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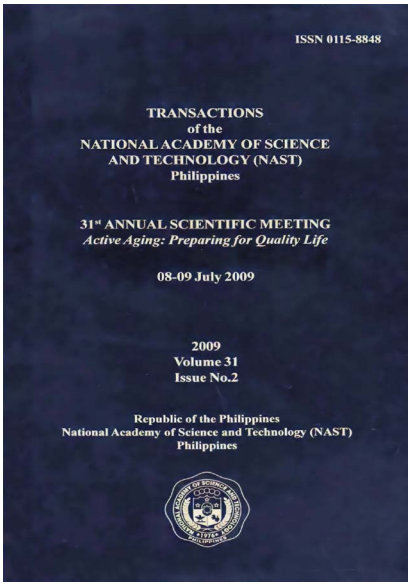

Population Dynamics and Elderly Savings: An Econometric Analysis

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ABSTRACT

The changing age structure of countries has substantial implications on savings and economic growth. In the course of the demographic transition, countries experience an increasing share of the working age population relative to the total population and this creates favorable effects on economic growth. Studies have shown that individuals accumulate savings in their working age years to serve as buffer for retirement. While accumulation of capital can be used to deal with the life cycle deficit, this also influences growth. This paper looks at the implications of the country's population dynamics on the savings of the elderly using econometric models applied to household data from the Family Income and Expenditure Survey. The results show that the saving rate of the elderly is substantially higher compared to the other age groups but has been on the decline since 1997. The accumulation of saving of the elderly is good for economic growth. Looking at the overall picture, however, the country's rapid population growth results in a high percentage of young dependents and this creates a negative effect in the aggregate household saving. While the elderly has higher saving rate, their contribution is not substantial to increase the aggregate saving rate.

Key Words: demographic transition, young dependents, elderly, saving rate, life cycle model,

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INTRODUCTION

The economic growth implications due to the changes in the nation's age structure, resulting from the demographic transition, have been substantial and are of interest in research in the last years. Studies, notably that of Bloom and Canning (2001) and Bloom and Williamson (1998), show that demographic factors have strong and significant effects on economic growth. Demographic transition is described as "a change from a situation of high fertility and high mortality to one of low fertility and low mortality." A country that enters into a demographic transition experiences sizable changes in the age distribution of the population. Demographic transition has three phases and each phase has a different impact on the economy. Phase 1 is triggered by an initial decline in infant mortality but fertility remains high resulting in the swelling of the youth dependency group (aged 0 to 14) as well as demand for basic education and primary health care. This phase creates a big challenge to the economy as it may hinder economic growth. It should be noted that the Philippines has been stuck at the first phase of the demographic transition in the last 40 years. In Phase 2 of the transition, these "baby boomers" enter the adult labor market (some 20 years later) and if the market is able to absorb them, they can accelerate the phase of economic growth. This is the phase when the proportion of working-age population is highest and the age dependency ratio or the ratio of young dependents (0 to 14 years) and elderly (65 years and above) over the working age (15 to 64 years) is lowest. Countries that are currently in Phase 2 of the demographic transition are Thailand, Singapore, Taiwan and South Korea. Phase 3 of the transition is when the elderly cohort (those aged 65 years and above) swells relative to the total population. An example of a country currently Phase 3 of the demographic transition is Japan.

In the course of the demographic transition, countries experience an increasing share of the working age population relative to the total population and this creates favorable effects on the per capita income. Mason and Lee (2006) refer to this effect of the demographic transition to income growth as the "first dividend." The conclusion is that countries with a population structure with heavy concentration at the working–age group

have the advantage of producing high levels of per capita income, all things being the same. It should be pointed out that the "demographic dividend," while essential to economic growth, is not automatic. It should be given the right kind of policy environment to produce a sustained period of economic growth. The critical policy areas are public health, family planning, education and economic policies promoting labor-market flexibility, openness to trade, and good governance. Cross-country and intra-country econometric analyses (Mapa and Balisacan; 2004; Mapa, Balisacan and Briones; 2006) have shown that the Philippines has not benefited from the so-called demographic dividend that is a major contributor to the economic success experienced by East Asian countries from the 1960s to 1990s. Mason (2007) discusses another form of dividend resulting from the changing age-structure of the nation's population and refers to it as the second demographic dividend. The second dividend results from the society's response to the prospect of an aging population, an outcome as the nation's age structure enters into Phase 3 of the demographic transition. The challenge faced by societies (and governments) when there is a substantial percentage of the elderly population is on how to support their consumption, given a reduction in their income. There are common approaches to this problem. This includes: (a) relying on public (or familial) transfer systems and (b) increasing saving rates and accumulating greater physical wealth or capital. Individuals accumulate saving in their working years and this serves as buffer during the retirement years. While accumulation of capital can be used to deal with the life-cycle deficit in the older ages, this capital also influences economic growth. As Mason points out, it is when society increases its saving rate that results in a more rapid economic growth -- creating the second demographic dividend.

