Econometric Modeling of Panel Data on the Saving Patterns of Philippine Agricultural Households

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This study aims to identify significant determinants of Philippine agricultural household saving using aggregate (regional) household panel data from the Family Income and Expenditure Survey (FIES) (1991 to 2006). Two definitions of saving are used — with and without expenses on durable goods as expenditure item. Using fixed effects models for panel data, the study identifies age of household head, self-employment of household head, land distribution, and young dependency rate as significant determinants of agricultural household saving. Self-employment, however, is significant only when expenses on durable goods is considered as an expenditure item. Also, time and cross-section fixed effects suggest that there are certain years and regions which had less agricultural household saving.

Keywords: panel data, fixed effects, saving rate, agricultural household

1. Introduction

Saving is an important component of household decision-making. As family members, more especially household heads, age, they accumulate earnings which they use for both consumption and saving. They eventually use their saving upon retirement, during which no more income comes in.

However, declining saving rates is a common problem to many countries (Gibson and Scobie, 2001). Especially among developing and low-income ones, saving is a concept not very well understood (Alba and See, 2006), and not much is known about what drives it (Beverly and Sherraden, 1999, as cited in Kibet

Mutai Ouma Ouma and Owuor, 2009). In the Philippines, Mapa and Bersales (2008) profiled saving behaviour of households and determined determinants of saving using the life-cycle model as framework. This paper builds on their results by focusing on agricultural households and by proposing an alternative operational definition of saving rate. It is in agricultural households where income is lower and less stable (Qian, 1988). These households also have a different set of income sources, some of which are yield, farming effort, and transportation and preservation abilities (Nugent, 2005). Thus, studying them specifically can provide a more precise picture of their saving behaviour.

Knowing more about the saving patterns of such households can help in the improvement of not just the agricultural sector but other sectors as well [United Nations Economic Commission for Europe (UNECE), 2007]. Besides, low income is associated with rurality (Sarris Savastano and Christiaensen, 2006), and rurality is associated with being agricultural (Kibet et al., 2009; UNECE, 2007).

This paper addresses such inquiries by building an econometric model of Philippine agricultural household saving using panel data analysis with two-way error component fixed effects. The paper is structured as follows: section 2 provides a general discussion of panel data analysis with two-way error component fixed effects; section 3 discusses the said analysis method as applied to Philippine agricultural household saving; section 4 provides empirical results; and section 5 concludes.

2. Panel Data Analysis

Econometric modeling often involves analysis of panel data, and various authors and researchers have elaborated on this methodology (Baltagi, 1995; Dougherty, 2007; Finkel, 1995; Hsiao, 1986; Markus, 1979; Park, 2009). Unlike in the usual regression analysis or time series analysis, the units in panel data analysis have both a cross-section component and a time series component. As this involves both, variables otherwise unobservable or immeasurable but which are inherent in cross-section and time may be used in explaining the dependent variable. For this study, the following fixed effects model is used:

$$\underline{y}_{it} = \underline{\alpha}_i + \underline{\lambda}_t + x_{it}'\underline{\beta} + \underline{\varepsilon}_{it}$$

$$\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$$

$$i = 1,2,\ldots, N\ ;\ t = 1,2,\ldots, T$$

where

y_{it} is the value of dependent variable for cross-section unit i at time t; x_{it} are the possible (observed) determinants of y_{it} ;

β are the unknown coefficients of x_{it};

α_i are the unobserved cross-section effects;

λ_t are the unobserved time effects;

ε_{it} is the random error term

with $\alpha_i = \sum_{i=1}^{N} \alpha_i A_i$ and $\lambda_t = \sum_{t=1}^{T} \lambda_t L_t$

Ai equals 1 for cross-section unit *i*, and equals 0 otherwise

Lt equals 1 for time t, and equals 0 otherwise.

This model is considered two-way because it takes into consideration both time and cross-section effects. If only one of these unobserved effects is used, the panel data model reduces to one-way. When the said cross-section and time effects are incorporated into the error term instead, the fixed effects panel data model becomes a random effects one.

Aside from tests for significance of parameters and validation of assumptions, statistical tests are done to validate the assumption of fixed effects (versus random effects) using the Hausman specification test.

