AN ANALYSIS OF TAX-DEFERRED RETIREMENT SAVINGS OF FARM HOUSEHOLDS

Ashok K. Mishra

&

Mitchell J. Morehart∗

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∗ The authors are economist and Senior Economist, Economic Research Service, U.S. Department of Agriculture, Washington D.C, respectively. The views expressed here are not necessarily those of the Economic Research Service or the U.S. Department of Agriculture.

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Abstract

The retiring farmer generally tries to balance the desire to keep the farm intact as a going concern with the need for a secure assets portfolio to finance retirement. This problem becomes more complex in situations where younger family members choose not to be active in the farm business. Tax-deferred savings are potentially an important component of a retirement plan and could represent a very substantial increase in tax-free assets for many individuals. This study examines the tax deferred retirement savings of farm households. The model is estimated using Agricultural Resource Management Survey (ARMS) 1999 farm-level national data and the Double-Hurdle estimation method. Results indicate that farm household's source of income, age of the farm operator, marginal tax rate, regional location, and participation in government programs are factors that significantly affect investment in tax-deferred savings.

Keywords: Double-Hurdle, farm households, marginal tax, retirement savings, tax-deferred

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The retiring farmer generally tries to balance the desire to keep the farm intact as a going concern with the need for a secure source asset portfolio to finance retirement. This problem becomes more complex when younger family members choose not to be active in the farm business. Consequently, failure to plan carefully for retirement and the ultimate transfer of the estate can result in serious problems such as financial insecurity, personal and family dissatisfaction, and needless capital losses. Further, Frey points out that many farmers do little formal planning or investing specifically for retirement. The amount of wealth at stake is substantial for most farm families. In 2001, farm households had average net worth of $545,869, compared with $395,500 for non-farm households (Mishra et al.)

To encourage employees or individuals not covered by private pension plans to save for retirement, as is the case for farmers, individual retirement accounts (IRA) were established by Congress in 1974 as part of the Employee Retirement Income Security Act. Emphasizing the need to enhance economic well-being of future retirees and the need to increase national savings, the Economic Recovery Tax Act of 1981 extended the availability of IRAs to all employees (including the self-employed) and raised the contribution limit. Tax-deferred savings are potentially an important component of a retirement portfolio and could represent a very substantial increase in tax-free assets for many individuals. Over the years, several retirement savings plans for self-employed individuals have been established, to better serve small businesses, including farms. These plans include 401 (k), Keogh accounts, savings incentive match plans for employees for small employers (SIMPLE), and simplified employee pension (SEP). However, in recent years chronically low levels of U.S. private and public savings have generated considerable concern among academics and policymakers. Despite the retirement program's

size and potential significance, surprisingly little is known about the determinants of tax-deferred retirement savings of farm households. Thus the goal of this analysis is to analyze the effect of farm, operator, household, and other demographic characteristics on the participation of farm households in tax-deferred retirement savings. The study is conducted at the farm level nationwide with the unique feature of a larger sample than previously reported, comprising farms of different economic sizes and in different regions of the United States.

Background

The United States population is aging. By 2030 it is expected that one out of every five Americans will be 65 or older. If tomorrow's retirees are like past retirees they will want a comfortable lifestyle in retirement. However, given the rising cost of living, increased health care costs, possible changes in Social Security, and a declining individual saving rate, they may be forced to accept a decreased standard of living in their retirement years. To avoid this, it is important for individuals to develop realistic investment plans that help meet their retirement goals. This is especially important for self-employed people such as farmers and ranchers. A major challenge for the self-employed is that they must initiate their own retirement plans. Retirement plans and retirement savings can benefit the farm family and other employees of the farm. Yet, the perception of retirement is quite different for farmers and ranchers compared to all other households.

Farm families, like many other families in America, have a diversified portfolio. Farm families hold both farm and nonfarm assets. The 1999 ARMS survey queried farm operators on off-farm assets, such as savings, retirement accounts, stocks, and other investments. In general, off-farm assets comprised 31 percent ($198,219) of total farm household assets, with $50,633 invested in tax-deferred retirement

accounts (TDRA). TDRAs contributed approximately 26 percent to total off-farm assets, second only to other investments (i.e., houses and property off the farm).

