Population Dynamics and Household Savings: Evidence from the Philippines

Dennis S. Mapa[1] and Lisa Grace S. Bersales[2]

Abstract

The economic growth implications due to changes in the nation's age structure have been substantial. 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. The changing age structure also influences household saving rate. Household saving rate in the Philippines is one of the lowest in East Asia. This paper looks at the impact of the slow demographic transition in the Philippines on its aggregate household saving rate using panel data from the Family Income and Expenditure Survey (1985 to 2003). The econometric model is based on the augmented life cycle model and the results suggest that the country's population dynamics play an important role in its household saving rate. The Philippines' rapid population growth formed a big bulge at the lower portion of the age pyramid that resulted in a higher percentage of young dependents. The data suggests that the country's high population growth resulted in low household saving rate and consequently, low economic growth. The study also shows that remittances from migrant workers are a major source of aggregate household savings.

Keywords: Demographic transition, household saving rate, augmented life cycle model, population dynamics

1. 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 recent 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

1 Associate Professor and Director for Research, School of Statistics, University of the Philippines Diliman. Email address: cdsmapa@yahoo.com.

2 Professor, School of Statistics, University of the Philippines Diliman.

of the population. Demographic transition has three phases and each phase has a different impact on the economy. Phase one is triggered by an initial decline in infant mortality but fertility remains high resulting in the swelling of the youth dependency group (0 to 14 years) as well as the demand for basic education and primary health care. This phase poses a big challenge to the economy as it may hinder economic growth. It should be noted that the Philippines has been stuck in the first phase of the demographic transition for the last 40 years. In the second phase 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 the second phase of the demographic transition are Singapore, South Korea, Taiwan, and Thailand. The third and last phase of the transition occurs when the elderly cohort (65 years and above) swells relative to the total population. An example of a country currently at the third phase 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 changing age structure interacts with the life cycle of production and consumption. Young (ages 0 to 14 years) and elderly (ages 65 years and above) members of the population produce less than they consume while the working age adults (ages 15 to 64 years) produce more than they consume. Hence countries having 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. However, the impact of the first dividend is conditioned on policies related to the labor market; that is, how wages and labor force participation rates react to the rapid increase in the working-age population. 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 the third phase of the demographic transition. A challenge faced by societies (and governments) when there is a substantial percentage of the elderly population is how to support their consumption,

given a reduction in their income. There are several approaches to this problem. These include: (a) relying on public (or familial) transfer systems and (b) increasing saving rates and accumulating greater physical wealth or capital. Individuals accumulate savings in their working age years which serve as buffer during their retirement years. While accumulation of capital can be used to deal with the life cycle deficit in the older years, this capital also influences economic growth. As Mason points out, when society increases its saving rate, it also experiences more rapid economic growth – resulting in the second demographic dividend.

The link between savings, population, and economic growth is inherent in the neoclassical growth model of Solow (1956) and Swan (1956). In the model, output per worker is determined only by two variables: capital per worker and the level of technology. The production function is described by, $Y_t = F[K_t, A_t L_t]$ where K_t is the physical capital, L_t is labor and A_t is the labor-augmenting technical progress. The constant return to scale assumption means that the production function can be expressed in intensive form (in per worker or per capita form), $\frac{Y}{AL} = F\left[\frac{K}{AL}, 1\right]$ or y = f(k), where k is the capital per worker and y is the output per worker. Labor and knowledge grow at constant exogenous rates, $\dot{L}_t = nL_t$ and $\dot{A}_t = gA_t$. Capital accumulation is determined by savings, $S_t = sY_t$, where s is fixed. The condition for a change in capital stock is that, $\dot{K}_t = sY_t - \delta K_t$, where δ is the depreciation rate. The fundamental result of the Solow-Swan model is,

$$\dot{k}_t = sy_t - (n + \delta)k \ ,$$

where the first term on the right side of the equation is the amount of new capital being provided each period by the average worker. The second term is indicative of the effective depreciation rate for the capital-labor ratio. If the saving rate is zero, then the capital per person will decline partly because of the depreciation of capital (at rate δ) and partly due to an increase in the number of persons (at the rate n). If savings exceed the necessary amount to equip new workers, then the capital-labor ratio increases and capital-deepening occurs (Lee, Mason and Miller (LMM), 2001).

The model yields three important implications that relate savings, population, and economic growth. First, an increase in the saving rate or a decrease in the population growth yields a higher equilibrium output per worker. Second, an increase in the saving rate or a decrease in the population growth produces a transitory increase in the growth rate of output per worker. And lastly, at the steady state neither saving rate nor population growth rate has an impact on the rate of growth of output per worker.

The two sources of capital-deepening in the Solow-Swan model that experienced high economic growth rates from the 1960s up to the 1990s (LMM, 2001) are: (a) rise in saving rate and (b) decline in population growth have been observed in the East Asian economies (Singapore, South Korea, Taiwan, and Thailand). Using the cross-country data, Mapa and Balisacan (2004) show that the average gross domestic saving ratios during the period 1975 to 2000 for these countries are 28% for Thailand, 32% for South Korea, and 44% for Singapore. The gross domestic saving (GDS) rate of the Philippines for the same period is only 22%.

This paper looks at the link between population dynamics or the changing age structure and the saving rate in the Philippines using aggregate (regional) household panel data generated from the Family Income and Expenditure Survey (FIES) from 1985 to 2003. The research is motivated by the fact that unlike its neighbors, the Philippines has failed to benefit from the second demographic dividend, where high saving rates lead to an even higher economic growth. The study makes use of econometric models to explain the connection between the population dynamics and household saving rate. The econometric model is based on the augmented life cycle model.

The remainder of the paper is organized as follows: Section 2 presents empirical studies and simulated results on the population dynamics-saving rate-economic growth nexus in the countries that experienced demographic transition. Section 3 presents a profile of household savings in the Philippines using data from the 1985, 1988, 1991, 1994, 1997, 2000 and 2003 FIES. The theoretical framework of the econometric model for saving rate using panel data is discussed in Section 4. Section 5 presents the empirical results and Section 6 states the conclusion.

