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PRECAUTIONARY WEALTH AND INCOME UNCERTAINTY: A HOUSEHOLD-LEVEL ANALYSIS

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This study investigates the presence of precautionary savings among self-employed farm households using an instrumental variable approach on farm-level data. Results indicate that precautionary saving is a powerful determinant of wealth accumulation among U.S. farm households. Precautionary savings account for 53% of total wealth accumulation in general. Our results indicate an age-wealth profile that is consistent with the life-cycle hypothesis. The share of precautionary saving in total wealth accumulation differs across farm households. Results show that for farm households receiving government payments (designed to benefit farmers by reducing income variability), precautionary saving account for a large share (51%) of wealth accumulation, compared to 41% for households that do not receive any government payments.

JEL classification codes: D91, Q12, G18, J24
Key words: Income uncertainty, permanent income, precautionary savings, life-cycle, and instrumental variables, government program.

I. Introduction

Recent economic conditions and the recession of 2008 have reignited the debate regarding the adequacy of household savings. Farm households in the United States face high income risks due to weather and price shocks. Farmer manage income

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risks through the use of crop insurance, futures and option markets, or by participating in government commodity programs –designed to lower farm income variability (Mishra et al. 2002). However, with looming budget deficits and slow economic growth, there is a possibility that current level of government farm program payments may not be sustainable in the long run. The federal government may be faced with difficult choices with regard to funding and supporting agriculture.

In the absence of farm program payments, farm households can lower their income risks by increasing savings during good times and use the savings to smooth their consumption in bad times (Newbery and Stiglitz 1985). The use of savings as a buffer against income shocks is the main hypothesis of precautionary saving theory. This theory states that individuals –in this case, farm households– who face higher levels of income uncertainty save more and accumulate more wealth in order to smooth future consumptions (Lusardi 1997). Unfortunately, empirical studies investigating the importance of precautionary saving are still inconclusive. For example, some studies find that precautionary saving accounts for a large percentage of wealth accumulation by households (Dardanoni 1991; Kazarosian 1997; Carroll and Samwick 1996 and 1997). Others find that precautionary savings account for only a small fraction of wealth accumulation by households (Guiso et al. 1992; Arrondel 2002; Kennickell and Lusardi 2005).

Because of the difficulty associated with obtaining good measures of permanent income and income uncertainty, using pooled cross-sectional data, few studies have tried to quantify the importance of precautionary saving using cross-sectional data (Skinner 1988; Dardanoni 1991; Guiso et al. 1992; Lusardi 1997 and 1998; Arrondel 2002). To the best of our knowledge, this is the first study that quantifies the importance of precautionary savings of U.S. farm households using a large, nationwide, farm-level dataset, comprising farms of different economic sizes and in different regions of the United States.

From a policy perspective, if the size of precautionary savings is large, then variability in farm income would not lead to a serious decline in the well-being of U.S farm households. On the other hand, if the size of precautionary savings is small, then the farm household would be susceptible to the fluctuation in farm income (Paxson 1992). Furthermore, precautionary savings could also be used as a tool to self-insure against income risk, thereby reducing government's expenditures on farm programs.

The main objective of this paper is to investigate the presence of precautionary savings among farm households in the United States. Due to the potential endogeneity of income uncertainty in the model, estimation of precautionary savings model using OLS can be misleading. Therefore, we use an instrumental variable (IV) approach to obtain consistent parameter estimates. A secondary objective of this paper is to compare precautionary savings between farm households that receive government farm programs payments and their counterpart. Unlike previous studies, this study is conducted with national farm-level data, with the unique feature of a larger sample, comprising farms of different economic sizes and in different regions of the United States. A better understanding of the characteristics that influence greater savings would be useful not only to farm households, financial planners, bankers, extension economists, but also to policymakers who aim at formulating policies that help farm operators and farm households to maintain stable incomes.

The rest of the paper is organized as follows. Section II presents the literature review of past empirical studies on precautionary savings. The economic model is presented in section III. Section IV describes the empirical framework. A summary of the data is presented in section V. Section VI presents the result of our analysis. Finally, conclusion of our main findings is presented in section VII.