Ownership of tax-deferred retirement accounts (TDRA) increases with both income and net worth. Ownership is also more likely among families headed by persons less than 65 years of age. The inverse relationship between age and ownership of TDRAs occurs for several reasons. First, even though retirement accounts have been in existence for about twenty years, they may not have become common until relatively late in the careers of people in the over 65 age group. Second, once a person reaches age 59½, funds in retirement accounts may be withdrawn without penalty, and some in the over 65 group may have already done so. Third, families may have used funds from retirement accounts accumulated from previous employment to purchase an annuity at retirement.

A comparison of TDRA savings of farm households, using 1999 ARMS data, with self-employed non-farm families (using 2001 data from the Survey of Consumer Finances, SCF) shows that the median value of TDRAs of farm families ($12,500) is greater than TDRA savings of self-employed non-farm families ($9,300). The median value of TDRA savings of farm households and self-employed non-farm households are substantially larger than the median TDRA savings of all non-farm families ($300). The TDRA savings pattern for farm households is different in terms of income class, age of the farm operator, net worth, and income from business. Table 1 shows that a majority of farm households earning $25,000 or more have TDRA savings. However, TDRA savings in the case of the self-employed non-farm family starts with annual earnings of $50,000 or more. An interesting point here is that farm households with income of $100,000 or more have less in TDRAs, half as much, as self-employed non-farm households. Net worth is another factor that influences the saving behavior of

individuals. Table 1 shows that the median value of TDRA holdings increases with household net worth. For example, the top 10 percent of farm households in terms of net worth have median TDRA holdings of $45,000, which is well below that ($275,000) of the self-employed non-farm families and also that of all non-farm families ($125,000). The median TDRA savings by business income class provides quite a contrast, but it again emphasizes the point that large farms, where the majority of income is coming from farming, save less in TDRAs than their counterpart (self-employed) non-farm families. For example, non-farm businesses earning $500,000 or more have TDRA holdings four times larger ($110,000) than farm businesses in the same group ($27,063). An important result that emerges from Table 1 is that farm households under a certain income threshold are saving more than their non-farm counterpart, self-employed and all other non-farm households.

Estimation Procedures

The effects of farm, operator, financial and household characteristics on TDRA savings are examined using cross-section survey data, which is not possible with aggregate time series data. The problem with cross-section survey data is that estimation procedures are complicated due to the existence of zero observations on the dependent variable (Cragg; Blisard and Blaylock). The Tobit model is a widely used traditional method for limited dependent variables that is very restrictive because it assumes that all zero observations represent standard corner solutions in the sense that positive savings would occur if some variables changed. This assumption may not be true in cases where some of the zeros result from 'non participation' decisions rather than corner solutions (Cragg; Jone; Blisard and

Blaylock). The most frequently applied model to deal with this problem is the Double-Hurdle model. This model was originally formulated by Cragg and builds on the foundations set by Tobin, who was the first to recognize the need for an alternative way to model a censored distribution of this kind.

The underlying assumption of the Double-Hurdle model is that farm households make two decisions with respect to a product (in this study participation in TDRAs) in an effort to maximize their utility; whether to participate in TDRAs (participation decision), and how much to save. This process is determined by the same set of independent variables (Cragg). Therefore, in order to observe a positive level of TDRA savings two separate hurdles must be passed. Two separate latent variables are used to model each decision process with a Probit determining participation and a Tobit determining the saving level (Blundell and Meghir).

$$y_{i1}^{*} = w_i'\alpha + \nu_i \qquad \text{Participation decision}$$

$$y_{i2}^{*} = x_i'\beta + \mu_i \qquad \text{Saving decision} \qquad (1)$$

The model:

$$\begin{aligned} y_i &= x_i'\beta + \mu_i \qquad if\ y_{i1}^{*} > 0\ and\ y_{i2}^{*} > 0 \\ y_i &= 0 \qquad\qquad otherwise \end{aligned} \qquad (2)$$

where y_{i1}^{*} is a latent variable describing the household's decision to participate in TDRA savings; y_{i2}^{*} is the observed level of farm household TDRA savings; w_i is a vector of explanatory variables accounting for the participation decision; x_i is a vector of explanatory variables accounting for the TDRA savings decision, and ν_i, and μ_i are respective error terms assumed to be independent and distributed as $\nu_i \sim N\left(0, \sigma^2\right)$ and $\mu_i \sim N\left(0, \sigma^2\right)$. The model assumes that both participation and savings

equations are linear in their parameters α and β. The Double-Hurdle model is estimated by maximizing the following equation[1].

$$L(\beta,\alpha,\sigma^2)=\prod_{0}\left[1-F(w'\alpha)F\left(\frac{x'\beta}{\sigma}\right)\right]\prod_{1}\left[F(w'\alpha)\sigma^{-1}f\left(\frac{y-x'\beta}{\sigma}\right)\right] \qquad (3)$$

where *F(.)* and *f(.)* are the standard normal cumulative and density functions, respectively, and σ is the standard error.