2. Population Growth-Saving Rate-Economic Growth: Country Studies

The relationship between population dynamics and saving rate is integrated in the life cycle model of consumption. Modigliani (1986) asserts "the self-evident proposition that the representative consumer will choose to consume at a reasonably stable rate, close to his anticipated average life consumption." The life cycle model predicts that both demographic variables and productivity growth will generate saving–the young save while the elderly dissave; and if it is assumed that the population is stationary with the income of the young the same as the income of the old, then saving and dissaving will be equal and opposite (Deaton 1992). However, a different picture emerges if a country enters into a demographic transition. During the first phase of the demographic transition the young dependent population (ages 0 to 14

years) is growing faster relative to the working-age population (ages 15 to 65 years) resulting in higher household consumption, which in turn diminishes the rate of savings (Coale and Hoover 1956). During the second phase of the demographic transition, working-age population is growing faster relative to the young dependent population resulting in higher saving rates.

A series of empirical studies based on cross-country aggregate-level panel data show that demographic factors have a strong and statistically significant effect on aggregate savings [Bloom, Canning, and Graham (2003); Deaton and Paxson (2000), and Kelly and Schmidt (2007)]. Country-specific studies also validate the results of the cross-country studies. One such example is the series of studies that used similar data sets for Taiwan. Williamson and Higgins (WH 2001) and Kelly and Schimdt (KS 1996) have shown that changes in the age structure over the demographic transition brought about an increase in the gross national saving rate of Taiwan by 25 percentage points (KS 1996) to 45 percentage points (WH 2001). Using the same data for their analysis, LMM (2001) estimated only about 14.5 percentage points increase in saving rate due to age structure. LLM (2001) suggest that the seemingly high impact of demographic factors on household saving rate, particularly that of WH, is due to the fact that the authors essentially relate all the increase in the household saving rate to the demographic transition. LLM argues that there are short-term fluctuations in the household saving rate that are non-demographic related. On the other hand, Deaton and Paxson's (2000) estimate of the increase in household saving rate in Taiwan induced by the demographic transition is around 6.5 percentage points only. Deaton and Paxson's analysis indicates that most of the increases in the household saving rate experienced in Taiwan are due to non-demographic factors, which they ascribe to changes in cohorts and time effects (LLM 2001). While there is a need to reach a consensus on the impact of demographic factors on household saving, empirical results suggest that the estimated rise in household saving rate accounted for by the demographic transition is economically significant.

LMM (2001) also made use of simulations to compare the impact of saving rate (due to the demographic factors) on per capita income in Latin America and Taiwan. The comparison is relevant because while the fertility decline in Latin America begun in about the same year as in Taiwan, the transition to replacement fertility took 60 years in Latin America compared to 30 years in Taiwan. The simulation results show that the Latin American scenario resulted in the same per capita income level as that in Taiwan but several decades later. The authors concluded that for countries that experience rapid demographic transitions, the saving rates remain high for several decades corresponding to a rapid increase in the per capita income growth.

Another simulation analysis of Mason (2001) using household data from Taiwan shows that the high rate of savings and investment resulting from the demographic transition accounts for 18% of the increase in the output per worker during the period 1960 to 1990, supporting the notion of the second demographic dividend (higher saving rate due to the demographic transition). Both the first demographic dividend (from the gap between population and labor force growth or the translation component), and the second demographic dividend account for about 27.7% of the increase in the per capita output in Taiwan. In Mason's simulation, using the middle-of-the-road estimate of the saving effects, the second demographic dividend (18%) is even higher than the first demographic dividend (9.7%).

Mason (2007) uses simulations to estimate the wealth accumulation of three countries, India, Japan, and the United States during the course of the demographic transition. These countries have experienced demographic transitions in various periods: India from 1975 to 2000, Japan from 1950 to 1980, and the United States during the period 1850 to 1940. Noting that wealth is accumulated during the working age years, Mason introduces the concept of total life cycle wealth or the wealth held by all individuals older than the age at which the accumulation process begins which the author estimates to be at 50 years. Mason assumes that surplus at younger working age is transferred to children for their consumption and thus wealth accumulation starts only when the person reaches the age 50 when the transfer to children stops. (Note that in the case of the Philippines, the intergenerational support stops at an age higher than 50.) Data from the 2000 Census of Population and Housing (CPH) show that more than half (57%) of the elderly population (60 years and above) are household heads. Moreover, about 72% of the elderly household head supports at least one family member (other than his/her spouse). There are even elderly household heads (12%) that support more than eight family members, mostly children and grandchildren. Mason's simulations show that by 1950, the United States life cycle wealth relative to total income is four times that of India and about twice that of Japan. During this period, Japan's simulated life cycle wealth begins to increase very rapidly and that by 1975, the ratio of life cycle wealth to output is 6.0 in Japan and only 3.6 in the United States. In the case of India, the simulated life cycle wealth increased very slowly until recently. The ratio of life cycle wealth to income did not reach 1.0 until 1985 (Japan reached this milestone in 1940 and the United States in 1905).

In the same paper, Mason also provides estimates of the effects of the two demographic dividends on the average per capita GDP growth of the three countries. The first dividend is due to the translation effect on income growth (faster rate of working-age population compared to the total population) and the second dividend is due to the effect of capital accumulation on income growth. For Japan, during the period 1950 to 1980, the simulations show that

of the average yearly per capita GDP growth rate of 6.23%, the first dividend accounts for 0.63% and the second dividend accounts for 1.72%. The two dividends due to demographic transition account for 37.7% of the yearly average per capita growth rate of Japan. Using the data from the United States from 1850 to 1940, the simulations show that the first dividend and the second dividend account for 0.27% and 0.62%, respectively, of the average yearly per capita GDP growth rate of 1.55% (57.6% of the actual). For India during the period 1975 to 2000, the simulations show that the first and second demographic dividends account for 0.34% and 1.02%, respectively, of the yearly average per capita GDP growth rate of 2.98%.

In another cross-country analysis, using data from 112 developing economies and 22 industrial economies for the period 1965 to 1995, the World Bank (1999) shows that an increase in the share of the young dependents in the population tends to reduce private savings. The study pointed out that an increase in the young age dependency ratio of 3.5 percentage points leads to about a one percentage point decline in private savings. The study concluded that "developing countries undergoing a demographic transition, in which the working-age population is a large and growing share of the population, may witness a transitory increase in their saving rates."