This paper shows the link between population dynamics and the elderly savings in the Philippines using household data from the Family Income and Expenditure Survey (FIES). The research is motivated by the fact that unlike its neighbors, the Philippines has once again failed to benefit from the second demographic dividend, where high saving rate lead to an even higher economic growth. The study makes use of econometric models

to explain the connection between the population dynamics on the hand and household saving rate on the other hand, using econometric models. The econometric model is based on the augmented life-cycle model. The relationship between population dynamics and saving rate is integrated in the life-cycle model of consumption proposed by Modigliani (1986). The life-cycle model predicts that both demographic variable and productivity growth will generate saving—the young saves while elderly dis-saves and if it is assumed that the population is stationary with incomes of the young the same as the income of the old, then saving and dis-saving will be equal and opposite (Deaton, 1992). However, a different picture is shown if a country enters into a demographic transition. During the first phase of the demographic transition the young dependent population (aged 0 to 14) is growing more relative to the working-age population (aged 15 to 64) resulting in higher household consumption, which in turn diminishes the rate of saving (Coale and Hoover, 1956). During Phase 2 of the demographic transition, working-age population is growing relative to young dependent population and results in higher saving rate. The saving patterns of households are obtained using the relevant data from the family income Family Income and Expenditure Survey (FIES) for the years 1985, 1988, 1991, 1994, 1997, 2000 and 2003. The number of households surveyed is presented in Table 1. Furthermore, the regional classification uses the fourteen regions (defined in the 1988 FIES) and is presented in Table 2.

Table 1. Sample households by FIES year

FIES Year	Number of Sample Households
1985	16,971
1988	18,922
1991	24,789
1994	24,797
1997	39,520
2000	39,615
2003	42,094

Source: Family Income and Expenditure Survey (FIES) Data, National Statistics Office (NSO)

Table 2. Regions in 1988 Family Income and Expenditure Survey (FIES)

Region 1	Ilocos Region
Region 2	Cagayan Valley
Region 3	Central Luzon
Region 4	Southern Tagalog
Region 5	Bicol Region
Region 6	Western Visaya
Region 7	Central Visayas
Region 8	Eastern Visayas
Region 9	Western Mindanao
Region 10	Northern Mindanao
Region 11	Southern Mindanao
Region 12	Central Mindanao
Region 13	National Capital Region
Region 14	Cordillera Autonomous Region (CAR)

Source: Family Income and Expenditure Survey (FIES) Data, NSO

Household saving rather than aggregate saving is the focus of this paper. This treatment allows the analysis of saving behavior under the life-cycle model by region. The FIES data supports these objectives. Aggregate saving computed from macro-economic data such as Gross Domestic Product (GDP), Regional GDP (RGDP), and the flow of funds data cannot provide micro-level data needed for such an analysis. This is the same reason for the use of household saving rather than aggregate saving in Attanasio and Szekely's (2001) study. The following operational definition of household saving and saving rate, respectively, is used in the study:

1. Saving + (Aggregated income of all households - Aggregated expenditure of all households)

$$2.\ \textit{Saving rate} = \frac{\textit{(Aggregated income of all households - Aggregated expenditure of all households)}}{\textit{Aggregate income of all hoouseholds}} \times 100$$

Total family income and total family expenditure of the FIES are used in computing saving and saving rate. Total family income includes total wages and salaries, pensions, dividend from investments, interests, rentals, cash receipts/gifts/support from domestic and international sources, net share of crops, and income from family sustenance activities as well as receipts from others sources not elsewhere classified. In order to compare saving

across FIES years, the data is deflated using the consumer price index (CPI) (1997=100). Further, the Cost of Living Index (reference=NCR) developed by the Asia Pacific Policy Center (APPC) was used to adjust savings to compare it across the regions. From the 2006 FIES, household saving rate nationwide is 15.21%. In 1997, it was 20%. This is lower than the recorded household saving rate of Thailand of 30% and Taiwan of 49% in 1996 (Attanasio and Szekely, 2001). Moreover, the household saving rate has been in the downward trend since 1997, as shown in Figure 1.