Data

Data for the analysis are from the 1999 Agricultural Resources Management Survey (ARMS). ARMS is conducted annually by the Economic Research Service and the National Agricultural Statistics Service. 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. A farm is defined as an establishment that sold or normally would have sold at least $1,000 of agricultural products during the year. Farms can be organized as proprietorships, partnerships, family corporations, nonfamily corporations, or cooperatives. Data are collected from one operator per farm, the senior farm operator. A senior farm operator is the operator who makes most of the day-to-day management decisions. For the purpose of this study, operator households organized as nonfamily corporations or cooperatives and farms run by hired managers were excluded.

[1] If the restriction $F(w_i'\alpha)=1$ is imposed, the likelihood equation for the Double-Hurdle model reduces to that of the Tobit model.

The 1999 ARMS survey collected information on farm households in addition to farm economic data collected through the regular survey. It contains detailed information on off-farm hours worked by spouses and farm operators, the amount of income received from off-farm work, net cash income from operating another farm/ranch, net cash income from operating another business, and net income from share renting. Furthermore, income received from other sources, such as disability, social security, and unemployment payments, and gross income from interest and dividends is also counted.

In addition, the 1999 ARMS survey queried farmers on different types of financial, production, and investment assets including various retirement and saving accounts (IRA, 401K, Keogh and other retirement accounts). Farmers were queried, first about their participation in tax-deferred savings accounts and subsequently on the amount of savings in these accounts. Summary statistics for each of the variables utilized in the analysis are presented in Table 2.

Since the tax rate for each individual was not available, we have assumed that households earning less that $30,000 do not pay any federal, state and local income taxes; households with gross income between $30,000 and $60,000 pay 15% in taxes; households earning between $60,000 and $200,000 pay 25% in taxes; and households earning $200,000 or more pay 40% in taxes. Income of the household includes farm earnings, off-farm work (in the form of wages and salaries, and income from off-farm businesses), interest and dividends, social security and public assistance, and other off-farm sources of income minus taxes (Hoppe). The determinants of TDRA participation and savings level are assumed to be the same in this analysis because it is generally difficult to rationalize why one variable should affect participation but not the TDRA savings level or vice-versa (Blaylock and Blisard).

Results

Estimated parameters for the Double-Hurdle model are reported in Table 3. Significance tests show that a large proportion of the estimated parameters are significantly different from zero at the 0.05 or higher level of significance. The Double-Hurdle estimates indicate that some independent variables have significantly different impacts on the participation and TDRA savings level decisions. The coefficient on OP_EDUC (operator's level of education) is positive in both equations, but statistically significant only in the TDRA savings level decision. This suggests that education may not play an important role in whether to participate in a TDRA, but once the decision to participate has been made then the level of education matters. This is plausible as one would need to know the type of account where the investment is made (for example IRA, 401k, or Keogh plan). Choosing among these plans require knowledge (such as knowing the features of the account and how they may best serve a household) and research time, which is directly correlated with one's educational attainment.

Consistent with economic theory, the coefficient on OP_AGE is positive and statistically significant at the 1 percent level of significance. This indicates that the likelihood of participation and the amount to invest in a TDRA increase with age of the farm operator. This is consistent with the finding of Hill who finds a positive relationship between farmers' age and wealth (farm wealth). Our results are also consistent with the findings of Venti and Wise. However, age related investment reaches a peak and then disinvestment starts. This is evident by a negative coefficient on OP_AGESQ. The results conform to the life-cycle hypothesis, in that at the early stages of their working life farmers save for retirement and in the later stages they disinvest for consumption.

Farm households are different than other self-employed non-farm households and in particular from all other non-farm households in terms of their employment (Hallberg et al.). Farm households typically have dual employment, farm and non-farm. They have multiple sources of income. Farm households earn income from farming, off-farm wages and salaries, off-farm businesses, farm rental payments, interest and dividends, and, other off-farm sources (see Mishra et al.). Therefore, to study the impact of income on participation and TDRA savings decisions we have separated farm household income into two components, farm (NET_CASH) and off-farm (OF_WAGE). The coefficient on OF_WAGE is positive and statistically significant in both equations. Results indicate that farm households with off-farm income in the form of wages and salaries are more likely to invest in TDRAs and once the farm household decides to invest the amount of investment is also positively correlated with OF_WAGE. One interpretation is that many off-farm jobs, particularly wage and salaried jobs, have fringe benefits associated with them. The option to investment in TDRAs is attractive for the household as it decreases taxable income and provides a source of income in retirement. Our results are consistent with Collins and Wyckoff, who studied tax-favored retirement savings behavior of non-self-employed households.