In the Philippines, Rodriguez and Meyer (1988) examined the saving behavior of 1000 rural households using data gathered by the Agricultural Credit Policy Council (ACPC) of the country in 1987. The authors found that factors such as income, household size and education of the household head, among others, played significant and positive roles in raising savings among rural households. Bautista and Lamberte (1990) analyzed the saving behavior of rural and urban households in the Philippines using data of 17,495 households from the 1985 FIES, and found that the marginal propensity to save for households in Metro Manila is lower than that for households in any other region (except Region 2). The study also showed that at a given income level, rural households generally save more than urban households. Moreover, the marginal saving rate of rural households increases more rapidly as they move up from low- and middle-income groups to the high-income group compared to the urban households. Both studies, however, did not include demographic variables in their econometric models.

3. Household Saving Profile in the Philippines (1985 to 2003)

The saving patterns of households obtained using the relevant data from the FIES for the years 1985, 1988, 1991, 1994, 1997, 2000 and 2003. The number of households surveyed is presented in Table 1. 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: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years.

Table 2 **Regions in the 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: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years.

Households are also categorized by per capita income deciles at the national and regional levels in the case of regional profiles. Accordingly, households are first ranked nationwide according to their per capita income and then categorized into the income deciles. This classification was maintained even in the regional profiling of saving behavior. Household savings rather than aggregate savings are the focus of this paper. This treatment allows the analysis of saving behavior under the life cycle model and for the different per capita income deciles as well as by region. The FIES data supports these objectives. Aggregate savings computed from macroeconomic data such as Gross Domestic Product (GDP), gross regional domestic product (GRDP), 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 savings rather than aggregate savings in Attanasio and Szekely's (2001) study.

The following operational definitions of household savings and saving rate, respectively, are used in the study:

1. Saving = (Aggregated income of all households – Aggregated expenditure of all households)

2. Saving rate = $\frac{\text{Saving}}{\text{Aggregated income of all households}} \times 100$

Total family income and total family expenditure of the FIES are used in computing savings 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 other sources not elsewhere classified.

The definition of savings used in this paper has been fully discussed (e.g., Attanasio and Szekely, 2001). However, as in other studies, this definition of savings has been used due to the limitations in the collection of data of household consumption of durables. Another operational definition of savings is to take out from expenditures the amount of durables and other items consumed which may be viewed as household investment. In the FIES questionnaire, however, no disaggregation of such items is done.

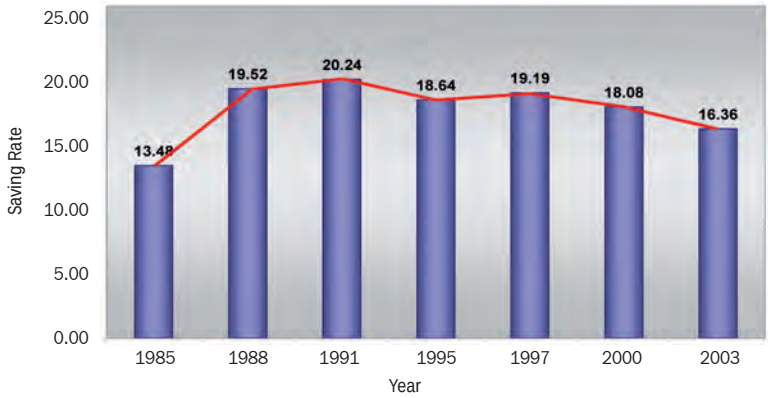
In order to compare savings across FIES years, the data is deflated using the consumer price index (CPI) (1997=100). The Cost of Living Index (reference=NCR) developed by the Asia Pacific Policy Center (APPC) was used to adjust savings to compare it across the regions.

A. Saving Rate

Based on 2003 FIES, household saving rate nationwide is 16%. In 1997, it was 19%. This is lower than the recorded household saving rate of Thailand of 30% and Taiwan of 49% in 1996 (Attanasio and Szekely, 2001). Recent years' saving rates are higher than the 1985 level. However, from 1997, a downward trend is noted, as shown in Figure 1.

The downward trend in household saving is generally reflected by the saving rates across the different national per capita income deciles, except for the highest income decile, whose saving rate increased in 2003 from 2000. Table 3 further shows that the bottom 20% reflects dissaving. It is also noted from this table that the income decile with the highest saving rate is 1.7 times that of the second-ranking income decile and is more than twice that of the other income deciles. Table 3 and Figure 2 present the saving rates and visual illustration of the saving patterns, respectively.

Figure 1 **National Saving Rate, FIES Years 1985 to 2003**



Source: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years.

Table 3 **Household Saving Rate by FIES Year and National Per Capita Income Decile**

