of D'Antoni and Mishra (2011). This research used 2006-2008 ARMS data and copulas techniques to determine that the off-farm hours worked by the operator and spouse were dependent. A seemingly unrelated regression model can be adapted such that a Tobit model can be used rather than simple regression (Brown and Taylor, 2008). Specifically,

$$Y_1^* = X_i\beta_i + \delta_O I_O + \varepsilon_1 \qquad (8)$$

$$Y_1 = \begin{cases} Y_1^* & if \quad Y_1^* > 0 \\ 0 & Otherwise \end{cases} \qquad (9)$$

$$Y_2^* = X_k\beta_k + \delta_S I_S + \varepsilon_2 \qquad (10)$$

$$Y_2 = \begin{cases} Y_2^* & if \quad Y_2^* > 0 \\ 0 & Otherwise \end{cases} \tag{11}$$

Equations (8) and (10) represent off-farm labor supply equations for the operator and spouse. Y_1^* and Y_2^* are the untruncated latent variables allowing for theoretically negative values representing the hours worked off-farm by the operator and spouse, respectively. Y_1 and Y_2 are the left censored dependent variables for off-farm hours worked by the operator and spouse. Vectors of *i* and *k* explanatory variables (X_i and X_k) and parameters (β_i and β_k) are included in the model. We denote separately the explanatory variable and parameters for insurance coverage for the operator and spouse. The parameter value and explanatory variable for the operator is represented by δ_O and I_O. Similarly, the parameter value and explanatory variable for the spouse is denoted δ_S and I_S. The error terms are denoted ε_1 and ε_2. These disturbances are joint normally distributed with variances σ_1^2 and σ_2^2 where $\varepsilon_1, \varepsilon_2 \sim N(0, 0, \sigma_1^2, \sigma_2^2, \rho)$ and the covariance is given by $\sigma_{1,2} = \rho\sigma_1\sigma_2$.

The results from this model are not directly interpretable as the marginal effect of the independent variable on the dependent variable; therefore, we further calculate the marginal effects. According to Greene (2008) the marginal effects can be calculated in the same manner in a bivariate Tobit context as in a univariate model:

$$\frac{\partial E(Y)}{\partial X} = \Phi(X\beta/\sigma)\beta \tag{12}$$

where $\Phi(X\beta/\sigma)$ is the cumulative normal distribution function. Our explanatory variables I_O and I_S are dummy variables representing whether the operator or spouse obtains health insurance coverage from off-farm sources. We suspect that this variable is determined jointly with the number of off-farm hours worked.

We used the Smith-Blundell test to determine endogeneity because the structural model is Tobit (Baum, 1999). Under this test, the null hypothesis is that all variables are exogenous while the alternative hypothesis states that the health insurance coverage variable is expressed as a linear projection of a set of instruments. The residuals from this first stage regression are added to the model. If the null is not rejected, then these residuals have no explanatory power. But we find that, for both the operator and spouse equations, the null hypothesis is rejected. To address endogeneity of the health insurance coverage variable in our model, we use the predicted probability of health insurance coverage for the operator and spouse, modeling it jointly using bivariate probit. According to Greene (2008) and Ahearn, El-Osta, and Dewbre (2006):

$$y_1^* = \begin{cases} \beta_1' X_1 + \varepsilon_1 & if \;\; y_1 = 1 \\ 0 & if \;\; y_1 = 0 \end{cases} \tag{13}$$

$$y_2^* = \begin{cases} \beta_2' X_2 + \varepsilon_2 & if \;\; y_2 = 1 \\ 0 & if \;\; y_2 = 0 \end{cases} \tag{14}$$

$$E[\varepsilon_1 | X_1, X_2] = E[\varepsilon_2 | X_1, X_2] = 0 \tag{15}$$

$$var[\varepsilon_1 | X_1, X_2] = var[\varepsilon_2 | X_1, X_2] = 1 \tag{16}$$

$$E[\varepsilon_1, \varepsilon_2 | X_1, X_2] = \theta \tag{17}$$

where y_1 and y_2 are binary variables indicating health insurance coverage from off-farm work for the operator and spouse, X_1 and X_2 are vectors of exogenous variables, β_1 and β_2 are vectors of estimated parameters, ε_1 and ε_2 are error terms, and θ is the coefficient of correlation between the error terms.