3. Panel Data Analysis of Philippine Agricultural Household Saving Rate

3.1 Data used

To build an econometric model of saving among Philippine agricultural households, this paper used annual household data from the triennial Family Income and Expenditure Survey (FIES) from 1991 to 2006. These six FIES years – namely 1991, 1994, 1997, 2000, 2003 and 2006 – constitute the time component λt of panel data analysis. Meanwhile, the household data were aggregated to regional level, and the Philippine regions comprise the cross-section component αi of panel data analysis. Such data aggregation was necessary because FIES took a different sample of households for each of its survey years. Table 1 provides a list of the said regions as defined in the 1988 FIES. This particular FIES year

Table 1. The Philippine regions used as cross-section units

I	Corresponding Region	I	Corresponding Region
1	Ilocos Region	8	Eastern Visayas
2	Cagayan Valley	9	Western Mindanao
3	Central Luzon	10	Northern Mindanao
4	Southern Tagalog	11	Southern Mindanao
5	Bicol Region	12	Central Mindanao
6	Western Visayas	14	Cordillera Autonomous Region
7	Central Visayas		

was the one used to define the regions because an aim of this study is to compare its results with a study (Mapa and Bersales, 2008) on the saving patterns of all households. Meanwhile, the National Capital Region (NCR) was excluded due to the relative scarcity of agricultural households in that region.

For each of the said FIES years and Philippine regions, the number of agricultural households in the survey sample is shown in Table 2. By agricultural household, the 2006 FIES means one "whose total income earned from agricultural activities is greater than or equal to income earned from non-agricultural activities" [National Statistics Office (data files), 2009], and this is the definition used for this study. It is acknowledged, though, that there are other definitions of an agricultural household which are just as valid.

Table 2. Number of sampled agricultural households, by region and FIES year

Region	FIES Year					
	1991	1994	1997	2000	2003	2006
1	384	348	424	375	509	456
2	470	484	740	639	943	857
3	610	556	470	373	401	439
4	871	800	1053	1008	1260	1098
5	619	552	678	642	851	651
6	847	772	909	763	865	785
7	578	552	526	446	642	495
8	523	519	813	703	900	696
9	450	427	688	675	776	648
10	623	606	621	567	762	545
11	809	758	661	651	889	782
12	404	396	574	576	1067	859
14	479	496	594	561	602	546

3.2 The life-cycle model of saving

In identifying possible determinants of agricultural household saving, this study uses the assumptions and concepts of the life-cycle model. Various studies on saving and rural saving have derived ideas from and supported the said model (Athukorala and Tsai, 2003; Dirschmid and Glatzer, 2004; Horioka and Wan, 2007; Mapa and Bersales, 2008). The life-cycle model in its most standard form assumes that people has smooth consumption patterns over their lifetime (Coleman, 2006). As income received tends to vary over time, with working-age people earning and most probably saving more, saving rates would then become

uneven (Coleman, 2006). There is more saving during those working years, less before those years, and negative upon retirement (Coleman, 2006).

Worth noting is the flexibility, coherence and depth of the life-cycle model of saving. As Browning and Crossley (2001) argues, it is a conceptual framework within which several useful models of almost all kinds may be built.

3.3 Measures and variables

Guided by related studies, expert opinion, and the life-cycle model, this paper uses the variables in Table 3 as possible determinants of the dependent variable, agricultural household saving. Half of these possible determinants are from FIES, while the others are from official government agency websites such as the National Statistical Coordination Board (NSCB), Bangko Sentral ng Pilipinas (BSP), Department of Labor and Employment (DOLE), Department of Agrarian Reform (DAR), and Department of Agriculture (DA).

Table 3. Determinants of agricultural saving

Possible determinants	Description
a. FIES variables	
Age	average age of household heads (in years)
Young dependency	percentage of household residents aged 14 and below
Education	percentage of household heads who have finished at least high school
Self-employment	percentage of self-employed household heads
Wife employment	percentage of employed wives in male-headed households
Remittances	Household income from abroad over total household income
b. Non-FIES variables	
Gross Regional Domestic Product (GRDP)	per capita gross regional domestic product (at constant prices; in pesos)
Palay production	volume of palay production (in metric tons) over area of land used for palay production (in hectares)
Inflation	inflation rate (in percent)
Rural bank branches	number of branches of the rural/cooperative banks
Vocational education	number of people (in hundreds) trained under technical vocational education and training programs
Land distribution	total area of land distribution accomplishment (in thousand hectares)

Meanwhile, results of the Hausman specification test as well as the methodology of this study suggest the appropriateness of fixed effects over random effects for this study.