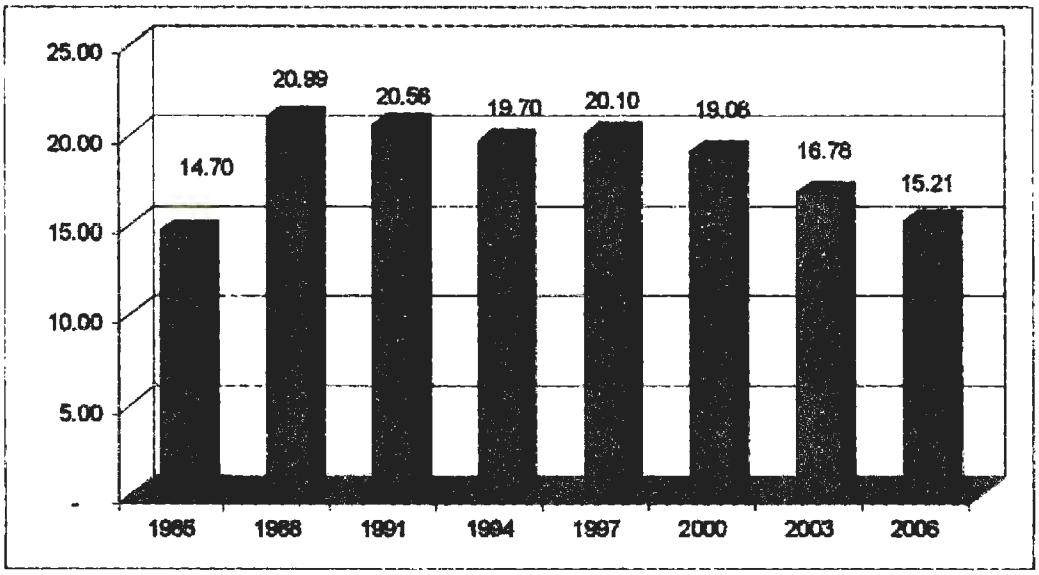

Figure 1. National Household Saving Rate from 1985 to 2006
Source: Family Income and Expenditure Survey (FIES), National Statistics Office

ECONOMETRIC MODELS FOR SAVING RATE

The basic econometric model for aggregate saving is the two-way error component fixed effects model where,

$$y_{it} = \alpha_i + \lambda_t + \underline{x}_{it}'\underline{\beta} + \varepsilon_{it} \quad i = 1,2,...,14 \qquad \textit{and} \qquad t = 1,2,...,6$$

In the model, y_{it} is the saving rate of Region i in time t, the vector $\underline{x}$ represents the determinants of saving discussed above, β is the vector of coefficients, α_i represents the regional and unobservable fixed effect, λ_t denotes the unobservable time effect and ε_{it} is the random error term

assumed to be normally distributed with mean 0 and constant variance σ^2_ε. The coefficient β is estimated using the Generalized Least Squares (GLS). The variable of interest in the econometric model of saving rate is the aggregate regional household saving rate. The variable is defined as,

$$S_{it} = \left(\frac{I_{it} - C_{it}}{I_{it}} \right) * 100 \qquad i = 1,2...,14; \quad t = 1,2,...,6$$

where S_{it} is the aggregate household saving rate of the i^{th} region at time t;
I_{it} is the aggregate (total) household income of the i^{th} region at time t; and,
C_{it} is the aggregate consumption (expenditure) of the i^{th} region at time t.

The data source for the aggregate regional household saving rate is the Family Income and Expenditure Survey (FIES) done in 1988, 1991, 1994, 1997, 2000 and 2003 (time periods). The data set is a panel data with 6 time periods corresponding to the FIES years and 14 cross-sectional units equivalent to the 14 Regions as defined in 1988. Although there are currently 17 Regions, the geographical boundaries of the regions were kept constant throughout the period 1988 to 2003. The 14 Regions are given in Table 2. In the construction of an econometric model for the saving rate, defined above, the following variables are identified as possible determinants:

1. Percentage of young dependents (aged 0 to 14 years), over the total population, at the beginning of the period.
2. Percentage of the elderly (aged 65 and above), over the total population, at the beginning of the period.
3. The percentage of household heads having at least high school diploma to capture the effects of education.
4. The percentage of women (15 years and above) in the labor force.
5. Life Expectancy (at birth) in years (at the start of the panel period).
6. Annual average growth rate of per capita Gross Domestic Product (in 1985 prices) over the previous 5 years (in percent) of the period (example for 1988 panel, the average growth rate of GDP from1983 to 1987 was used) will be used.
7. Annual regional inflation rate (in percent).
8. Average number of branches of banks in the region (using the average of three years: the FIES year, a year before and after the FIES year).