When specifying the equations in the bivariate probit model, there must be at least one variable that is highly correlated with the dependent variable in equations (13) and (14) but uncorrelated with the dependent variables in (8) and (10). The exogenous instruments used in these equations are a variable indicating personal expenditure on personal insurance, health, and retirement benefits and a variable indicating expenditure on fringe benefits for hired workers. If fringe benefits are awarded to hired workers, we expect negative correlation with operator and spouse insurance coverage from off-farm work: intuitively, if a farmer pays for benefits to cover their workers, then they are more likely to cover themselves as well. Personal expenditure on insurance, health, and retirement benefits is indeterminate in sign. It can be argued that those expending personal funds on these benefits are less likely to be covered from other sources and therefore pay these expenses out of necessity. On the other hand, one could make the case that those who pay for these expenses out of pocket are more concerned about being fully insured and financially secure than those who don't; therefore, they seek out off-farm employment providing these benefits as well.

In addition to these exogenous instruments, we regress operator and spouse insurance coverage on variables like age, age squared, education, and household size. There was no evidence of weak instruments in this regression. The explanatory variables are all significant at 1% and a joint F-test for the operator and spouse equations was large and significant at 1%. We reject the null that all parameters are jointly equal to zero and conclude that at least one of our instruments in each equation is not weak.

From these results, we calculate the predicted probability of the operator having health insurance from off-farm sources holding the spouse's equation constant and vice versa. These predicted values will then be used in our structural model outlined by equations (23) through (26). These equations can be rewritten with the predicted values notated $\hat{I}_O$ and $\hat{I}_S$ as:

$$Y_1^* = X_i\beta_i + \delta_O\hat{I}_O + \varepsilon_1 \tag{33}$$

$$Y_1 = \begin{cases} Y_1^* & if \quad Y_1^* > 0 \\ 0 & Otherwise \end{cases} \tag{34}$$

$$Y_2^* = X_k\beta_k + \delta_S\hat{I}_S + \varepsilon_2 \tag{35}$$

$$Y_2 = \begin{cases} Y_2^* & if \quad Y_2^* > 0 \\ 0 & Otherwise \end{cases} \tag{36}$$

We will estimate a bivariate Tobit model will be estimated via maximum likelihood following two alternative specifications. Model 1 will include the predicted probability of health insurance coverage whereas Model 2 will not.

5. Data

This research utilizes Agricultural Resource Management Survey (ARMS) data from 2006 to 2008. The ARMS is conducted annually by the Economic Research Service and the National Agricultural Statistics Service (for more detail, see http://www.ers.usda.gov/Briefing/ARMS/). The survey collects data to measure the financial condition (farm income, expenses, assets, and debts) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households. The target population of the survey is operators associated with farm businesses representing agricultural production in the 48 contiguous states. Data is collected from one senior farm operator, the individual who makes most of the day-to-day management decisions.

We limited our study to farm households where either the farm operator or spouse is under the age of 65. This excludes all households that are fully covered by Medicare. We also exclude all households that did not respond to hours worked off-farm or reported hours per week worked on or off-farm greater than 140. This applies to farms that reported 140 hours worked at either location separately or additively. In other words, any operator or spouse responding that they on average sleep fewer than four hours per night is assumed to have incorrectly completed the survey and is dropped.

The list of variables, with summary statistics, used in our labor supply model can be found in Table 1. The dependent variables in the bivariate Tobit equations are the hours per week worked off-farm by the operator and spouse, respectively. For each equation, we include explanatory variables for age, age squared, education, household size, distance from the off-farm job, and whether they obtain health insurance from an off-farm source. The specific survey question asks respondents under the age of 65 whether they have insurance coverage from an off-farm job. Of the operators in our sample, 21% report that they are covered by an off-farm job. As expected, even more spouses (30%) reported that they received insurance coverage from an off-farm source. In addition to operator and spouse specific variables, we use farm size, decoupled and coupled government payments, total farm sales, and an indicator variable for dairy farms. Dairy farms were specified due to the labor-intensive nature of these farms. Location specific variables include an indicator for ERS Resource Region (Figure 5). The Mississippi Portal is used as the reference region in our study. Because we utilize a pooled sample, indicator variables for year are included. The reference year in this research is 2006.

The ARMS has a complex stratified, multiframe design where observations in the ARMS represent a number of similar farms when using the provided expansion factors. The expansion factors are most useful and recommended when the goal of the research is making generalizations about the population of farms or the full survey is used. The recommended procedure in this scenario is the delete-a-group jackknife procedure (Dubman 2000; National Research Council of the National Academies 2007). 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 replicate weights to subsamples of the ARMS data. Following El-Osta (2011), we employ a bootstrapping technique rather than the jackknife procedure to remedy the sample design problems associated with the subsample.