On the other hand, the coefficient on NET_CASH is negative and statistically significant in the participation model. Farm households receiving the majority of their income from farming, as many large and very large farms do, are less likely to participate in TDRAs. It is plausible that farm operators of large commercial farms view their farm as a primary source of retirement income. They are also much more likely to be full-time farmers. The coefficient on GOVT_PMT is negative and statistically significant only in the participation equation. Results show that farm households that received government payments are less likely to participate in tax-deferred retirement savings. One reason could

be that these households expect government payments to continue even when they retire (for example, conservation reserve payments). Additionally, most program participants tend to operate large farms and work as full-time farmers.

One of the reasons to contribute to TDRAs is to reduce the household's tax burden. Previous literature (Venti and Wise; O'Neil and Thompson; Hubbard; Becker and Fullerton; Collins and Wyckoff) identifies the marginal tax rate (individual or ad hoc basis) as a factor to explain the likelihood of participation in an IRA or tax-favored retirement savings. Since the marginal tax rates for farm households are not available we use constructed ad hoc marginal tax rates, as described in the data section, in the analysis. As expected, the coefficient on MG_TAX is positive and statistically significant in both equations (participation and TDRA savings) at the 1 percent level of significance. Results indicate that participation in a TDRA and the amount saved in a TDRA increase with the marginal tax rate. The associated marginal effect shows that a one percent increase in MG_TAX increases the likelihood of participating in a TDRA by 0.50 percent. Findings here support the argument that those able to obtain a larger tax benefit are more likely to participate in the TDRA. Our findings are consistent with the findings of Venti and Wise and Collins and Wyckoff. Collins and Wyckoff found the marginal tax rate elasticity of contribution to an IRA to be 0.24. In their study of factors affecting the likelihood of individuals to participate in an IRA over four different years (1979, 1980, 1981 and 1982), O'Neil and Thompson found the marginal tax rate elasticity of contribution to an IRA ranging from 1.0447 to 0.466. Additionally our results are consistent with Becker and Fullerton and Sinai, Lin, and Robins.

Previous studies in economics have found significantly different patterns of participation among geographic regions (see International Foundation Information Center). A geographic location was included by dividing the 48 states into four distinct census regions (Northeast, South, Midwest, and West). Our regional delineation is similar to that of Collins and Wyckoff. The coefficients on R-NEAST and R_WEST are positive and statistically significant. Results indicate that farms located in the Northeast and West regions are more likely to participate in TDRAs than farms located in the Southern Region (base group). It is likely that the region variables represent the effects of omitted variables that are correlated with regional location (e.g., the intensity of TDRA advertising by financial institutions) of farm households. Our results confirm previous findings by O'Neil and Thompson; Collins and Wyckoff.

Summary and Conclusions

Farms families, like many other families in America, have diversified portfolios. Farm families hold both farm and nonfarm assets. Failure to plan carefully for retirement and ultimate transfer of the estate can result in serious problems such as financial insecurity, personal and family dissatisfaction, and needless capital losses. This study examined the effect of operator, source of income, and other demographic characteristics on the tax-deferred retirement savings of farm households using farm level data. The Double-Hurdle estimates indicate that some independent variables have significantly different impacts on the decision about whether to save in TDRAs and how much to save.

Results from this study indicate that age of the operator, off-farm income, farm earnings, marginal tax rate, participation in government programs, and regional location of the farm household are important determinants in the TDRA participation decision. However, educational level, age of the operator,

marginal tax rate, and off-farm income are important factors that determine the level of TDRA savings. Additionally, our results confirm the life cycle hypothesis: farmers seem to accumulate wealth (in this case retirement savings) as they age and disinvest after achieving a specific age. The contribution of this study is important in three ways. First, this is the first study that has investigated the tax-deferred retirement savings behavior of farm households. Second, it uses national farm level data encompassing various regions of the U.S. Third, the estimation is more robust than simple logit analysis of participation in TDRA as it uses more information and a better procedure (Double-Hurdle) to estimate the underlying empirical model. While this study has some important contributions, there remain some unresolved issues. For example, the study uses estimated (or ad hoc) marginal tax rates. Ideally one would want to use the reported marginal tax rates. Given the large discrepancies observed between farm and non-farm household TDRA savings, it may also be useful to extend the model to non-farm households to determine how the motivating factors compare.