9. The number of closed banks during the same three years was also included as a determinant of saving rate.
10. The natural logarithm of the initial regional per capita GDP (measured in 1985 prices).
11. Percentage of income from abroad defined as aggregated household income (assistance) from abroad over total household income.

Moreover, the institutional and cultural differences across regions can be accounted for by allowing regional fixed effects in the estimation.

EMPIRICAL ANALYSIS OF THE MODEL

The average regional household saving rate from 1988 to 2003 is 18.48% (Table 3). In 2003 and 2006, the average household saving rates were even lower at 16.78% and 15.21%, respectively. To explain what drives household saving rate, an econometric model was built using panel data. The results of the two specifications using the Generalized Least Squares (GLS) are provided in Table 4.

Table 3. Summary Statistics for the Variables in the Econometric Model

VARIABLE	Mean	Maximum	Minimum	Std Dev.
Saving rate	18.48	25.72	9.40	3.46
Log of initial income	9.15	10.33	8.49	0.44
Education	36.37	62.14	22.82	9.05
Percentage of young dependents	39.2	45.43	32.06	3.24
Percentage of Elderly	4.54	6.61	2.20	1.17
Log of Life Expectancy	4.18	4.26	4.09	0.04
Female Labor Force Participation	49.46	64.86	34.94	5.92
Household Income from Abroad (in %)	7.00	15.16	1.21	3.45
Inflation Rate	7.81	16.43	0.70	3.45
Number of Banks	410	2651	65.00	526
Number of Closed Banks	3.34	3.83	0.00	19.00

Table 4. Determinants of Regional Household Saving Rate (a) Dependent variable is aggregate regional household saving rate. (Panel Data; Fixed Effects Model).

Variable	MODEL 1		MODEL 2	
	Coefficient	s.e. [α]	Coefficient	s.e. [α]
Log of initial income	5.3985**	2.6732	6 9796*	2.8851
Education	0.2734*	0.153	0.2728	0.1643
Proportion of young dependents	-0.3645**	0.1743	-0.3747*	0.2078
Proportion of elderly	2.37989***	0.5592	2.1166***	0.6841
Female labor force participation	-0.0373	0.0933	-	-
Log of life expectancy	22.5994	22.8262	-	-
Percentage of Income from abroad	0.5559***	0.2306	0.4405**	0.1941
Inflation Rate	-	-	-0.1977	0.1957
Constant	-134.95	89.6475	-54.7563*	29.9182
N	84		84	
Adjusted R-squared	0.69		0.7	

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

In model 1 (base model), the determinants include initial per capita GDP, level of education, the demographic variables, female labor force participation, longevity variable (life expectancy), and the proportion of income from abroad. The two demographic variables have significant but opposite signs. On the one hand, the percentage of young dependents has a negative and significant effect on saving rate which is consistent with the life cycle model and supports earlier studies that slowing population growth has been associated with high savings in East Asia (Harrigan, 1998). On the other hand, the percentage of the elderly population has a significant but positive effect on saving rate. Under the life-cycle model, in the absence of bequest motive, the elderly population should be dis-saving. However, the data from the regional panel say otherwise. The result for the elderly population in the model runs in contrast with the result of the cross-country saving rate regression where it was found that "presence of large proportion of elderly people in the population depresses saving rate, with the effect of the old being particularly large" (Bloom, Canning and Graham; 2003). The income and education variables have both positive and significant effects on saving rate which are consistent with the earlier studies. The

percentage of income from abroad is also positive and significant driver of saving rate, while the female labor force participation and measure of longevity are not significant. Another variation of the model is given in model 2 where inflation rate is incorporated into the regression model and the two insignificant variables (female labor force participation and life expectancy) are excluded in the model. The results show that inflation rate does not play a significant role in determining aggregate saving rate.