II. Literature review

The literature abounds with studies that investigate the presence of precautionary savings in the general population. Empirical findings can be divided into two groups. The first found that precautionary savings accounts for zero or a very small proportion of households' wealth accumulation. Skinner (1988) investigated the presence of precautionary savings using data from 1972-73 Consumer Expenditure Survey (CES). The author used occupation as proxy for income uncertainty. The study found no evidence that households in riskier occupations (farmers, self-employed non-farmers, and salespersons) save more than households in less risky occupations. On the other hand, Guiso et al. (1992) tested for presence of precautionary savings in Italian households using 1989 Italian household income and wealth survey. The authors measured income uncertainty using the subjective variance of the household's next year income. The study found that households have precautionary savings, but the savings only account for 2% of the total household wealth. Similarly, Lusardi (1997 and 1998) found that precautionary savings accounted for about 20% to 24% of the total household wealth accumulation in Italian households. In a more recent study, Arrondel (2002) used subjective earning variance to explain wealth accumulation by French households. He found that precautionary reasons were rated as important factors for saving, but that precautionary savings averaged about 5% of the accumulated household wealth.

The second set of papers found that precautionary savings accounted for a large percentage of wealth accumulation by individuals and households. For example, Kazarosian (1997) found a strong evidence of precautionary savings using panel data from the National Longitudinal Survey (NLS). In addition, he found that farm households exhibit high precautionary savings compared to households in other occupation groups. Dardanoni (1991) analyzed precautionary savings using cross sectional data for British households and found that approximately 60% of total savings of individuals can be explained by precautionary savings. Carroll and Samwick (1996 and 1997) estimated that up to 50% of wealth accumulation by a household can be attributed to precautionary motives. Using an approach similar to Dardanoni (1991), Zhou (2003) analyzed precautionary saving of Japanese households and found that precautionary savings contribute approximately 64% of the wealth accumulation for agriculture, forestry, fisheries, and self-employed households. Even though the results regarding the magnitude of precautionary savings, from the above studies are mixed, the majority indicate that precautionary savings represent a large percentage of wealth accumulation among self-employed households.

To the best of our knowledge, only one study by Jensen and Pope (2004) measures precautionary savings by farmers. Using panel data (1973-1999) from Kansas, the authors tested for the presence of precautionary saving motive among Kansas farm households. They found clear evidence of the precautionary saving hypothesis. However, the magnitude of this savings is very small. One drawback of Jensen and Pope (2004) is that farms and farm families in their study were from a limited area (Kansas) and the majority specialized in wheat farming. Further, farm families in this area faced limited off-farm job opportunities compared to farms in other regions of the U.S. This study addresses the shortcomings of Jensen and Pope's work by including different types of farms, farm located in various regions of the U.S., and increased sample size with detailed information of operator, family, and farm characteristics.

III. Theoretical model

In this section, we briefly lay out a theoretical foundation of the precautionary saving model used in this paper. In doing so, we follow Caballero's (1990) model specification. Assume that the household takes a decision in a discrete time and has time-separable utility function U. The household maximizes the expected discounted utility of the consumption streams subject to its budget constraint. More specifically, the household consumption optimization problem can be written as follows:

$$Max_{C_t} E\sum_{t=1}^{\infty} B^{t-1}U(C_t), \tag{1}$$

subject to

$$C_t = Y_t + RW_{t-1} - W_t, \tag{2}$$

where E denotes expectation, C_t denotes consumption at time t, $B=\frac{1}{1+\delta}$ is the discount factor where δ is discount rate. W_t is total assets (nonhuman wealth) at time t, U is the utility function, $R = 1 + r$ is the gross interest rate, and Y_t is the total household labor income in year t.

Solving the above optimization consumption function is a very difficult task because the function does not have a closed form solution under general forms of the utility function and income distribution. Some simplified assumptions about both the distribution of the income and the shape of the utility function must be made to overcome this difficulty (Dardanoni 1991). Caballero (1990) derived a closed form solution of the above consumption optimization problem assuming that labor income follows a random walk distribution and the utility function displays constant absolute risk aversion(exponential utility function). Under these two assumptions, Caballero(1990) found that optimal consumption at time t can be expressed as follows:

$$C_t\left(\frac{R-1}{R}\right)\left(w_t + \sum\nolimits_{t=0}^{\infty}\left(\frac{1}{R}\right)^t E_t\left(Y_t\right)\right) - \left\{\frac{1}{\theta(R-1)}\log E_t\left(e^{-\theta \upsilon_{t+1}}\right)\right\}, \tag{3}$$

where υ_{t+1} is a stochastic shock to consumption and θ is the Arrow-Pratt risk aversion coefficient. Equation (3) shows that consumption is a function of two terms. The first term represents consumption under certainty equivalence which is equivalent to permanent income. The second term is adjustment in consumption associated with the income uncertainty component. Thus, consumption is related to precautionary savings behavior.