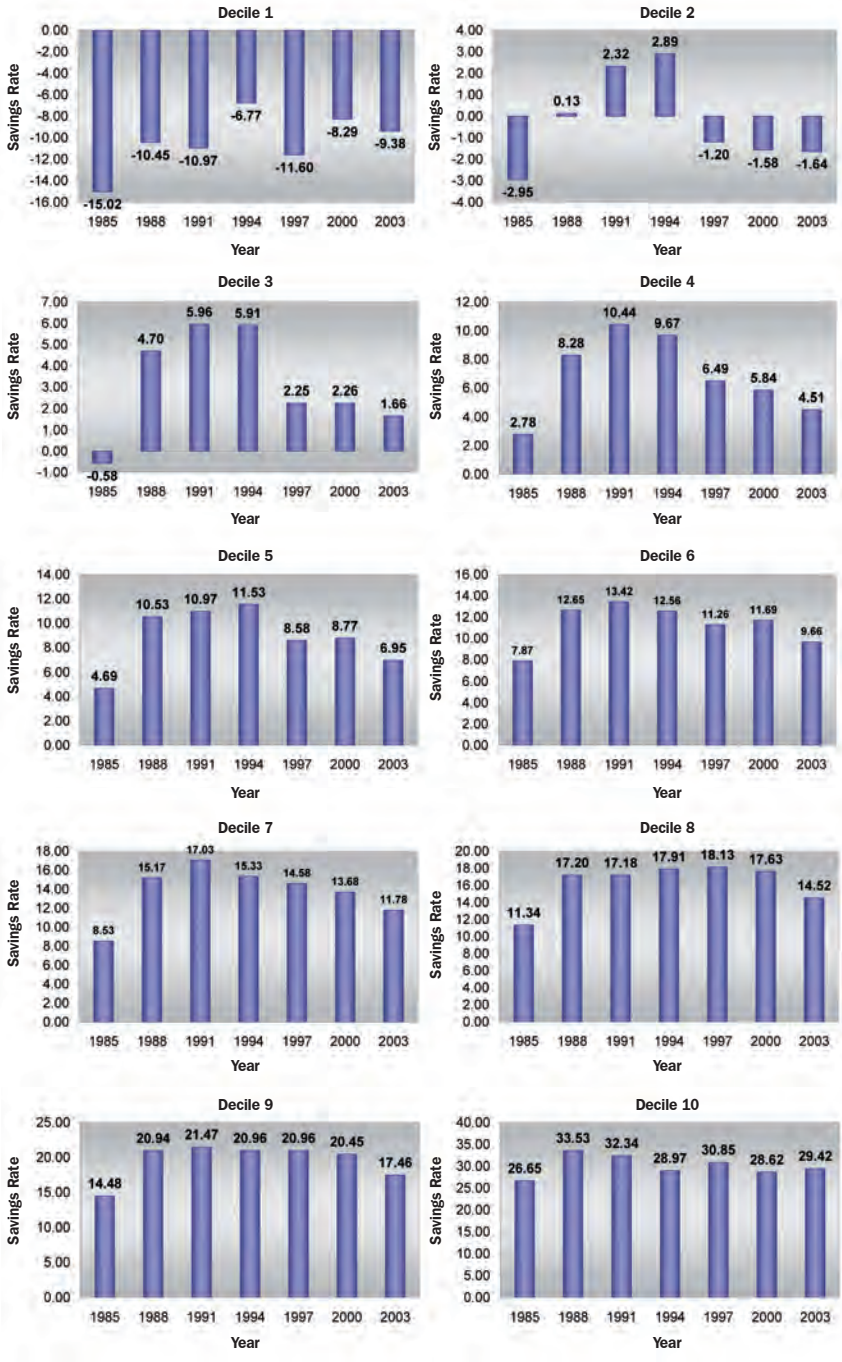
FIES Year	National Per Capita Income Decile									
	1	2	3	4	5	6	7	8	9	10
1985	-15.02	-2.95	-0.58	2.78	4.69	7.87	8.53	11.34	14.48	26.65
1988	-10.45	0.13	4.70	8.28	10.53	12.65	15.17	17.20	20.94	33.53
1991	-10.97	2.32	5.96	10.44	10.97	13.42	17.03	17.18	21.47	32.34
1994	-6.77	2.89	5.91	9.67	11.53	12.56	15.33	17.91	20.96	28.97
1997	-11.60	-1.20	2.25	6.49	8.58	11.26	14.58	18.13	20.96	30.85
2000	-8.29	-1.58	2.26	5.84	8.77	11.69	13.68	17.63	20.45	28.62
2003	-9.38	-1.64	1.66	4.51	6.95	9.66	11.78	14.52	17.46	29.42

Source: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years

B. Life Cycle Profiles

The FIES data collected by the National Statistics Office (NSO) is a pooled data set of households where a sample of predetermined number of households is collected every three years. The FIES series does not collect genuine panel data of a household, that is, the FIES is not a collection of data from the same household through time. The lack of panel data creates a problem in the analysis of household savings since savings is a dynamic phenomenon. To assuage this problem, the authors made use of the synthetic cohort techniques pioneered by Browning, Deaton, and Irish (1985) and adopted by Attanasio and Szekely (2001) in their analysis of household saving in East Asia and Latin America.

Figure 2 **Household Saving Rate by FIES Year for Different Income Deciles**



Source: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years.

The basic idea of the synthetic cohort analysis is to follow the average behavior of a group of households, rather than the individual household. The group membership is assumed to be fixed over time. This strategy allows the author to study the dynamic behavior of the average household saving rates through time. In the study of the aggregate household savings, the synthetic cohort analysis is used, by grouping the different households, according to the age group of the household head, from different FIES years (1985 to 2003) and the average behavior of these groups are assumed representative of cohort behaviors through time. This type of analysis is, however, not immune to problems as pointed out by Attanasio and Szekely (2001), particularly the endogeneity of family formation and dissolution, differential mortality and migration rates across the different socio-economic groups.

Table 4 shows the national saving rate by age group. It is noted that those aged 85 and above are the ones with the higher saving rates. The regions with the highest saving rates in these age groups are Ilocos Region, Western Visayas, and Southern Luzon. Those with ages 70 to 74 follow with a nationwide saving rate of 24.6%. The region having the highest saving rate for this age group is NCR. The next age groups with saving rate 20% or more are those with ages 50 to 64. The regions with the highest saving rates for these age groups are Southern Mindanao, NCR, and Northern Mindanao. In younger age groups, the regions with highest saving rates are Eastern Visayas, Ilocos Region, Cordillera Autonomous Region (CAR), and NCR.

Table 4 **Nationwide Saving Rate, by Age Group: FIES Years 1985-2003**

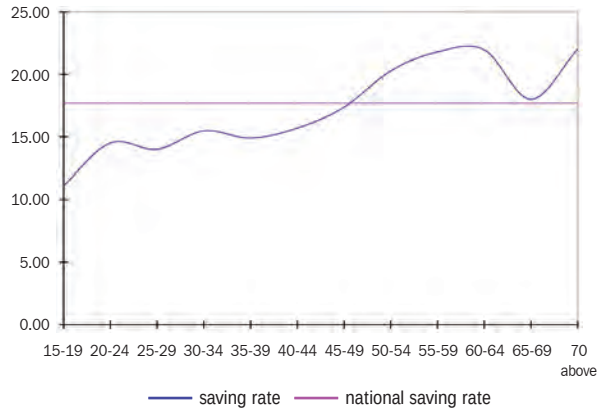
Age Group	Average Saving Rate for all Regions	Highest Regional Saving Rate	Region with Highest Saving Rate
15-19	11.1	30.1	Eastern Visayas
20-24	14.5	20.8	Ilocos Region
25-29	14.0	18.3	Cordillera Autonomous (CAR)
30-34	15.5	19.6	National Capital (NCR)
35-39	14.9	19.2	Cordillera Autonomous (CAR)
40-44	15.7	19.4	Eastern Visayas
45-49	17.4	20.7	Cagayan Valley
50-54	20.3	32.8	Southern Mindanao
55-59	21.8	26.0	National Capital (NCR)
60-64	22.0	32.2	Northern Mindanao
65-69	18.0	26.8	Cordillera Autonomous (CAR)
70-74	24.6	32.2	National Capital (NCR)
75-79	18.9	27.5	Central Mindanao
80-84	19.0	28.9	Western Mindanao
85-89	21.3	30.2	Ilocos Region
90-94	22.2	32.3	Western Visayas
95-99	28.7	37.2	Southern Luzon

Notes: Highest Saving Rate = 28.7%; Lowest Saving Rate = 11.1%;
Standard Deviation = 4.4; C.V. = 23.5

Source: National Statistics Office, Philippines: Family Income and Expenditure Survey data, various years.