Considering all of the above-discussed, this paper estimates the following two-way fixed effects LSDV panel data model of Philippine agricultural household saving:

$$y_{it} = \underline{\alpha}_i + \underline{\lambda}_t + x_{it}'\underline{\beta} + \underline{\varepsilon}_{it}$$

$$\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$$

i = *Region* 1, *Region* 2,..., *Region* 12, *Region* 14; t =1991,1994,..., 2006

where y_{it} is the aggregate agricultural household saving rate in Region i in FIES year t;

x_{it} are the possible (observed) determinants of y_{it} ;

β are the coefficients of x_{it};

αi = are the unobserved regional effects (Ai = 1 if Region i, 0 otherwise);

λt = are the unobserved FIES year effects (Lt = 1 if FIES year t, 0 otherwise);

εit is the random error term.

This model could test the null hypothesis of no regional and/or FIES year effects. Statistical significance in F-tests implies some effect of regional and/or FIES year membership on y_{it}. In addition, this model involves the usual test of significance for the possible determinants/predictor variables x_{it}. In this study, their parameters β were estimated using the Generalized Least Squares (GLS) method.

As regards the dependent variable y_{it} , a number of definitions have been used for saving. These involve sums of deposits and investments (Kibet et al., 2009), investment in human capital and durable goods (Butelmann and Gallego, 2001), and net purchase of assets (Juster Lupton Smith and Stafford, 2004). This paper, as previously discussed, studies saving in the context of aggregated Philippine agricultural household data, and it defines the dependent variable as follows (called "SaveRate1" in succeeding discussions)

$$s_{it}^{(1)} = \left[\frac{I_{it} - C_{it}}{I_{it}} \right] * 100$$

where S_{it} is the aggregate agricultural household saving rate in Region i in FIES year t;

I_{it} is the aggregate total agricultural household income in Region i in FIES year t;

C_{it} is the aggregate total agricultural household expenditure/consumption in Region i in FIES year t.

Since this paper is considering agricultural households, another specification of aggregate saving (called "SaveRate2" in succeeding discussions) has been formulated for econometric modeling, as shown in the following formula.

This transfers expenses on durable furniture and equipment from consumption to income, because such items could have long-term benefits for agricultural households. Various studies (Attanasio and Székely 2001; Mapa and Bersales, 2008; Scobie and Gibson 2003) have also considered this specification.

$$s_{it}^{(2)} = \left[\frac{I_{it} - C_{it} + D_{it}}{I_{it}} \right] * 100 \quad i = \textit{Region } 1, \textit{Region } 2, ..., \textit{Region } 12, \textit{Region } 14; \; t = 1991, 1994, ..., 2006$$

where D_{it} is the aggregate total agricultural household expenditure on/consumption of durable furniture and equipment of Region i in FIES year t.

4. Results

4.1 Comparison of saving patterns of agricultural and non-agricultural households

For both definitions on saving rate considered in this study, agricultural households have higher saving rate than non-agricultural households. Table 4 shows this for SaveRate1 and Table 5 for SaveRate2. A decreasing trend is noted from 1991 to 1996 but with some recovery in the most recent FIES year. In addition, if regional agricultural SaveRate1 is compared to national agricultural SaveRate1, it may be observed that Regions 1, 5 and 6 never had a higher SaveRate1 than the national SaveRate1 in all FIES years. On the other hand, in almost all FIES years, the agricultural SaveRate1 of Regions 2, 3 and 7 is higher than the national value.

4.2 Determinants of saving of agricultural households

This section shall present both the full models based on the life-cycle model and the reduced model with only statistically significant variables retained in the equation. This is done for both operational definitions of saving rate. Table 6 shows the estimated full econometric model of agricultural SaveRate1. In this model, only age, young dependency, and land distribution are statistically significant.