Since savings and wealth are linked through the intertemporal budget constraint, investigating the impact of uncertainty on saving or consumption is equivalent to investigating the impact of income uncertainty on the wealth accumulation for individuals (Jensen and Pope 2004). Given that wealth data is relatively more available and more accurate than saving data, the majority of precautionary saving studies (Guiso et al. 1992; Lusardi 1997, 1998; Kazarosian 1997) have focused on estimating the following reduced form equation:

$$\frac{W_h}{y_h^p} = f\left(AGE, X_h, \sigma_h^2\right). \tag{4}$$

The response variable is wealth of a farm household (W_h) divided by the estimated permanent income of the household (Y_h^p) as a function of age of the farm operator, and X_h is a vector of observable variables which influence the age-wealth profile relationship. The vector X should include permanent income if the households' preferences are non-homothetic. σ_h^2 is a measure of income uncertainty of household h.[1] The above specification function is a direct extension for the life-cycle hypothesis model (King and Dicks-Mireaux 1982). The precautionary saving model added income uncertainty as a new determinant for the wealth accumulation along with permanent income. The expected sign on income uncertainty is positive, meaning that the higher the income uncertainty, the higher is the wealth accumulation (Lusardi 1998).

The specification function for the permanent income model is grounded in the conventional human capital theory. The theory states that earnings of an individual should be primarily determined by the level of education of the individual, occupation, and the experience in the labor market as it is approximated by age (Ben-Porath 1967; King and Dicks-Mireaux 1982). Musgrove (1979) used age, education, and occupation to estimate permanent income model using cross sectional dataset for South American households. Wang (1995) used a cross sectional data to estimate the permanent income for Chinese households. In addition to age, education, and occupation, the author also included type of employer and regional dummies in the model specification equation.

IV. Empirical framework

The impact of precautionary savings on the U.S farm household wealth accumulation is estimated using the same functional form adopted by Carroll and Samwick (1997 and 1998). The model is expressed as follows:

$$Ln\left(w_i\right) = \alpha_0 + \alpha_1\sigma_{\mu i}^2 + \alpha_2 Ln\left(y_i^p\right) + \alpha_3 HSize + \alpha_4 Nkids + \alpha_5 AGE + \alpha_6 AGESQ + \varepsilon_i \tag{5}$$

where $Ln(w_i)$ is the total wealth (net worth) for the i^{th} farm household (in natural log), $\sigma_{\mu i}^2$ is a measure of income uncertainty for the i^{th} farm household, $Ln(y_i^p)$ is the natural logarithm of the permanent income of the i^{th} farm household, *Hsize* is the

[1] We do not distinguish between business risk and financial uncertainty.

household size, *Nkids* is the numbers of children under 13; *AGE* represent age of the farm operator, *AGESQ* is operator age squared, and ε_i denotes the error term.

In order to estimate the impact of the income uncertainty on the wealth accumulation using equation (5), we need the estimates of permanent income. y_i^P, and household income uncertainty, $\sigma_{\mu i}^2$. The precautionary saving model (equation 6) is estimated using a two-step procedure. Specifically, in the first step we estimate the permanent income and the income uncertainty of the farm household. In the second step, we estimate the precautionary savings of the farm households using a instrumental variable (IV) approach. In this paper, permanent income model is estimated using the human capital theory (Mincer 1958; Musgrove 1979; King and Dicks-Mireaux 1982). See Willis (1987) for extensive discussion and justification of the following model specification:

$$Ln\left(y_{it}^{P}\right) = Z_i\beta + g\left(A_{it}\right) + R_i + \mu_{it} , \tag{6}$$

where $Ln(y_{it}^{P})$ is the natural log of the observed annual household income at time t, Z_i is a vector of observable variables for an individual operator i. This vector includes education of the farm operator, occupation, number of kids, household size, and farm size as it is represented by the number of acres operated. β is a vector of associated parameter estimates, $g(A_{it})$ is the age-income profile (quadratic age function), and R_i is a vector of dummy variables to capture the influence of region-specific effect such as the weather variability and the location advantages of the farm (Paxson 1992). In a recent study Mishra and Paudel (2011) have used cross-sectional data and a similar model as equation (6) to estimate permanent income of U.S. farm households.