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Table 1: Tax-deferred retirement savings of farm, self-employed, and all non-farm families, by selected characteristics

Family characteristics	Retirement savings of Farm families	Retirement savings of self-employed non-farm families	Retirement savings of all non-farm families
	Median value of holdings (*dollars*)		
All families	12,500	9,300	300
Income (current dollars)			
Less than 10,000	2,359	0	0
10,000-24,999	0	0	0
25,000-49,999	12,500	0	0
50,000-99,999	27,500	18,000	17,100
100,000 or more	55,000	109,000	80,000
Age of head (farm operator) years			
Less than 35	2,359	0	0
35-44	11,218	2,800	5,000
45-54	22,500	26,000	8,400
55-64	27,063	24,000	3,400
65 and older	4,500	16,500	0
Percentiles of net worth			
Less than 25*	0	0	0
25-49.9	17,500	500	0
50-74.9	25,144	30,700	6,000
75-89.9	32,500	136,250	42,000
90-100	45,000	275,000	125,000
Sales Class			
Less than $250,000	0	1,800	NA
$250,000-$500,000	21,821	15,000	NA
Over $500,000	27,063	110,000	NA

Source: Farm families' data from the 1999 Agricultural Resource Management Survey (ARMS) and Nonfarm families' data from the 2001 Survey of Consumer Finances (SCF).

* This represents the lowest quartile of farm households based on the value of their net worth.

Table 2: Variable definitions and Summary Statistics

Variable name	Description	Mean (Std. Dev)
OP_EDUC	Education level of farm operator	13.0 (26.87)
OP_AGE	Age of the farm operator (years)	54.65 (203.61)
HH_SIZE	Size of farm operator household	2.76 (21.03)
OF_WAGE	Income from off-farm jobs with wages and salaries *($0,000)*	3.40 (89.72)
MG_TAX	Marginal tax rate	0.189 (1.99)
NET_CASH	Net cash income from farming *($0,000)*	1.539 (166.43)
GOVT_PMT	=1 if the farm household received government payments, 0 otherwise	0.41 (7.411)
R_NEAST	=1 if the farm is located in the Northeast region of the U.S., 0 otherwise	0.07 (3.64)
R_MWEST	=1 if the farm is located in the Midwest region of the U.S., 0 otherwise	0.38 (7.31)
R_WEST	=1 if the farm is located in the West region of the U.S., 0 otherwise	0.43 (7.44)
R_SOUTH	=1 if the farm is located in the South region of the U.S., 0 otherwise	0.13 (5.05)

Table 3: Estimated Parameters of the Double-Hurdle Model

Variable name	Double-Hurdle Model			
	Probit coefficient	Marginal effect	TDRA investment	Marginal effect
Intercept	-2.190*** (0.228)		-3.835*** (0.206)	
OP_EDUC	0.083 (0.073)	0.031	0.0718** (0.007)	0.062
OP_AGE	0.045*** (0.007)	0.017	0.070*** (0.0060)	0.039
OP_AGESQ	-0.0004** (0.0002)	-0.0001	-0.0006** (0.0000)	-0.0003
HH_SIZE	0.006 (0.011)	0.002	0.007 (0.061)	0.012
OF_WAGE	0.007** (0.003)	0.003	0.017** (0.009)	0.010
MG_TAX	1.349*** (0.125)	0.500	1.543*** (0.101)	0.766
NET_CASH	-0.0005*** (0.0001)	-0.002	-0.0003 (0.0004)	-0.001
GOVT_PMT	-0.063** (0.023)	-0.024	0.040 (0.027)	0.022
R_NEAST	0.157*** (0.058)	0.057	0.151** (0.042)	0.021
R_MWEST	0.272 (0.117)	0.096	0.039 (0.051)	0.081
R_WEST	0.107** (0.037)	0.039	0.007 (0.032)	0.004
σ			99.8**	
-Log L	5531		1172	
Correct prediction	64%			

Numbers in parenthesis are the standard errors. Single, Double and Triple asterisks indicate statistical significance at 10, 5, and 1 percent level.