Test runs using this full model lead to the following final model, which involves only the significant determinants of agricultural SaveRate1. In this model, the significant drivers of agricultural SaveRate1 are age, young dependency, self-employment and land distribution, the last one being positively related to it.

The above model implies that more land distribution accomplished means more agricultural SaveRate1, such that a thousand hectare increase in land distribution accomplishment results in an increase in the estimated mean agricultural SaveRate1 of about 0.065 percentage point, holding other factors constant. Also, as the household heads of agricultural households approach

Table 4. SaveRate1 of Philippine Agricultural and Non-Agricultural Households, 1991-2006 FIES years

REGION	HOUSEHOLD TYPE	FIES year					
		1991	1994	1997	2000	2003	2006
All regions	agri	13.0	12.1	9.4	10.9	5.4	7.3
	non-agri	21.0	19.9	22.0	20.1	18.2	15.7
1	agri	8.8	3.5	2.7	1.4	-0.6	-0.9
	non-agri	23.3	20.6	21.4	23.3	19.8	15.0
2	agri	19.3	20.5	12.7	8.2	10.3	13.3
	non-agri	24.4	23.3	27.3	20.9	25.6	19.2
3	agri	14.3	13.4	20.6	14.6	2.6	9.3
	non-agri	19.6	20.6	22.3	21.9	14.4	14.2
4	agri	13.9	10.6	7.6	9.2	8.2	5.5
	non-agri	22.9	20.7	22.0	17.5	15.8	12.2
5	agri	9.3	6.9	5.9	10.4	-1.0	-0.5
	non-agri	17.9	17.7	17.1	15.1	16.3	13.8
6	agri	4.3	5.0	0.9	1.0	0.5	3.2
	non-agri	13.1	11.8	13.9	16.9	14.4	12.4
7	agri	16.4	13.4	6.6	21.4	9.0	9.7
	non-agri	22.4	19.5	20.1	16.1	16.9	14.9
8	agri	12.2	12.6	13.0	19.2	9.6	0.9
	non-agri	19.2	30.5	26.2	25.0	20.1	20.7
9	agri	16.4	13.4	9.8	6.2	1.3	10.0
	non-agri	27.5	13.8	28.5	23.1	22.7	23.1
10	agri	11.5	12.7	13.3	22.9	4.2	10.9
	non-agri	18.4	22.4	24.1	23.8	19.2	18.7
11	agri	15.7	12.0	12.4	12.3	8.7	6.5
	non-agri	23.1	17.9	23.6	21.4	16.3	16.5
12	agri	11.7	13.9	2.0	6.5	7.7	9.4
	non-agri	18.6	19.8	19.9	23.0	33.0	17.9
14	agri	17.3	19.9	10.1	10.4	0.4	12.6
	non-agri	28.8	33.4	26.7	24.4	20.5	23.6

Table 5. SaveRate2 of Philippine agricultural and non-agricultural households, 1991-2006 FIES years

REGION	HOUSEHOLD TYPE	FIES year					
		1991	1994	1997	2000	2003	2006
All regions	agri	13.8	13.5	10.9	11.8	6.8	9.1
	non-agri	22.9	22.5	24.8	22.3	20.8	18.4
1	agri	10.4	4.0	4.8	2.0	0.1	1.1
	non-agri	25.3	22.0	23.1	25.0	21.9	17.5
2	agri	20.3	21.8	14.4	8.9	11.0	14.2
	non-agri	26.0	25.5	30.2	22.4	28.9	22.7
3	agri	14.7	14.1	22.2	15.0	3.2	11.3
	non-agri	20.7	22.5	24.2	23.4	15.9	16.6
4	agri	14.7	11.5	9.6	10.8	9.4	7.0
	non-agri	24.5	23.0	24.6	19.8	18.3	14.9
5	agri	9.6	7.6	6.5	10.7	0.6	0.9
	non-agri	20.3	20.1	21.0	17.3	19.7	16.1
6	agri	5.5	6.9	2.3	1.6	1.8	4.5
	non-agri	15.5	15.8	17.1	19.8	17.8	15.1
7	agri	16.8	14.5	7.8	23.2	10.3	11.4
	non-agri	24.0	21.1	23.2	18.3	20.1	17.3
8	agri	12.5	13.4	13.6	19.6	10.2	2.5
	non-agri	23.1	32.0	29.3	27.1	23.1	23.4
9	agri	17.1	14.1	10.8	6.6	3.0	12.8
	non-agri	28.8	19.5	31.3	25.5	25.2	26.4
10	agri	12.7	14.5	15.5	24.1	6.9	13.1
	non-agri	21.3	25.9	27.8	26.0	22.1	22.1
11	agri	16.6	15.4	14.5	14.7	11.0	9.5
	non-agri	26.2	22.8	28.4	23.9	20.7	19.1
12	agri	12.9	15.9	4.6	7.8	9.6	11.2
	non-agri	20.6	23.4	23.7	25.2	36.0	20.9
14	agri	18.1	20.4	10.9	10.7	1.0	14.5
	non-agri	32.4	36.5	28.3	26.0	22.4	25.8