The permanent income model is estimated by ordinary least squares (OLS). Miles (1997) notes that household characteristics will be an imperfect measure of Z_i; characteristics which are more likely to be important determinants of earnings or permanent income, and which individuals will have more information on than is reported in the national farm-level data, are ability, motivation, and health. An implication of this is that the residual from estimation of equation (6) will reflect both μ_{it} (the truly random component of earnings, or permanent income for household i at time t) and a part of income systematically linked to household attributes *not* measured by the econometricians. Defining the fitted values of log of household labor incomes from cross-section estimation of equation (6) by $\widehat{y}_i^P$, omitting time-scripts:

$$\widehat{y}_i^P = Z_i\widehat{\beta} + \widehat{\alpha}_1 AGE + \widehat{\alpha}_2 AGESQ + \widehat{\alpha}_3 HSize + \widehat{\alpha}_4 Nkids + \widehat{\alpha}_5 R + \widehat{\alpha}_6 OCCUP + \widehat{\alpha}_7 SIZE, \tag{7}$$

where *OCCUP* is a dummy variable representing the occupation of the operator and *SIZE* is farm size. Other variables in equation (7) are defined earlier. Miles (1997) points out that the residuals from equation (7) can be decomposed into a systematic component ω_i and the random component μ_{it}:

$$Ln\left(\widehat{y}_{it}^{p}\right) - y_i^P \equiv \widehat{\varphi}_i = \omega_i + \mu_i, \tag{8}$$

where ω_i is, by definition, that part of the deviation of current income from its expected value, conditional on the econometrician's information, which is accounted for by household specific attributes which are not public information but are known to the household. It should be noted that ω_i is independent of μ_i. Using equations (6) and (7), noting that the farm household's estimate of the systematic component of log income is $\widehat{y}_i^P + \omega_{i,}$, and using the decomposition of $\widehat{\varphi}_i$ given by equation (8), $Ln(y_{it}^p)$ can now be written as:

$$Ln\left(y_{it}^{p}\right) \cong \widehat{y}_{\boldsymbol{i}}^{P} + Z_i\left(\beta - \widehat{\beta}\right) - \widehat{\alpha}_1 AGE - \widehat{\alpha}_2 AGESQ - \widehat{\alpha}_3 HSize - \widehat{\alpha}_4 Nkids + \varphi_i - \mu_i. \tag{9}$$

Following equation (8), Miles (1997) notes that $E(\widehat{\varphi}_i)^2 = \sigma_{\mu i}^2 + \sigma_{\omega i}^2$, and therefore $E(\widehat{\varphi}_i)^2$ is a noisy and upward biased estimate of $\sigma_{\mu i}^2$, which is a true measure of farm household *i*'s income uncertainty. Miles (1997) argues that the squared of the residuals associated with the measurement of permanent income can be used as measure of income uncertainty. As a result, estimating the precautionary saving model using OLS for equation (4) will lead to problems in the standard errors of the variable. In fact, the OLS estimates will be biased toward zero with the magnitude of bias proportional to the variance of the measurement error for the household (Carroll and Samwick 1997 and 1998; Lusardi 1997). To account for the bias in the construction of the household income variability (square residuals) an IV estimation procedure is applied. The instruments include farm operator's educational attainment and spouse's off-farm work hours. The predictive power and the validity of the instruments is tested and reported in the results section. The IV estimation procedure implicitly assumes that our instruments (farm operator's educational attainment and spouse's off-farm work hours) are correlated with the variance of total household income, but not correlated with the error term in equation (5). In other words, the instruments are assumed to be correlated with household wealth only through the variance of income. We use Hansen's (1982) overidentifying restrictions test to validate the null hypothesis of no correlation between the error and the instruments in equation (5).