A potential problem in the regression specification is the potential reverse causation from the saving rate to the level of income. Growth studies have shown that saving rate is a key variable in determining the speed of economic growth and the steady state level of income. There is also potentially a feedback from saving to education, implying that higher saving may give rise to higher level of education. To solve the problem, we use instrumental variables, treating income and education as potentially endogenous. The instrumental variables used are initial geographical conditions (percentage of provinces in the region that are landlocked), percentage of households with access to electricity, and measures of inequality. Table 5 shows two specifications of the models using regression with instrumental variables. In model 3, the number of closed banks is incorporated to include presence of financial infrastructure (other variants of the model which also included the number of bank branches in the region was found to be insignificant).

Table 5. Determinants of Regional Household Saving Rate (b) Dependent variable is aggregate regional household saving rate. (Panel Data; Fixed Effects Model, Instrumental Variable).

Variable	MODEL 3		MODEL 4	
	Coefficient	s.e. $^{\alpha}$	Coefficient	s.e.$^{\alpha}$
Log of initial income	6.9440**	2.711	6.9795**	2.8851
Education	0.2674*	0.1573	0.2703*	0.1508
Proportion of young dependents	-0.3322**	0.1626	-0.3406**	0.1395
Proportion of elderly	2.0694***	0.6106	2.0273***	0.5498
Percentage of Income from abroad	0.4727***	0.1744	0.5054***	0.1565
Inflation Rate	-0.2076	0.2001	-0.2001	0.1952
Number of Closed Banks	0.0015	0.0842	-	-
Constant	-53.93**	22.99	-53.9899**	25.2887
N	84		84	
Adjusted R-squared	0.7		0.7	

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

The results in models 3 and 4 are somewhat the same as the previous two models with level of income, education, percentage of young dependents, percentage of the elderly and percentage of income from abroad as being significant drivers of saving rate. Moreover, the results produced mixed results when it comes to the demographic variables, with the percentage of young dependents (aged 0 to 14 years) having a negative and significant impact on aggregate household saving rate while the proportion of the elderly (aged 65 years and above) has a positive and significant impact on the aggregate household saving rate. A one-percentage point reduction in the proportion of young dependents results in an increase in the average saving rate by 0.34 percentage point, while a one percentage point increase in the proportion of the elderly results in an estimated increase of 2.03 percentage points in the average saving rate, all things being the same.

Econometric Model for the Elderly

After analyzing the relationship between the population dynamics and the household saving rate using regional panel data, the researchers also investigated the impact of the presence of young dependents on the saving rate of the elderly headed households. This was done by extracting only information from the FIES that are relevant to the elderly headed households. The results from the econometric model, shown in Table 6 below, support the previous models. It shows that presence of household members less than 15 years (young dependents) reduces the average saving rate of the elderly headed household, all things being the same. The model also shows that an increasing household size also creates negative effect on the average saving rate of the elderly headed household. The variables that are positively and significantly related with the saving rate of the elderly are income of the houschold (in natural logarithm) and gender of the household head, with female headed household having a higher average saving rate than male headed household.

Table 6. Determinants of Elderly Saving Rate Dependent variable is elderly household saving rate. (Pooled Cross Section Data (1985 to 2006)

Variable	MODEL 5	
	Coefficient	s.e.
Log of initial income	10.9466***	0.1373
Household Members less than 15 years old	-1.5868***	0.1053
Gender of Household Head	1.2223***	0.2712
Household Size	-0.1374***	0.0148
Percentage of Income from abroad	0.0023	0.0075
Constant	-100.8019***	1.4890
Year indicator variables are all significant at the 1% level with 1988 positive, 1991 to 2006 all negative; Base year is 1985		
*** significant at 1% level		
n	50638	

CONCLUSION

The results of the econometric model suggest that the Philippines' population dynamics play an important role in the aggregate household's saving rate. The high proportion of young dependents creates a negative effect in the aggregate household saving -- it decreases the overall household saving rate. The elderly increases the aggregate household saving but their contribution is not substantial to increase the overall saving rate. For the elderly headed household, the number of young dependents reduces the household saving rate. This suggests that the country pays a high price for its high population growth through lower saving rate and consequently, lower economic growth. Achieving a slower rate of population growth should be an explicit development objective of the country. Lower rates of childrearing will substantially increase the incentives for saving as experienced by East Asian countries like Singapore, South Korea, Taiwan and Thailand.

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