Table 6. Estimated full econometric model of SaveRate1

Determinant	*Coefficient*	*s.e.*[a]
GRDP per capita (at constant prices; in pesos)	-0.0002	0.0007
Average age of household heads	-0.866*	0.511
Percentage of young dependents	-1.291***	0.352
Percentage of household heads with high school diploma	0.098	0.105
Percentage of self-employed household heads	-0.137	0.082
Percentage of employed wives in male-headed households	-0.082	0.137
Income from abroad over total income	-1.628	1.010
Volume of palay production over area of land used for palay production	-4.677	3.701
Inflation rate	-0.140	0.389
Number of rural bank branches	0.005	0.014
Number of people (in hundreds) trained under vocational education programs	0.001	0.002
Land distribution accomplishment (in thousand hectares)	0.056***	0.018
(Constant)	101.043***	11.665

Fixed Effects			
Region 1 (Ilocos Region)	-3.131	1991	2.358
Region 2 (Cagayan Valley)	3.897	1994	-0.327
Region 3 (Central Luzon)	1.194	1997	-3.026
Region 4 (Southern Tagalog)	-2.734	2000	2.341
Region 5 (Bicol Region)	-5.560	2003	-2.814
Region 6 (Western Visayas)	-9.689	2006	1.468
Region 7 (Central Visayas)	2.106		
Region 8 (Eastern Visayas)	1.442		
Region 9 (Western Mindanao)	1.309		
Region 10 (Northern Mindanao)	5.303		
Region 11 (Southern Mindanao)	2.681		
Region 12 (Central Mindanao)	-3.037		
Region 14 (Cordillera Autonomous Region)	6.217		
F Test for No Fixed Effects			2.900***
N		78	
Adjusted R-Squared		0.5598	

***significant at 1%; **significant at 5%; *significant at 10%
a standard errors are White's heteroskedasticity consistent

Table 7. Estimated final econometric model of SaveRate1

Determinant			Coefficient	s.e.a
Average age of household heads			-1.111**	0.471
Percentage of young dependents			-1.171***	0.219
Percentage of self-employed household heads			-0.091*	0.050
Land distribution accomplishment (in thousand hectares)			0.065***	0.024
(Constant)			88.451***	20.617
Fixed Effects				
Region 1 (Ilocos Region)	-5.196	1991		4.147
Region 2 (Cagayan Valley)	1.230	1994		2.523
Region 3 (Central Luzon)	-0.778	1997		0.332
Region 4 (Southern Tagalog)	-0.733	2000		2.020
Region 5 (Bicol Region)	-0.954	2003		-5.600
Region 6 (Western Visayas)	-8.544	2006		-3.421
Region 7 (Central Visayas)	5.948			
Region 8 (Eastern Visayas)	4.641			
Region 9 (Western Mindanao)	0.935			
Region 10 (Northern Mindanao)	3.283			
Region 11 (Southern Mindanao)	-0.415			
Region 12 (Central Mindanao)	-3.532			
Region 14 (Cordillera Autonomous Region)	4.114			
F Test for No Fixed Effects				5.760***
N			78	
Adjusted R-Squared			0.5855	

***significant at 1%; **significant at 5%; *significant at 10%
a standard errors are White's heteroskedasticity consistent

retirement years, their SaveRate1 decreases, such that every year increase in their average age leads to around 1.11 percentage point decrease in estimated mean agricultural SaveRate1, all other things being the same. This is consistent with a finding of Burney and Khan [1992].