V. Data

Data for the analysis were taken from the 2005 and 2006 Agricultural Resource Management Study (ARMS). The 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. We use pooled data with 8,628 observations, representing about 1.3 million farm 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, i.e., 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.

The ARMS collects information on farm households in addition to farm economic data collected through the regular survey. It also collected 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 was also counted. In this study we only include farm operators between ages 20 and 65. The age limitation is consistent with other studies (Lusardi 1997; Kazarosian 1997; Guiso et al. 1992) that estimate permanent income and precautionary savings of households in Italy, England, and Italy, respectively. Finally, wealth (or net worth) of the farm household is defined as the sum of farm wealth (farm assets-farm debt) and nonfarm wealth (total nonfarm assets-nonfarm debt).

Finally, following Goodwin and Mishra (2004) we adopt a bootstrapping approach to correct the standard errors and stratification, which are inherent in the survey design.[2] The ARMS database contains a population-weighting factor, which indicates

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[2] Goodwin, Mishra and Ortalo-Magne (2003) point out that the jackknife procedure may suffer from some limitations and, therefore, they propose bootstrapping procedure as an alternative.

the number of farms in the population (i.e., all U.S. farms) represented by each individual observation. We utilize the weighting factor in a probability-weighted bootstrapping procedure. Specifically, the data (selecting N observations from the sample data) are sampled with replacement. We then estimate the models using the pseudo-sample of data. This process is repeated a large number of times and estimates of the parameters and their variances are given by sample means and variance of the replicated estimates. We utilize 2,000 replications in the application that follows. Table 1 presents summary statistics for each of the variables in the analysis.

Table1. Definitions and summary statistics, 2005 and 2006 pooled data

Variable	Descriptions	Mean	Std. dev.
VAR_INCALL	Estimated income variance	1.113	1.801
VAR_INCGOV	Estimated income variance for farm household receiving government payments	1.121	1.745
VAR_INCNGOV	Estimated income variance for farm household without government payment	1.081	1.839
INCOME	Total household income($)	86,298	150,806
P_INCOME	Estimated permanent income ($)	94,253	105,788
NETW	Net worth of farm operator household (includes both farm and nonfarm net worth, $)	800,088	1,522,771
OCCUPATION	=1 if a operator's job is farming 0 otherwise	0.68	0.47
EDUC	Operator education attainment	13.02	1.689
HSize	Farm household size	3.06	1.558
Nkids	Number of children under 13	0.85	1.329
AGE	Age of farm operator	50.69	9.19
Total number of observations		8,628	
Population		1,290,982	

Source: 2005 and 2006 Agricultural Resource Management Survey (ARMS).

VI. Results and discussion

As presented in Table 1, the estimated income variance of farm households receiving government payments is about 1.12, while for their counterpart it is about 1.08. We tested to see if there is a significant difference between the income variances of the two groups. Since the variances are not normally distributed, using a *t*-test to test for differences will invalidate the normality assumption of the t-test and may result in inappropriate inference. Therefore, we use a nonparametric version of the t-test, the Wilcoxon rank sum test, to test for differences between income variance of the two farm household groups (Hollander and Wolfe 1973). The test follows a chi-square distribution with 1 degree of freedom. The p-value of the test is 0.0019, which indicates a significant difference between the medians of the income variances of the two groups. Hence, we conclude the income variance of farm households with government payment is significantly higher than the income variance of farm households without government payment. Our finding is consistent with Mishra and Sandretto (2002), who found that government farm program payments did not reduce income variability in total farm household income.[3] In fact, Mishra and Sandretto (2002) point out that off-farm income has helped to reduce the variability in total household income. Findings here suggest that government policies that influence general economic conditions have a profound impact on farm families.