6. Results and Discussion

The results for both models of off-farm labor supply are found in Tables 2 (operator equations) and 3 (spouse equations). For both the operator and spouse, the predicted probability of insurance coverage from off-farm work was positive and significantly correlated with the number of hours worked off-farm. Similarly, the correlation of decoupled government payments was significantly negative against the number of hours worked off-farm by both the operator and spouse in the first model. Coupled payments were negative and significant only for the operator equation in the first model.

When the predicted probability of health insurance coverage is removed from the model, we find different marginal effects for both decoupled and coupled payments (Model 2, Table 2). In the case of the farm operator, the marginal effect for decoupled payments decreased from –0.11893 to –0.18544 when comparing the two models (Table 2). The marginal effect for coupled payments in the operator equations also falls from –0.00947 to –0.02392. We find similar results for the spouse (Table 3). With regards to decoupled payments, the marginal effect falls from –0.02135 in the first model to –0.03593 in the second model (Table 3). In the first model the marginal effect for coupled payments were not significantly different than zero but was –0.00433 in the second model.

These results lead us to reject the null hypothesis, which is that including fringe benefits in the off-farm labor supply model will have no effect on the marginal effect of government payments. We conclude instead that there is significant evidence that the marginal effect of government payments on hours worked off-farm will decrease in magnitude when accounting for fringe benefits. These results are consistent with the expectation drawn from theory. Recall that including fringe benefits in the full off-farm wage, the off-farm labor supply curve is more inelastic. In which case, a given decline in decoupled government payments will reduce the number of hours worked off-farm by a greater amount in models excluding fringe benefits (Model 2) than models including fringe benefits (Model 1). These results provide support for the notion that the welfare lost by farm households when decoupled payments are reduced may be overstated when models exclude fringe benefits from off-farm work.

We also find significant differences in the importance of demographic factors for the farm operator across specifications. When accounting for fringe benefits, we find that the age, education, and age squared are insignificant factors affecting off-farm work. Conversely, Model 2 in Table 1 shows these three demographic variables are significant at 1%. Interestingly, we find the size of the household to be positive and significant for the operator in the first model. When accounting for fringe benefits, it appears larger households may induce the operator to seek more stable income, such as working off-farm (Mishra and Goodwin 1997). When fringe benefits are excluded, the size of the household becomes insignificant. This further demonstrates that omission of this important variable can lead to significantly different conclusions about the factors affecting the off-farm labor supply of the farm operator.

The spouse equations as a whole appear less affected by the inclusion of government payments in empirical model. While we find many variables with parameter values of different magnitudes across specifications, the most curious change was associated with education. In Model 1, more highly educated spouses appear to work fewer hours on the farm. Model 2 indicates the exact opposite: the more highly educated the spouse, the more hours are worked on the farm. It is worth noting that the marginal effect for education in the first model, while negative and significant, is small.

We found distance to off-farm jobs to be an important factor in off-farm labor supply decisions. Across both models and specifications, we found the coefficient on miles from the off-farm job was positive and highly significant. If mileage traveled to off-farm work is considered a fixed cost to the employee, it follows that higher earnings would be expected to justify longer travel distances. Holding wages constant, the worker would be expected to work more off-farm hours in order to increase earnings. We also found that for dairies and larger farms, operators and spouses supplied fewer hours to off-farm work when compared to other farm types and sizes.

7. Summary and Conclusions

The purpose of this paper is to examine the link between government payments and fringe benefits in models of off-farm labor supply. Prior literature has largely omitted these considerations when addressing the impact of government payments on labor allocation of the farm household. Using farm-level data from three Agricultural Resource Management Surveys, results from this study show that, if fringe benefits are accounted for, a decline in decoupled government payments will more modestly reduce the number of hours worked off-farm. In fact, our research makes plausible the scenario that if decoupled payments are reduced, farm operators and spouses may work more off farm to maximize total household income. These results support the idea that welfare loss from reductions in decoupled payments may be overstated by models which exclude fringe benefits from off-farm work.

This research is important due to the looming budget deficits and the possibility of a reduction in decoupled government payments; as outlined in Farm Bill debates, farm families may be facing a different economic environment in years to come. With the need for reduced government budgets in coming decades, it is important that we formulate policy that minimizes impact on its dependents while accomplishing policy objectives. For example, consider a policymaker that is faced with the decision to cut funding either for decoupled payments or crop insurance. In light of the findings from this research, the existing literature may overstate the welfare lost by the farm household. Without this new information, the policymaker may believe a greater level of harm may be done through the reduction of decoupled payments and thereby choose to reduce funding for crop insurance, although the opposite is true.