The two other significant determinants are also negatively related to agricultural SaveRate1. For young dependency, every percentage point increase in the proportion of young dependents at agricultural households suggests an around 1.17 percentage point decrease in estimated mean agricultural SaveRate1, all other things being the same. This somehow confirms some of the findings of Athukorala and Tsai (2003), Horioka and Wan (2007), and Burney and Khan (1992). And for self-employment, with all other factors held constant, every percentage point increase in the proportion of self-employed agricultural household heads leads to

an approximately 0.09 percentage point decrease in estimated mean agricultural SaveRate1, and this supports a finding of Burney and Khan (1992).

As regards the fixed regional and FIES year effects on agricultural SaveRate1, the significant F statistic in the above model shows the rejection of the null hypothesis of no fixed effects. Indeed, certain regions and FIES years do have significantly higher or lower SaveRate1 values. For instance, the fixed effects coefficients suggest that Regions 7, 8, and 14 and FIES year 1991 have the higher agricultural SaveRate1, holding other factors constant. On the other hand, Regions 1 and 6 and FIES years 2003 and 2006 have the lower agricultural SaveRate1, all other things being the same. It is noted that 2003 and 2006 are the most recent FIES years in this paper, while 1991 is the earliest.

Some of the above-mentioned findings on agricultural households apply to all households in general. Mapa and Bersales (2008), who studied the saving patterns of all Philippine households, also found young dependency to be a significant determinant of aggregate saving, and inflation and presence of financial infrastructures non-significant. However, household head education is significant for all households. For agricultural households it is not, probably due to the possibility that formal education is not a strong requirement for income-earning among the said households.

Meanwhile, Table 8 presents the estimated full econometric model of SaveRate2. Young dependency, remittances, and land distribution are statistically significant in this model.

Further test runs result in the following final model, which shows only the significant determinants of SaveRate2. The significant determinants as well as the coefficient signs in this model are similar to those in the SaveRate1 final model except that, here, self-employment is not anymore significant.

Due to the similarities of this final model with the SaveRate1 final model, almost all of the previously-mentioned interpretations still apply here. Only the actual coefficients differ. In the case of land distribution, every thousand hectare increase in it leads to an increase in the estimated mean agricultural SaveRate2 of about 0.047 percentage point, all other things being the same. Also, the estimated mean agricultural SaveRate2 decreases by 0.94 percentage point or 0.99 percentage point for every year increase in average age of agricultural household heads or in proportion of young dependents at agricultural households, respectively, with all other factors held constant.

In addition, the F statistic in the above model is also statistically significant. Again, Regions 7, 8, and 14 and FIES year 1991 have the higher agricultural SaveRate2, all other things being equal. At the same time, holding other factors constant, the two more recent FIES years have the lower agricultural SaveRate2.

Table 8. Estimated full econometric model of SaveRate2

Determinant		Coefficient	s.e.a
GRDP per capita (at constant prices; in pesos)		-0.0001	0.0007
Average age of household heads		-0.816	0.550
Percentage of young dependents		-1.118***	0.317
Percentage of household heads with high school diploma		0.077	0.112
Percentage of self-employed household heads		-0.122	0.082
Percentage of employed wives in male-headed households		-0.087	0.146
Income from abroad over total income		-1.802*	1.010
Volume of palay production over area of land used for palay production		-3.900	3.424
Inflation rate		-0.097	0.419
Number of rural bank branches		0.008	0.015
Number of people (in hundreds) trained under vocational education programs		0.0003	0.002
Land distribution accomplishment (in thousand hectares)		0.051**	0.024
(Constant)		92.778***	15.250
Fixed Effects			
Region 1 (Ilocos Region)	-2.565	1991	1.931
Region 2 (Cagayan Valley)	4.427	1994	0.208
Region 3 (Central Luzon)	0.820	1997	-2.384
Region 4 (Southern Tagalog)	-3.646	2000	1.862
Region 5 (Bicol Region)	-5.476	2003	-3.177
Region 6 (Western Visayas)	-9.284	2006	1.559
Region 7 (Central Visayas)	2.259		
Region 8 (Eastern Visayas)	1.399		
Region 9 (Western Mindanao)	1.090		
Region 10 (Northern Mindanao)	5.216		
Region 11 (Southern Mindanao)	3.293		
Region 12 (Central Mindanao)	-2.363		
Region 14 (Cordillera Autonomous Region)	4.830		
F Test for No Fixed Effects			2.680***
N		78	
Adjusted R-Squared		0.5276	