Table 2 shows the two stage least squares (2SLS) estimates of the precautionary savings model. Column 2 reports estimates for all farm households (8,628 farm households), column 3 reports parameter estimates for farm households receiving farm program payments (4,751), and column 4 reports parameter estimates for farm households not receiving any kind of farm program payment (3,877). We considered farm operator's educational attainment and spouse's off-farm work hours as instruments for variance of income. The validity of the instruments was tested using the F-test for joint significance of the excluded instruments in the first stage regression. Results in Table 2 indicate that in all cases (all farm households, farm households receiving government payments, and farm households without government payments) the F–statistics is greater than 10, implying that instruments have high predictive power.[4] The overidentification test did not reject the model specification and the chosen instruments in the first two cases (columns I and II). However, the test of overidentification restriction was rejected in the final model (column III). Results suggest that farm operator's educational attainment and spouse's off-farm work hours may have a direct effect on farm household wealth for a sub-group of farmers who do not receive any government payments, beyond their direct effect on farm household income uncertainty. Similar findings on overidentification restrictions test are reported by Carroll and Samwick (1996 and 1997).

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[3] Recall that according to Gardner (2002) and Mishra et al. (2002), farm programs were designed to reduce variability in farm income and increase income of farm families.

[4] This is consistent with Staiger and Stock(1997), who suggest the use of F-statistics on the excluded instruments in the first stage regression as rough guides to the quality of the instruments.

Table 2. Parameter estimates of precautionary savings equation, dependent variable: ln(wealth)

Variable	All farm households (I)	Households receiving government payments (II)	Households without government payments (III)
Intercept	3.023***	5.914***	1.300
	(0.747)	(1.206)	(0.880)
Income variance	0.528***	0.641***	0.496***
	(0.054)	(0.103)	(0.056)
Log permanent income	0.629***	0.315***	0.827***
	(0.069)	(0.118)	(0.074)
Family size	0.054**	0.120***	0.014
	(0.022)	(0.035)	(0.030)
Number of kids under age 13	-0.056**	-0.088**	-0.029
	(0.026)	(0.039)	(0.036)
Operator age/10	0.641***	0.836***	0.421*
	(0.144)	(0.202)	(0.225)
Operator age squared/100	-0.042***	-0.061***	-0.018
	(0.014)	(0.021)	(0.023)
2006 year dummy	0.033	0.024	0.042
	(0.028)	(0.040)	(0.040)
No. of observations	8,628	4,751	3,877
F-value for instrument validity	109.89***	36.09***	73.55***
	(0.000)	(0.000)	(0.000)
Over-identification test	0.177	0.466	19.596***
	(0.673)	(0.495)	(0.000)

Note: *, **, and *** denotes parameter significance at the 10, 5 and 1% level. Robust standard errors reported in parentheses. Data from 2005 and 2006 Agricultural Resource Management Survey (ARMS).

Consistent with theory, results in Table 2 reveal a strong effect of income uncertainty on precautionary savings by U.S. farm households in all the three groups (column I, II, and III). In each case the coefficient of income uncertainty is positive and statistically significant at the 1% level of significance. Results indicate that farm households who face high income risks (Mishra and Goodwin 1997) appear to accumulate more wealth. Results show that for all farm households, precautionary savings accounts for 53% of the wealth accumulation (see column I, Table 2). This result is consistent with the findings of other economists who find that precautionary saving accounts for a large percentage of the wealth accumulation (Dardanoni 1991;

Zhou 2003; Carroll and Samwick 1997). However, our estimates are lower than those obtained by Zhou (2003) – 64% for self-employed farmers in Japan. Additionally, not specific to farming, Dardanoni (1991) and Carroll and Samwick (1997) found that 60% and 50% of the wealth accumulation by households can be explained by precautionary savings, respectively, in the British and American households. Finally, when investigating precautionary savings of farm households receiving farm programs payments and those that do not (columns II and III, Table 2), our findings indicate that precautionary savings accounted for about 64% and 50% of the total household wealth accumulation, respectively.

The findings here are not surprising. A higher rate of precautionary savings among farm households receiving farm payments may be due to the fact that much of the payments are capitalized into the farmland (Goodwin, Mishra, and Ortalo-Magne 2003). A decline in income uncertainty, through government payments, may increase agricultural land values (Just and Miranowski 1993).[5] Finally, compared to their counterparts, farm households participating in farm program payments operate large farms and have higher net worth (Mishra et al. 2002; Mishra and El-Osta 2009).