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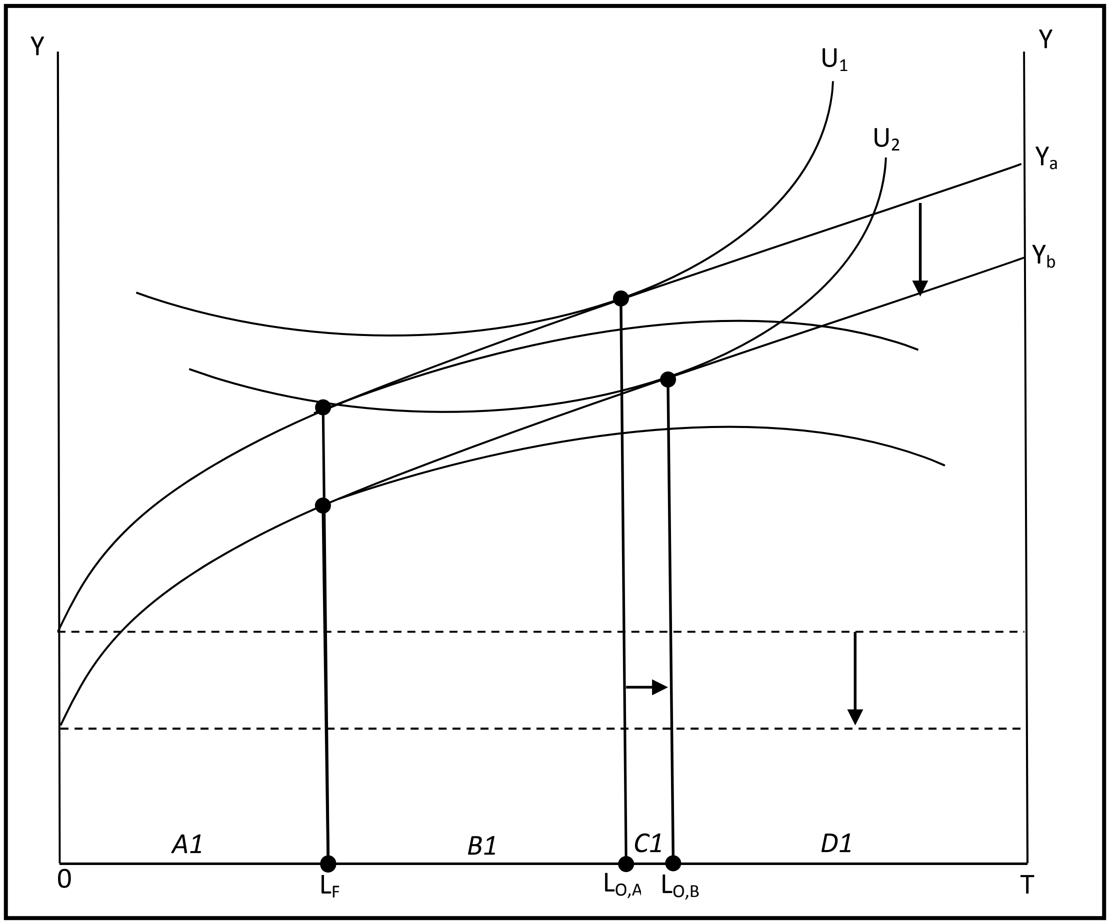
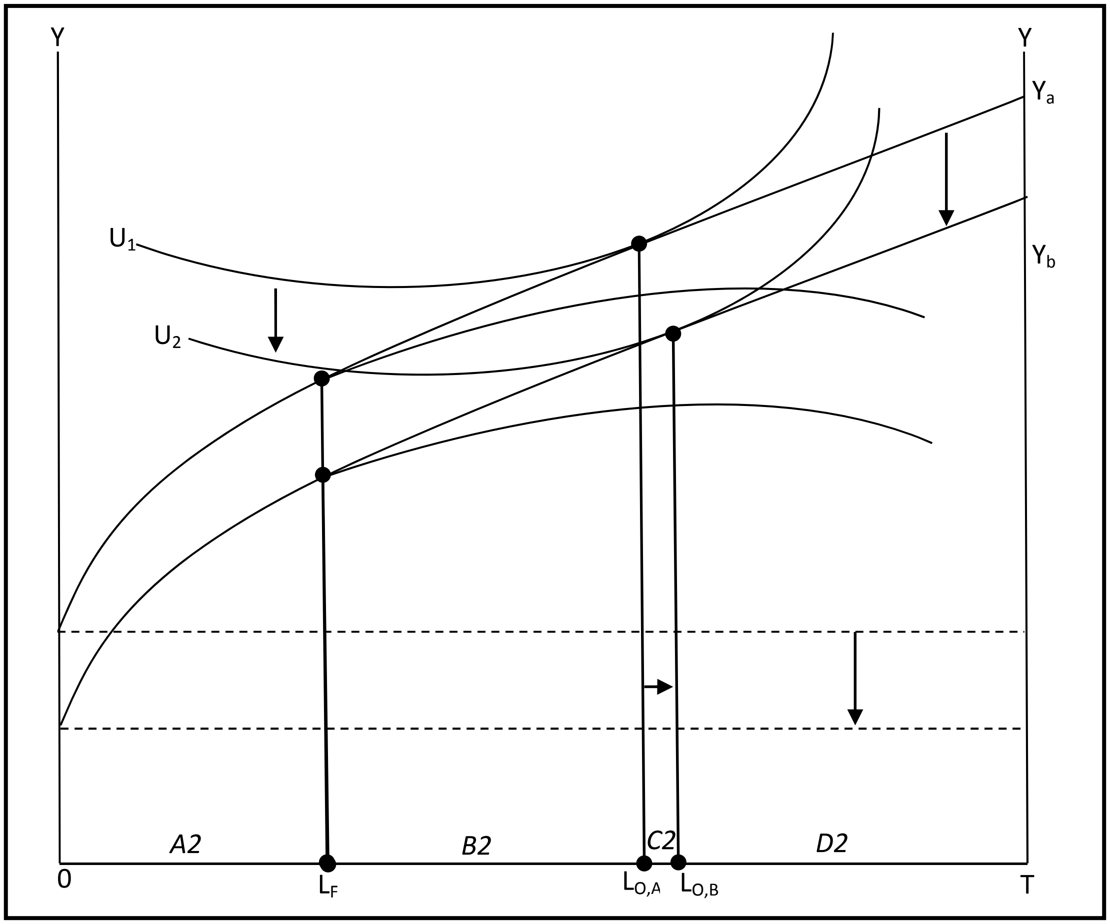
Figure 1: Labor leisure model representing decreased decoupled government payments—without fringe benefits