***significant at 1%; **significant at 5%; *significant at 10%
a standard errors are White's heteroskedasticity consistent

Table 9. Estimated final econometric model of SaveRate2

Determinant		Coefficient	s.e.a
Average age of household heads		-0.941**	0.462
Percentage of young dependents		-0.988***	0.205
Land distribution accomplishment (in thousand hectares)		0.047*	0.025
(Constant)		72.087***	19.880
Fixed Effects			
Region 1 (Ilocos Region)	-6.086	1991	3.475
Region 2 (Cagayan Valley)	1.545	1994	2.498
Region 3 (Central Luzon)	0.540	1997	0.259
Region 4 (Southern Tagalog)	-0.354	2000	1.544
Region 5 (Bicol Region)	-2.214	2003	-5.302
Region 6 (Western Visayas)	-6.897	2006	-2.474
Region 7 (Central Visayas)	5.306		
Region 8 (Eastern Visayas)	3.392		
Region 9 (Western Mindanao)	0.227		
Region 10 (Northern Mindanao)	3.774		
Region 11 (Southern Mindanao)	1.536		
Region 12 (Central Mindanao)	-2.632		
Region 14 (Cordillera Autonomous Region)	1.864		
F Test for No Fixed Effects			5.960***
N		78	
Adjusted R-Squared		0.5652	

***significant at 1%; **significant at 5%; *significant at 10%
a standard errors are White's heteroskedasticity consistent

5. Conclusions and Recommendations

The above findings and arguments say a lot about the drivers of the saving patterns of Philippine agricultural households and how these economic activities could be improved. Doing so could benefit not only agricultural households but also the agricultural sector as a whole and other people in the country as well.

Agrarian reform remains a significant consideration to agricultural households. This impacts on their saving as implied in the two final econometric models, in which land distribution is significantly and positively related to saving. Steps must therefore be taken in order to have more land distribution

accomplished. This could address not only mass sentiments but also the saving behaviors of the said households. The finding that remittances is not a significant determinant of agricultural household saving cannot be disregarded. This finding implies that the strength in enhancing agricultural saving probably lies in a potential which the country already has, but which has yet to improve considering foreign counterparts.

Proportion of self-employed agricultural household heads is significantly and negatively related to their saving. This implies the need for more careful planning in developing businesses that cater to agricultural households. It is probably through encouraging more women of agricultural households to join the workforce that agricultural entrepreneurship could improve, and after this agricultural saving just might improve as well. It is noted, though, that proportion of employed wives did not approach statistical significance.

This finding on self-employment, however, applies only to SaveRate1. In SaveRate2, a household head's being self-employed or not is not anymore significant. It may be that income derived from durable goods already says a lot about agricultural household saving. These durables are probably made to not only be part of income, but also generate even more income. Hence, any additional income or expenses brought about by being self-employed might not anymore significantly impact on SaveRate2.

Just like in all households, saving of agricultural households could decrease with increase in the population of young dependents. It is therefore essential that population growth be addressed, for many important reasons other than decline in saving rates. At the same time, programs addressing retirement years and encouraging more saving must be enhanced. As another finding of this study suggests, agricultural households whose heads are older are saving less.

Descriptive data and fixed effects coefficients suggest the decline in aggregate agricultural household saving rates, with the more recent FIES years having the lower and at times even negative values. But as previously discussed, a lot could still be done despite these. That 2006 has higher time effects coefficients and actual saving rates than the preceding FIES year is itself a sign of progress, and this must be maintained at the very least.

Future studies on agricultural household saving patterns may investigate on elderly dependency as a possible determinant of saving rate. As FIES does not have data on number of elderly dependents in the households, the said variable was instead proxied by mean age of household heads, a significant determinant in the two final models. Also, data could be adjusted for cost-of-living since this study involves a comparison of the Philippine regions.

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