The life cycle model is validated by the FIES data as shown in Figure 3.3, except for the age group 70 years and above, that failed to exhibit the expected dissaving. The information in this figure is derived from the data for the FIES years 1997 to 2003. It should be highlighted that the saving rate peaked at the age group 50 to 64 years, which is relatively late compared to Taiwan and Thailand. In both these countries, savings start its peak at 40 to 44 years. The 2000 Census of Population and Housing revealed that 72% of the Philippine population belonged to ages 34 years and below, while only 8% belonged to the age group, 50 to 64 years. Thus, the household saving rate was substantial at least for the years covered by this analysis.

Figure 3 **Household Saving Rate by Age Group of Head of Household (1997 to 2003)**

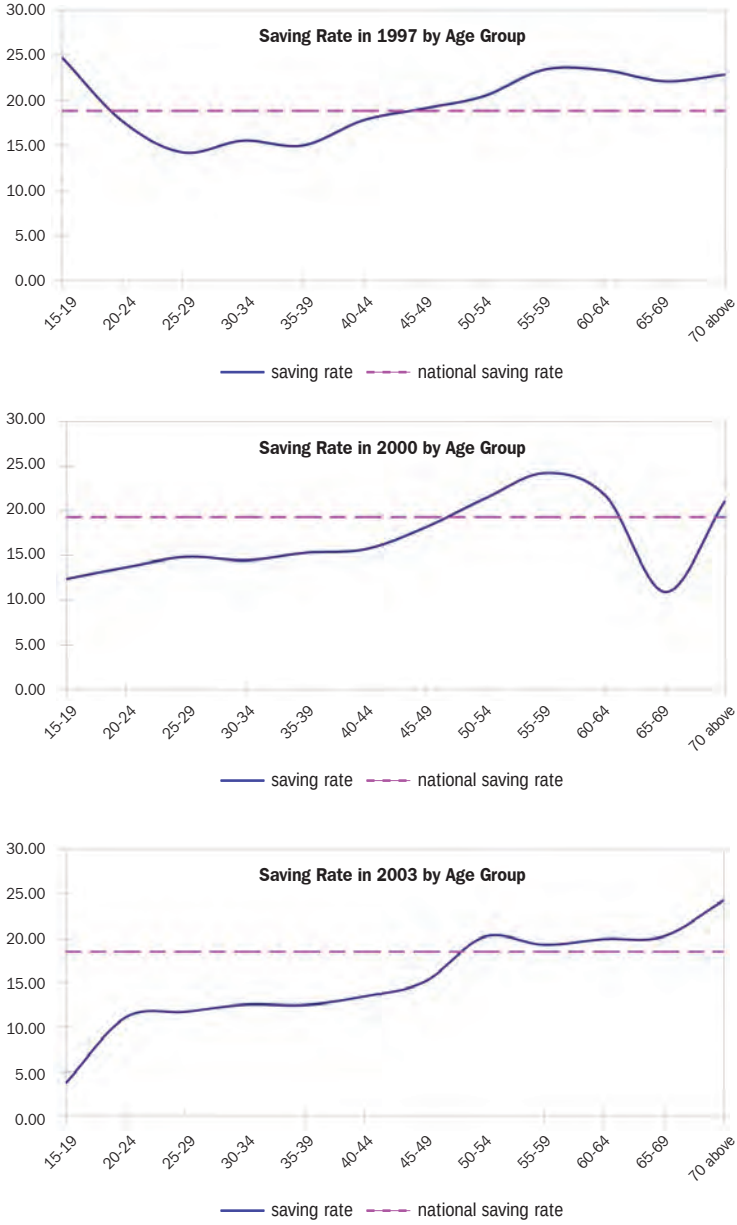


The upward blip of saving rate for age group 70 years and above appears to hold using annual data as shown in Figure 4. In 1997, the life cycle pattern of savings peaked at age group 55 to 59 years. The other deviation of the 1997 data is that the age groups 15 to 19 and 20 to 24 years saved more compared to the older age groups. Except for this, the annual data for 2000 and 2003 had younger age cohorts saving less and older age groups having higher saving rates.

4. Econometric Models for Saving Rate

This section discusses the theoretical framework of the econometric model for saving rate. A set of possible explanatory variables are identified, based primarily on the life cycle model, and augmented with other determinants of saving rate as suggested by the available literature on saving.

Figure 4 **Household Saving Rate by Age Group of Head of Household (by FIES Years, 1997, 2000, 2003)**



The standard theoretical model that explains much of household saving behavior is the so-called intertemporal utility optimizing agent model (commonly known as the life cycle model). In this model, the household chooses its current consumption and savings, and an asset portfolio, so as to smooth its utility over time. There are several representations of this standard theory and the one provided here follows that of Coleman (1998). In this model, the household solves the following problem:

$$\text{maximize}_{C_t, A_t} \; E_t\left[U\left(C_t, C_{t+1}, ..., C_T; B\right) \middle| Z_t, Z_{t+1}, ...Z_T\right]$$

$$\text{subject to}: C_{t+s} + A_{t+s+1} = Y_{t+s} + (1 + r_{t+s})A_{t+s} \qquad \text{(i)}$$

where, C_{t+s} is the consumption at time (t + s);

Y_{t+s} is the income at time (t + s);

A_{t+s} is the asset held at the beginning of the period (t + s);

Z_{t+s} are variables affecting utility of consumption such as household size;

B is a bequest left to younger generation, $B \geq 0$;

r_{t+s} is the interest rate at time (t + s);

U is the utility function; and,

E_t is the expectation operator taken at time t.

The utility function U is assumed to be inter temporally additive,

$$U\left(\left(C_t, C_{t+1}, ..., C_T; B\right) \middle| Z_t, Z_{t+1}, ...Z_T\right) = \sum_{s=0}^{T} \beta^s v(C_{t+s}). \qquad \text{(ii)}$$

This particular assumption means that consumption is instantaneously enjoyed as it takes place and is independent of consumption at other times. The discount rate β indicates the patience of the consumer and is assumed to be less than one indicating that households prefer a marginal peso spent now than a marginal peso spent later.