Source: Adapted from Dewbre and Mishra (2007).

Figure 2: Labor leisure model representing decreased decoupled government payments—with fringe benefits



Source: Adapted from Dewbre and Mishra (2007).

Figure 3: Effect of a small decrease in decoupled government payments—with fringe benefits—on farm labor, leisure and off-farm labor hours

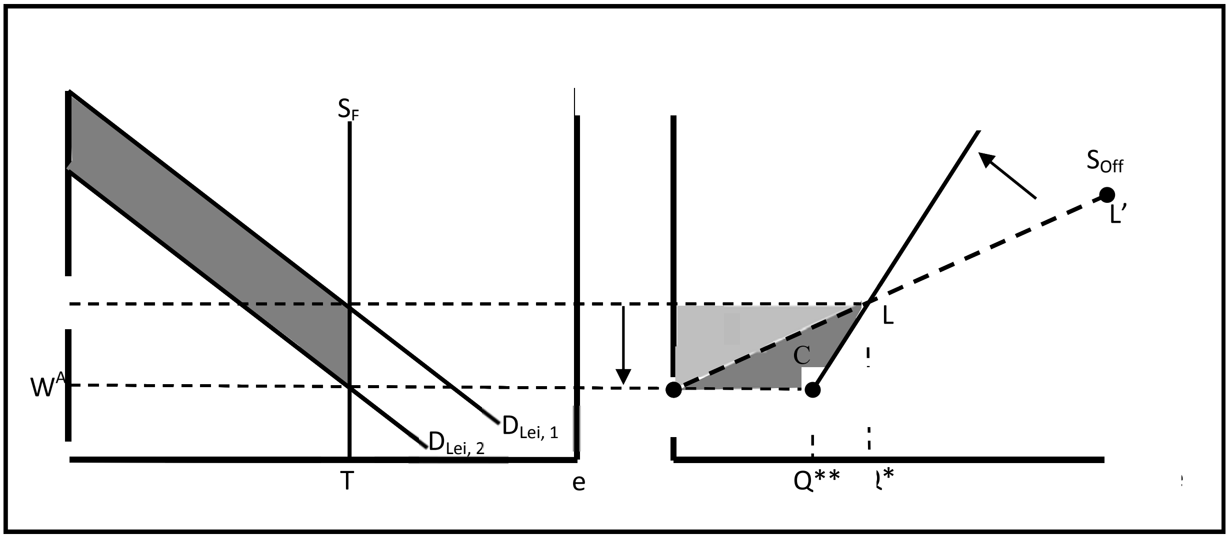


Figure 4: Effect of a large decrease in decoupled government payments—with fringe benefits—on farm labor, leisure, and off-farm labor hours