The impact of permanent income on wealth accumulation is positive and significant at the 1% level of significance in all three cases (Table 2). Results indicate that, on average, farm households with more permanent income accumulate more wealth. Findings here show that a 1% increase in permanent income increases wealth accumulation by about 0.63% for all farm households in the U.S. Our findings are consistent with those obtained by Lusardi (1997), Arrondel (2002), Carroll and Samwick (1997), and Kazarosian (1997). Further, when investigating the impact of permanent income on wealth accumulation by government farm program participation results indicate that farm households participating in government farm programs have a lower rate of wealth accumulation. For example, results in Table 2 show that a 1% increase in permanent income increases wealth accumulation by about 0.32% and 0.83% for farm households participating in government programs and those not participating in government farm programs, respectively (columns II and III). A plausible explanation is that farm households *not* participating in government programs have higher permanent income than their counterparts (Mishra and Paudel 2010). This is due to the fact that farm families *not* participating in government programs are more likely to have stable off-farm jobs and off-farm income is a major source of income to the farm household (Mishra et al. 2002).

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[5] In a portfolio choice model this can happen through reducing the risk-adjusted discount rate.

Evidence from other studies using micro-data strongly suggests that income and wealth is influenced by the composition of the household (see Miles 1997; Mishra and Paudel 2009; Attanasio et al. 1995). The results reveal a strong impact of the demographic makeup of the household upon wealth accumulation. Not surprisingly, household wealth is strongly influenced by the number of people in the household for all farm households (column I, Table 2) and farm households receiving government payments (column II, Table 2). Conditional on the number of people, wealth accumulation appears to be a diminishing function of the number of children under the age of 13 for all farm households (column I, table 2) and farm households receiving government payments (column II, Table 2). Unfortunately, both variables (family size and number of children under the age of 13) were found not to be significant in the final model (column III, Table 2). Our findings are consistent with Guiso et al. (1992), Miles (1997), and Mishra and El-Osta (2009). Our results indicate an age-wealth profile that is consistent with the inverted-U shape expected from the life-cycle hypothesis. Results show that age of the head of the household has a strong positive effect on wealth accumulation in the first two cases (columns I and II, Table 2). In general, the age variable (*AGE*) is positive while age squared (*AGESQ*) is negative and significant in the first two cases (all farm household and farm households receiving government payments). Our findings are consistent with Arrondel (2002), and Carroll and Samwick (1996).

VI. Conclusion

The main objective of this paper was to assess the importance of precautionary saving in U.S. farm households. Following the precautionary savings literature, we specify wealth as a function of age, permanent income, income uncertainty, and other socioeconomic factors that influence the age-wealth profile. The precautionary wealth model is then applied to pooled data for the U.S. farm households, 2005-2006. The empirical model is estimated using an IV approach. The use of IV approach to estimate the importance of precautionary savings in total wealth accumulation is critical, especially when income uncertainty is subject to some measurement errors. This can be the case when income uncertainty is estimated using pooled cross sectional survey data. OLS will underestimate the extent of precautionary savings in total wealth accumulation by farm households.

Further, evidence here suggests that federal support of farm income warrants continued scrutiny. Findings from this study indicate that farm households receiving government farm payments have higher income variance than their counterparts.

In addition to receiving government payments, it appears from our analysis that these farm households have higher precautionary savings than their counterparts. It is plausible to conclude from the empirical evidence (Ahearn et al. 2006; El-Osta et al. 2003 and 2004) that farm households receiving government payments are less likely to work off the farm and hence may not be able to stabilize their income.

Whether intended or not, the capitalization of government payments into higher prices of farmland, production facilities, and other specialized resources has helped to create farm wealth. Consistent with findings in the literature, we found that precautionary saving is a powerful determinant of wealth accumulation by U.S. farm households. However, the share of precautionary savings in total wealth accumulation differs across farm households. For example, the precautionary savings of farm households receiving government payments account for a large share (51%) of the wealth accumulation compared to 41% for households that do not receive any payments, and 44% for all farm households in general.

This finding is important because it indicates that random shocks to incomes of U.S farm households will not have serious consequences on the well-being of U.S. farm households. This implies that the government policies that reduce the income variations of the U.S. farm households might have some unintended consequences, such as over-capitalization in farmland. They might in fact increase the wealth accumulation of the U.S farm households. In addition, we found that age, family size, and children below the age of 13 are also important determinants of wealth accumulation. Consistent with other studies on saving behavior our results indicate an age-wealth profile that is consistent with the inverted-U shape expected from the life-cycle hypothesis.

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