The utility function $v(C_t, Z_t)$ is assumed to be quadratic in which households are risk-neutral. The model is known as the certainty equivalence model (Hall; 1978). Letting $v(C_t, Z_t) = v(C_t/\alpha(Z_t))$, where $\alpha(Z_t)$ is an equivalence scale for the demographic characteristics of the household, the solution to the maximization problem above equates marginal discounted marginal utility across time:

$$\frac{\partial v(C_t / \alpha(Z_t)}{\partial C_t} = E_t\left[\beta(1+r)\frac{\partial v(C_{t+1} / \alpha(Z_{t+1})}{\partial C_{t+1}}\right] \quad \text{(iii)}$$

The equation above implies that optimal consumption depends solely on the person's level of impatience and lifetime resource, the marginal propensity to consume from current income is the same as the marginal propensity to consume from expected future income (for instance, young people expecting higher income later in life will borrow against this income). In each period, the household plans to equate discounted consumption over time and in making that decision, what is important is the household's lifetime income and not current income. Moreover, when $\alpha(Z)$ varies over the life cycle, consumption varies accordingly--rising when there are children and falling as children become independent.

There are several shortcomings of the model above. For one, the elderly do not seem to dissave nearly as much as the model predicts. In fact, empirical evidence suggests that the elderly do save. Research suggests that rising longevity plays an important role in determining national savings. Lee, Mason and Miller (1998, 2000) and Bloom, Canning and Graham (2003) argue that the elderly do not dissave as much as what the life cycle model predicts, primarily because of the need to finance a longer period of retirement (the precautionary motive). These observations have been documented using household data from East Asia. It is therefore important that empirical models of aggregate savings include longevity as a determinant.

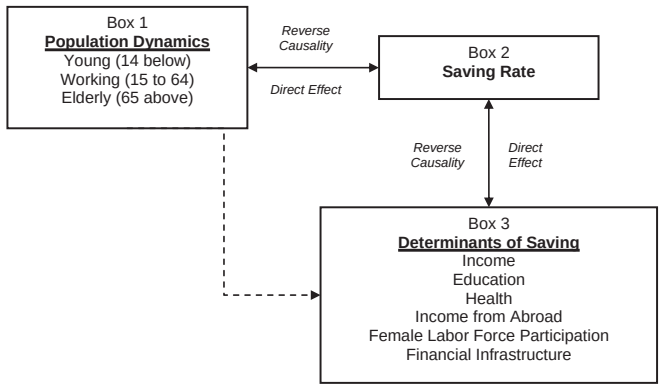
There is empirical evidence that liquidity constraints matter. For example, young people do not borrow against future income because they are concerned that they may not earn what they expect later in life (Coleman 1998). Also, there is an important issue of the bequest motive for saving and accumulating wealth. It is also important to understand why bequests are made since empirical evidence suggests that a large portion of accumulated capital stock results from bequests.

Despite the shortcomings of the life cycle model of saving behavior, it is still useful in providing a picture as to why people save. It is seems that many individuals, especially the better educated, tend to smooth their consumption over their lifetime. Moreover, people do partly save for retirement. However, augmentation of the model to capture some of its shortcomings is needed and might be useful from the point of view of policy.

The framework of the econometric model is given in Figure 3.5. The econometric model estimates the direct effect of the population dynamics, particularly the impact of the young population (0 to 14 years) and the elderly population (65 years and above), on the household saving rate (the impact

of the Box 1 on Box 2). At the same time, the model permits estimates of the effects of other determinants of saving rate (the impact of Box 3 on the Box 2). The reverse causality is represented by the arrow coming from growth (Box 2) going to the population dynamics (box 1) and the other determinants of growth, notably education (Box 3). This reverse causality creates a problem in the estimation of the regression model, resulting in biased and inconsistent estimates. This problem is remedied through the introduction of instrumental variables into the regression equation.

Figure 5 **Theoretical Framework of the Econometric Model**



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

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

Here, y_{it} is the saving rate of Region i in time t, the vector $\underline{\boldsymbol{x}}$ represents the determinants of saving discussed above, $\underline{\boldsymbol{\beta}}$ 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 $\underline{\boldsymbol{\beta}}$ is estimated using the Generalized Least Squares (GLS).

A. Variable of Interest

The variable of interest in the econometric model of saving rate is the aggregate regional household saving rate from 1988 to 2003. The variable is defined as,

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

$$t = 1,2,...,6$$

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 FIES of 1988, 1991, 1994, 1997, 2000 and 2003 (time periods). The data set consists of 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 as defined in 1988 are as follows:

Ilocos Region	Eastern Visayas
Cagayan Valley	Western Mindanao
Central Luzon	Northern Mindanao
Southern Tagalog	Southern Mindanao
Bicol Region	Central Mindanao
Western Visayas	National Capital Region (NCR)
Central Visayas	Cordillera Administrative Region (CAR)

B. Determinants of Aggregate Savings

In the construction of an econometric model for the saving rate, defined above, the following variables are identified as possible determinants.

1. Age Structure/Demographics

The average saving rate can be written as the sum of the saving rates of the different age groups in a population weighted by their income shares. That is, the average saving rate is,

$$\bar{s} = \sum_{i=0}^{T} s_i \frac{Y_i}{Y} = \sum_{i=0}^{T} s_i \frac{P_i}{P} \frac{y_i}{\bar{y}} \qquad \text{(v)}$$

This decomposition suggests that the age structure of the population matters. In theory (in the absence of a bequest motive), the dissaving of the elderly should offset the saving of the young so that in a stable population there will be no aggregate saving. However, as argued by Bloom, Canning and Graham (2003), if the age structure of the population is unbalanced, which happens during a demographic transition, the saving behaviors of

the various cohorts do not cancel out and aggregate saving (or dissaving) is expected.

The variables used to represent age structure (at the beginning of the period) are the youth share of the population and the elderly share of the population and are defined as follows:

i. Percentage of Young Dependents (aged 0 to 14 years), over the total population, at the beginning of the period; and,
ii. Percentage of the Elderly (aged 65 and above), over the total population, at the beginning of the period.