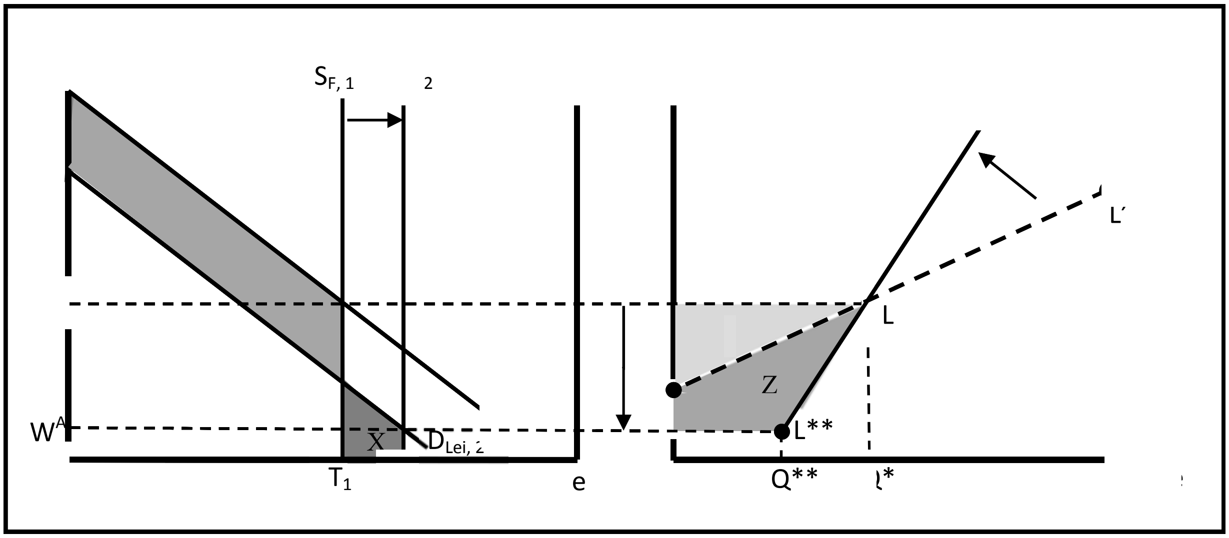
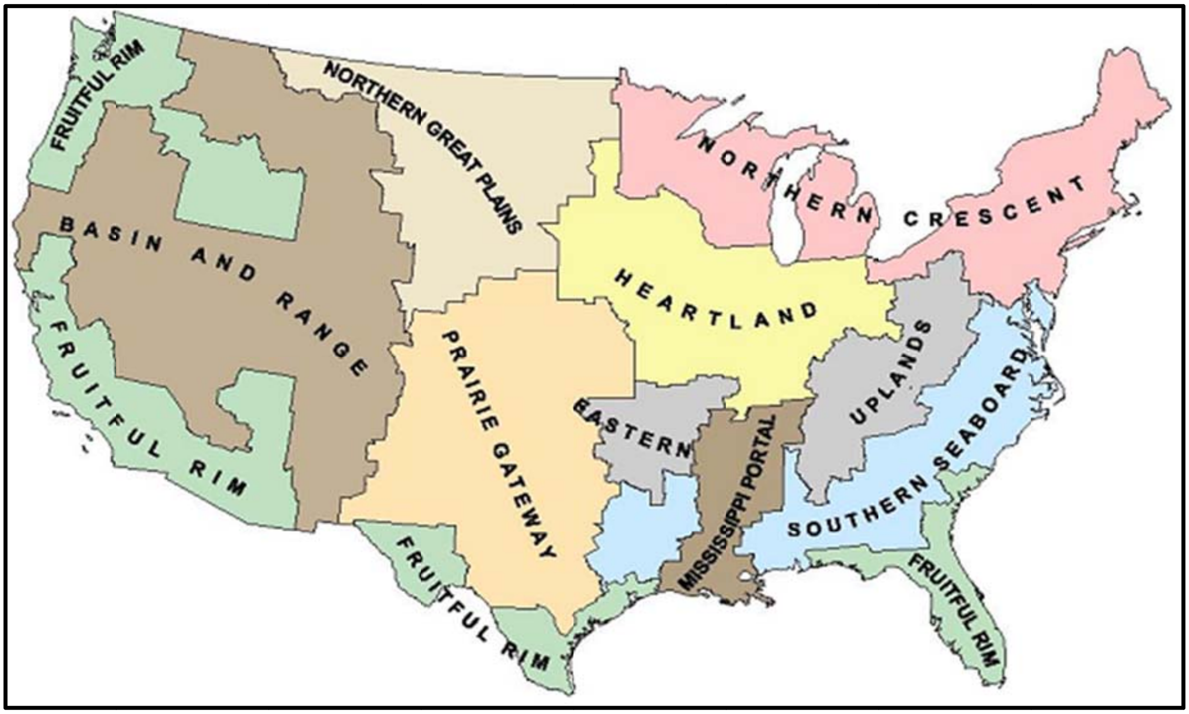