2. Level of Education

Empirical evidence suggests that schooling transition towards higher levels is one reason for the diverging saving patterns between Latin American countries (Mexico and Peru) and East Asian countries (Taiwan and Thailand). More educated individuals usually have higher incomes, and thus, higher saving capacity and this may be the potential factor behind differences in domestic savings.

iii. The percentage of household heads having at least high school diploma would be used to capture the effects of education on aggregate savings.

3. Female Labor Force Participation

Fertility and female labor participation are usually jointly determined, and they have a double effect on saving behavior--lower fertility rates imply fewer children in the average household, while higher participation implies more household members in the work force and thus, more income.

iv. To capture this effect, the percentage of women (15 years and above) in the labor force would be used.

4. Longevitiy

In addition, longevity raises the saving rates of every age group. This suggests that an addition of some function of life expectancy to the relationship is necessary.

v. Life Expectancy (at birth) in years (at the start of the panel period) would, therefore, be added in the econometric model as a possible determinant of aggregate savings.

5. Growth Tilting

Economic growth increases the relative income of the young and it not only increases average savings but also increases the effect of having a large young cohort. This leads to a phenomenon known as "growth tilting", making the impact of a large young cohort on savings larger in a fast-growing economy.

vi. To capture the effect of this determinant, 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.

6. Inflation

Periods of high inflation tend to be associated with highly negative real rate of interest and may deter opportunities for saving.

vii. Therefore, annual regional inflation rate (in percent) will be added in the econometric model as determinant of aggregate savings.

7. Presence of the Financial Infrastructure

Presence of financial infrastructure in the regions, such as number of banks, investment houses and other financial institutions can promote saving among households. However, problems encountered by these financial institutions such as closed banks can create a negative perception among the households and may be a disincentive for saving. In the econometric models, the researcher use appropriate proxies to measure the presence of financial infrastructure in the regions.

viii. The presence of financial infrastructure in the regions is measured using the 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); and
ix. The number of closed banks during the same three years was also included as a determinant of saving rate.

8. Initial Level of Income/ Initial Level of Income Growth

The magnitude of life cycle savings may depend on the region's income level (or initial income growth level) to capture the relationship of life cycle saving with the level of regional development.

x. The natural logarithm of the initial regional per capita GDP (measured in 1985 prices) shall be used to capture this relationship.

9. Remittance (Income transfer from abroad)

The model is also interested in looking at the contribution of remittances to the savings of the households. The data source for income transfer is the FIES.

xi. Percentage of income from abroad defined as aggregated household income (assistance) from abroad over total household income would be included in the model.

10. Institutional and Cultural Differences

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

C. Empirical Analysis of the Model

The average regional household saving rate from 1988 to 2003 is 18.48% (Table 5). In 2003, the average household saving rate was even lower at 16.36%. The household saving rate of the Philippines pales in comparison with its neighboring countries in East Asia such as Taiwan and Thailand where the household saving rates were recorded at 30% for Thailand (in 1996) and 49% in Taiwan (in 1996).

Table 5 **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	39.20	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	526
Number of Closed Banks	3.34	3.83	0.00	19.00

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 3.6.

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 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 dissaving. 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 the "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.

Table 6 **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	

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

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) 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 savings may give rise to higher levels 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 7 shows two specifications of the models using regression with the 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 7 **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. α	Coefficient	s.e.α
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.

The econometric model suggests that average per capita income is positively and statistically related to saving rate, supporting the life cycle hypothesis. The results from Model 4 (the preferred model) shows that a 100-peso increase in the average per capita income leads to an increase in the estimated mean saving rate by about 0.67 percentage point, all things being the same.

Education is an important determinant of saving rate, supporting earlier studies in other East Asian economies. A one percentage point increase in the proportion of household heads with at least high school diploma increases the estimated mean saving rate by about 0.27 percentage point.

The results are mixed when it comes to the demographic variables, with the percentage of young dependents (ages 0 to 14 years) having a negative and significant impact on aggregate household saving rate while the proportion of the elderly (ages 65 years and above) has a positive and significant impact on the aggregate household saving rate. A 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 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.

The study also confirms that remittance is one major source of aggregate household savings. A percentage point increase in income from abroad results in an increase in the estimated mean saving rate by about half percentage point, ceteris paribus. However, neither the rate of inflation (included in Models 3 and 4) nor the number of banks (included in Mmodel 3) in the region plays a significant role in determining the aggregate saving rate.

5. Conclusion

The simulation results of the econometric model suggest that the Philippines' population dynamics play an important role in the aggregate household saving rate. A high proportion of young dependents (ages 0 to 14 years) creates a hindrance to the expansion of aggregate household saving, supporting the life cycle hypothesis on saving. The country, with its rapid population growth over the years, exhibits a big bulge in the lower portion of the age pyramid which resulted in a higher percentage of young dependents compared to the working population (ages 15 to 64). The swelling of the young dependency group also increases the demand for education and health which results in lower levels of aggregate savings. This suggests that the country's unabated high population growth rate through the years have resulted in lower saving rates and consequently, lower economic growth rates.

Achieving a slower rate of population growth should be an explicit development objective of the government. Lower rates of childrearing will substantially increase the incentives for saving as experienced by East Asian countries like Singapore, South Korea, Taiwan and Thailand.

An interesting result from the econometric model is the fact that the older population (ages 65 and above) still saves, contrary to the expectation of the life cycle model. This phenomenon has also been documented in studies in other Asian countries such as Taiwan and Thailand. Unfortunately, in the Philippines, as in other countries, there are cases when the elderly are being victimized by various forms of "investment scams". This suggests that efforts should be made to create awareness among the elderly regarding proper

investment. The financial institutions should provide financial instruments that will fit the needs of the elderly population.

Education is also vital to increasing aggregate household savings. Policy-wise, efforts should be made to reduce the gender gap in education. These policies should encourage women to participate in the labor force.

Remittances are a major source of aggregate household savings as the econometric model shows. However, remittances can also be a disincentive for saving as these are withdrawn immediately to settle bills and to purchase consumer goods. Policy-wise, efforts should be made to encourage both the migrant workers and the remittance beneficiaries to save a portion of the remittances in secure financial intermediaries. Financial institutions should develop saving products that would be attuned to the needs of the lower income migrant workers.

Acknowledgments

The authors are grateful to Deputy Governor Nestor A. Espenilla, Jr. of the Bangko Sentral ng Pilipinas (BSP) for his support in this research on household saving. The authors benefited from discussions with Arsenio M. Balisacan and Ramon L. Clarete as well as the participants of the 11th International Convention of the East Asian Economic Association (EAEA) held in Manila, the participants of the roundtable discussions held at the School of Statistics, UP Diliman, and BSP for their comments and suggestions. The authors are thankful to Kristine Joy S. Briones for excellent research assistance and the Asia Pacific Policy Center (APPC) for providing the data used in the econometric models and an anonymous referee for comments and suggestions. Errors and omissions are sole responsibilities of the authors.

References

Attanasio, O.P. and Székely, M. (2001), "Household saving in developing countries: Inequality, Demographics and all that. How different are Latin America and South East Asia?" Working Paper No. 427, Inter-American Development Bank.

Bautista, R.M. and Lamberte, M.B. (1990), "Comparative Saving Behavior of Rural and Urban Households in the Philippines" Working Paper 90-15, Philippine Institute for Development Studies.

Bloom, D. and Canning, D. (2001), "Cumulative Causality, Economic Growth, and the Demographic Transition." In Birdsall, N., A. C. Kelly and S.W. Sinding, eds. *Population Matters, Demographic Change, Economic Growth and Poverty in the Developing World.* Oxford University Press.

Bloom, D.E., Canning, D. and Graham, B. (2003), "Longevity and Life-Cycle Savings." *Scandinavian Journal of Economics* 105: 319–38.

Bloom, D.E. and Williamson, J.G. (1997), "Demographic Transitions and Economic Miracles in Emerging Asia." Working Paper 6268, National Bureau of Economic Research.

Browning, M., Deaton, A., and Irish, M. (1985), "A Profitable Approach to Labor Supply and Commodity Demands over the Life Cycle," *Econometrica* 53-3: 503-543.

Browning, M., and Lusardi, A. (1996), "Household saving: macro theories and micro facts." *Journal of Economic Literature* 34: 1797-1855.

Coale, A.J. and Hoover, E.M. (1958), "Population Growth and Economic Development in Low-Income Countries." Princeton: Princeton University Press.

Coleman, A. (1998), "Household Savings: A Survey of Recent Microeconomic Theory and Evidence." Working Paper 98-8, New Zealand Treasury.

Deaton, A. S. (1992), "Understanding Consumption." Oxford: Oxford University Press.

Deaton, A. S. and Paxson, C.H. (2000), "Growth, Demographic Structure, and National Saving in Taiwan." In Chu, C. Y. Cyrus and Ronald Lee, eds. *Population and Economic Change in East Asia, Population and Development Review*, a supplement to Volume 26: 141-73.

Hall, R. (1978), Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy* 86(6): 971-987.

Horioka, C.Y. and Wan, J. (2006), "The Determinants of Household Saving in China: A Dynamic Panel Analysis of Provincial Data." Working Paper No. 12723, National Bureau of Economic Research.

Kelly, A.C. and Schmidt, R.M. (1996), "Saving, Dependency and Development." *Journal of Population Economics* Vol. 9: 365-86.

Kelly, A. C. and Schmidt, R.M. (2007), "Evolution of Recent Economic-Demograhic Modeling: A Synthesis." In Mason, A. and Mitoshi Yamaguchi, eds. *Population Change, Labor Markets and Sustainable Growth: Towards a New Economic Paradigm.* Elsevier.

Lee, R.D., Mason, A. and Miller, T. (1998), "Saving, Wealth and Population." Paper presented at the Symposium on Population Change and Economic Development at the Bellagio Center, Lake Como, Italy, November 1998.

Lee, R.D., Mason, A. and Miller, T. (2000), "Life Cycle Saving and the Demographic Transition: The Case in Taiwan." In Chu, C.Y. Cyrus and Ronald Lee, eds. *Population and Economic Change in East Asia, Population and Development Review*, a supplement to Volume 26: 194-223.

Lee, R.D., Mason, A. and Miller, T. (2001), "Saving, Wealth, and the Demographic Transition in East Asia." In Mason, Andrew, ed. *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized.* Stanford: Stanford University Press.

Mapa, D. and Balisacan, A. (2004), "Quantifying the Impact of Population on Economic Growth and Poverty: The Philippines in an East Asian Context." In Sevilla, L.A., ed. *Population and Development in the Philippines: The Ties That Bind.* AIM Policy Center.

Mapa, D. S., Balisacan, A.M. and Briones, K.S. (2006), "Robust Determinants of Income Growth in the Philippines." *Philippine Journal of Development*, Volume XXXIII, Nos. 1-2: 1-32.

Mason, A. (2001), "Population and economic growth in East Asia." In Mason, Andrew, ed. *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized.* Standford: Standford University Press.

Mason, A. (2007), "Demographic Dividends: The Past, the Present and the Future." In Mason, Andrew and Mitoshi Yamaguchi, eds. *Population Change, Labor Markets and Sustainable Growth: Towards a New Economic Paradigm.* Elsevier.

Mason, A. and Lee R. (2006), "Reform and support systems for the elderly in developing countries: Capturing the second demographic dividend." *Genus (Journal of Population Sciences)* Volume 62 No. 2: 11-35.

Modigliani, F. 1986. Life cycle, individual thrift, and the wealth of nations. *American Economic Review* 76: 297-313.

Paxson, C. H. (1995), "Saving and Growth: Evidence from Micro Data." Working Paper No. 5301. National Bureau of Economic Research.

Radelet, S., Sachs, J. and Lee, J. (1997), "Economic Growth in Asia." *Emerging Asia: Changes and Challenges.* Asian Development Bank.

Rodriguez, J.A.A. and Meyer, R. L. (1988), "The Analysis of Saving Behavior: The Case of Rural Households in the Philippines." Working Paper 88-12, Agricultural Credit Policy Council.

Solow, R. (1956), "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* 70:65-94.

Swan, T. (1956), "Economic Growth and Capital Accumulation." *Economic Record* 32:334-361.

Williamson, J.G. and Higgins, M. (2001), "The Accumulation and Demographic Connection in East Asia." In Mason, Andrew, ed. *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized.* Stanford: Stanford University Press.

World Bank. (1999), "Why Do Savings Rates Vary Across Countries?" *World Bank Policy and Research Bulletin* Volume 10, No. 1:1-4..

Young, A. (1995), "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience." *Quarterly Journal of Economics* 110: 641-680.