Figure 5: Economic Research Service (ERS) Farm Resource Regions



Source: Adapted from http://www.ers.usda.gov/publications/aib760/aib-760.pdf

Table 1: Summary Statistics and Variables used in the Study

Variables	Description	Mean	Std. Dev.
Operator off-farm hours	Off-Farm hours per week	13.99	(20.14)
Spouse off-farm hours	Off-Farm hours per week	22.58	(19.59)
Operator age	Operator age, years	51.74	(9.61)
Spouse age	Spouse age, years	49.34	(9.15)
Operator educational attainment	Years of education	13.62	(1.85)
Spouse educational attainment	Years of education	13.94	(1.91)
Operator Miles	Miles to off-farm job	5.79	(29.64)
Spouse Miles	Miles to off-farm job	9.96	(97.84)
Operator Health Insurance	=1 if the operator has health insurance coverage through off-farm work; 0 otherwise	0.21	(0.41)
Spouse Health Insurance	=1 if the spouse has health insurance coverage through off-farm work; 0 otherwise	0.30	(0.46)
Decoupled Government Payments	Annual payments ($1,000)	9.87	(24.33)
Coupled Government Payments	Annual payments ($1,000)	10.81	(36.23)
Farm Sales	Total value of farm sales ($1,000)	370.42	(2423.67)
Household size	Number of members residing in the household	3.17	(1.43)
Dairy	=1 if the farm specializes in dairy farming; 0 otherwise	0.12	(0.32)
Heartland Region	=1 if farm located in the Heartland region; 0 otherwise	0.17	(0.38)
Northern Crescent Region	=1 if farm located in the Northern Crescent region; 0 otherwise	0.16	(0.37)
Northern Great Plains Region	=1 if farm located in the Northern Great Plains region; 0 otherwise	0.06	(0.24)
Prairie Gateway Region	=1 if farm located in the Prairie Gateway region; 0 otherwise	0.11	(0.31)
Eastern Upland Region	=1 if farm located in the Easter Upland region; 0 otherwise	0.10	(0.30)
Southern Seaboard Region	=1 if farm located in the Southern Seaboard region; 0 otherwise	0.14	(0.34)
Fruitful Rim Region	=1 if farm located in the Fruitful Rim region; 0 otherwise	0.16	(0.37)
Basin and Range Region	=1 if farm located in the Basin and Range region; 0 otherwise	0.05	(0.22)
Mississippi Portal Region	=1 if farm located in the Mississippi Portal region; 0 otherwise	0.05	(0.22)
y2006	=1 if data from year 2006; 0 otherwise	0.35	(0.48)
y2007	=1 if data from year 2007; 0 otherwise	0.34	(0.47)
y2008	=1 if data from year 2008; 0 otherwise	0.32	(0.47)

Source: Agricultural Resource Management Survey (ARMS), 2006, 2007, and 2008

Table 2: Results of Bivariate Tobit Model, off-farm hours worked by farm operator

	Model 1		Model 2	
Variable	Parameter (Std. Error)	Marginal Effect	Parameter (Std. Error)	Marginal Effect
Operator Age	-0.06403 (0.32179)	-8.28908E-10	1.58146*** (0.34012)	1.58146
Operator Education	-0.09658 (0.21655)	-2.51164E-08	1.57994*** (0.22283)	1.57994
Operator Miles from Work	0.19929*** (0.01074)	0.12905	0.23506*** (0.01146)	0.15222
Operator Age Squared	-0.00278 (0.00324)	0.00000	-0.02228*** (0.00341)	0.00000
Operator Health Insurance coverage (*predicted*)	103.27710*** (3.25183)	99.27283		
Decoupled Payments	**-0.40896*** (0.02813)**	**-0.11893**	**-0.63880*** (0.02999)**	**-0.18544**
Coupled Payments	**-0.03335** (0.01540)**	**-0.00947**	**-0.08677*** (0.01700)**	**-0.02392**
Farm Sales	-0.00105** (0.00043)	-0.00024	-0.00308*** (0.00051)	-0.00070
Household Size	0.94721*** (0.31910)	0.92350	-0.08316 (0.33845)	-0.02038
Dairy Farm	-28.55481*** (1.73086)	-12.59553	-37.64139*** (1.83704)	-16.60362
Heartland Region[a]	-0.02042 (2.03440)	-0.01019	2.81062 (2.15887)	1.60253
North Crescent Region	3.02686 (2.09719)	1.71908	3.30791 (2.22396)	1.88187
Northern Great Plains Region	-1.69206 (2.41387)	-0.82008	-0.68095 (2.56393)	-0.33624
Prairie Gateway Region	3.46977 (2.14930)	1.90063	5.94399*** (2.28166)	3.28683
Eastern Upland Region	1.77119 (2.15195)	0.93879	5.27537** (2.28608)	2.90080
Southern Seaboard Region	-5.18266*** (2.10227)	-2.24317	-4.57771** (2.23008)	-1.98957
Fruitful Rim Region	1.13464 (2.08994)	0.60446	-2.93029 (2.21260)	-1.27588
Basin and Range Region	-1.21952 (2.49426)	-0.59777	-0.73387 (2.64082)	-0.36273
Year 2007[b]	-2.29581** (0.94453)	-0.76899	-3.78333*** (1.00315)	-1.25778
Year 2008	-3.22765*** (0.95442)	-1.10318	-2.84013*** (1.01458)	-0.97271

* p < 0.10, ** p < 0.05, *** p < 0.01

[a] Mississippi Portal region is the base region.

[b] Year 2006 is the base year.

Table 3: Results of Bivariate Tobit Model off-farm hours worked by spouse

	Model 1		Model 2	
Variable	**Parameter (Std. Error)**	**Marginal Effect**	**Parameter (Std. Error)**	**Marginal Effect**
Spouse Age	0.87197*** (0.25702)	0.86876	2.67027*** (0.24638)	2.66043
Spouse Education	-0.61038** (0.24770)	-0.00069	3.41133*** (0.14891)	3.40747
Spouse Miles from Work	0.02134*** (0.00245)	0.01654	0.02297*** (0.00249)	0.01780
Spouse Age Squared	-0.01130*** (0.00279)	-4.1635E-05	-0.03306*** (0.00263)	-0.00012
Spouse Health Insurance coverage (*predicted*)	85.55800*** (4.33492)	82.94191		
Decoupled Payments	**-0.07274*** (0.01339)**	**-0.02135**	**-0.12311*** (0.01358)**	**-0.03593**
Coupled Payments	**-0.00333 (0.00828)**	**-0.00107**	**-0.01512* (0.00850)**	**-0.00433**
Farm Sales	-0.00123*** (0.00025)	-0.00028	-0.00182*** (0.00026)	-0.00041
Household Size	-0.52949** (0.24291)	-0.01326	-2.40229*** (0.22982)	-0.06014
Dairy Farm	-6.92280*** (0.97772)	-3.05365	-9.44936*** (0.99191)	-4.16811
Heartland Region[a]	0.62530 (1.33851)	0.33220	1.86157 (1.36462)	1.06472
North Crescent Region	-2.20824 (1.39470)	-0.94782	-2.00191 (1.42286)	-0.86662
Northern Great Plains Region	-1.66305 (1.59297)	-0.79680	-1.32139 (1.62557)	-0.63780
Prairie Gateway Region	-2.12222 (1.42750)	-0.96321	-1.19505 (1.45573)	-0.55994
Eastern Upland Region	-3.02233** (1.45899)	-1.36309	-1.64029 (1.48701)	-0.75914
Southern Seaboard Region	-2.15411 (1.38951)	-0.94810	-1.75963 (1.41745)	-0.78567
Fruitful Rim Region	-5.11490*** (1.38746)	-2.15200	-6.78629*** (1.41307)	-2.85508
Basin and Range Region	-3.50495** (1.67209)	-1.66394	-3.52727** (1.70563)	-1.67477
Year 2007[b]	-1.28410** (0.64363)	-0.43677	-1.79507*** (0.65622)	-0.59860
Year 2008	-0.57821 (0.65416)	-0.23205	-0.27658 (0.66733)	-0.12421

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[a] Mississippi Portal region is the base region.

[b] Year 2006 is the base year.