NÚMERO 186

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INCOME SMOOTHING OVER THE LIFE CYCLE: FAMILY LIVING ARRANGEMENTS AND THE WELFARE OF PERUVIAN HOUSEHOLDS

Resumen

Presentamos evidencia que indica que los hogares peruanos no suavizan consumo a lo largo del ciclo de vida a través del típico mecanismo de ahorro-desahorro. (hipótesis del ciclo de vida-HCV). En vez de eso, los hogares peruanos hacen arreglos intergeneracionales de vivienda que les permiten suavizar el ingreso del hogar.

Calculamos los efectos edad, generación y año para variables relacionadas a estructura del hogar y ahorro, utilizando seudo-paneles de hogares peruanos. La identificación de los efectos año y generación se logra utilizando el método de variables instrumentales propuesto en Heckman y Robb (1985). Se encuentra evidencia de diferencias significativas en el tamaño de los hogares, por nivel de educación, que sugieren que la reducción en fecundidad no ha alcanzado a los menos educados. Ajustes intergeneracionales de vivienda juegan un papel importante a lo largo del ciclo de vida, en el sentido que las familias extendidas son más comunes entre hogares con jefes muy jóvenes (menos de 25) y muy mayores. Estos arreglos familiares generan confusión respecto al significado de la jefatura del hogar a lo largo del ciclo de vida, dado que el jefe auto-reportado deja de ser el principal generador de ingresos conforme éste va envejeciendo.

El análisis del ahorro del hogar nos muestra que estos ajustes en la estructura del hogar a lo largo del ciclo de vida limitan la viabilidad de explicar el comportamiento de los hogares peruanos a partir de la HCV, aún luego de controlar por diferencias en el tamaño del hogar. Se encuentra evidencia que los hogares peruanos utilizan los arreglos familiares mencionados para suavizar el ingreso del hogar.

Abstract

We present evidence that Peruvian households do not smooth consumption over the life cycle through the typical saving-disaving mechanism. (life cycle hypothesis-LCH) Instead, they smooth household income through intergenerational living arrangements.

We calculate age, cohort and year effects for variables related to household structure and savings using pseudo-panels from Peruvian households. The identification of the age-cohort effects is attained using the instrumental variable approach proposed in Heckman and Robb (1985). We find evidence of important differences in household size by educational level, that suggests fertility reductions have not reached the less educated. Family living arrangements play an important role over the life cycle, in the sense that extended families are more common for households with very young (less than 25) and elder household heads. These living arrangements add confusion to the meaning of headship over the life cycle, since self-reported heads stop being main income earners as they age.

The analysis of household savings shows that adjustments in household structure over the life cycle limit the ability of the LCH to explain their behavior, even after controlling for changes in household size. We find evidence that Peruvian households use intergenerational family living arrangements to smooth income over the life cycle.

Introduction[1]

Countries all over the world have moved from a relatively high fertility – high mortality scenario towards a low fertility – low mortality one over the twentieth century.[2] At different times and paces, they have all moved in that direction, although huge differences remain. Industrialized countries, for instance, currently enjoy an average life expectancy of 75 years, and a fertility rate of about 2 children per woman. (UNICEF, 1995, 1996). Four decades ago, these countries already had a life expectancy of 68 years and a fertility rate of 2.6, figures most of the developing world have not reached even during the nineties, despite spectacular advances in many developing countries.

How do these demographic changes affect the social and economic performance of a country? A direct demographic effect is the change in the age composition of the population. With high fertility and high mortality, population grows faster and each new generation is larger than the previous one resulting in a very young population.[3] Later, as fertility falls, and lower mortality implies that more people lives longer, the population ages. Consequently, we move from a high children dependency rate towards a high elder dependency rate. The demographic transition is characterized as a situation in which reductions in the number of newborn outweigh the increments in the number of elders, and this happens because the latter are a very small portion of the population at the beginning of the process. During the transition, though, total dependency rate, the sum of the two, is lower.

During the first stage, the most critical issue is how to deal with children, for instance, in terms of investments in their nutrition, health, and education. During the demographic transition, the total dependency rate is relatively low and resources can be used to improve the welfare of all the population. As the final stage approaches, the issues move towards how will the society manage to sustain the elderly. This is a particularly important challenge in the future of developing countries considering

1. This research has been developed under the project "A Dynamic Analysis of Household Decision-making in Latin America: Changes in household structure, female labor force participation, human capital and its returns" funded by the Regional Research Center Network of the IADB. This version has benefited from helpful comments by Orazio Attanasio, Miguel Székely, and all participants of the IADB workshop that took place in Mexico D.F. in March 1999. The authors also acknowledge the valuable research assistance by Tami Aritomi and Eduardo Maruyama. Usual disclaimer applies.

2. Generally, though, the decline in mortality rates has preceded the decline in fertility rates by several decades.

3. Actually, if infant mortality is too large, or life expectancy is too low, in a country, then lower mortality means more children or more women living all the way through her fertile years. Thus, at very high mortality, reductions in mortality might actually imply a younger population. This effect does reduce the effect of mortality on aging but it is not that important at the current level of development of most countries.

that the proportion of the population under any kind of formal pension system is not that high.

The demographic transition does not only affect the patterns of inter-generational transfers. (see Duryea and Székely, 1998) but also intra-household production, investment and consumption strategies. With lower fertility rates, households on average might have more resources per child, and that might result in higher investments per child in education, for instance. Also, as women have to devote less time to child rearing activities, they might also invest more in their education, and participate more in the labor market.

An important issue in developing countries is that, in the absence of an efficient public system of social security, households have implemented social networks to reduce the effect of shocks and care for the dependent member of the family. These social networks allow to implement inter-generational transfers in the form of cash, or may imply changes in the household structure (Subbarao, et. al., 1995). For instance, family arrangements may include mechanisms such as the junction of two families in one household. A young married couple might decide to live with their parents in order to offer proper care to their offspring. Alternatively, elders might join their children's household so that they can support them during his/her retirement years. An important question, less treated in the literature, is how would these arrangements be affected by the demographic transition described above.

Aggregate evidence on the Peruvian demographic transition show an ongoing aging process for the population.[4] Overall, the Peruvian demographic transition seems to be very similar in timing and speed to that of East Asian & Pacific countries. This result is interesting in the sense that several studies have recently focused on the effects of these changes over the social and economic behavior of individuals and families in countries of that region such as Taiwan. (Lee et. al., 1998; Deaton and Paxson, 1993, 1998) The main difference between Peru and Taiwan is the growth rate of the economies during the periods of analysis. While Taiwan experienced very high growth rates over the last four decades, the Peruvian economy has by the end of the nineties a level of per capita GDP similar to the one they had twenty years before. The lack of growth may imply different effects of the demographic transition on the dynamic economic behavior by Peruvian households.

The goal of this paper is to present micro empirical evidence on the Peruvian demographic transition, and on its differentiated effects by level of education. In this paper, we focus on the analysis of changes in household structure and household savings. For such purpose we use four nationwide household surveys (Peruvian Living Standards Measurement Surveys – PLSMS) applied in 1985, 1991, 1994 and

4. Saavedra and Valdivia (2000) report that the fertility rate in Peru has dropped from 6.8 children per woman in the early sixties to 3.4 in the early nineties. On the other hand, 140 infants died out of every 1,000 born alive in 1960, while that number had dropped to 42 in 1996. Life expectancy for males has increased from 57 to 60 years over the last 20 years. The corresponding figures for females are 66 and 71.

1997. We do not use the small panel that could be constructed with those databases, but instead construct a pseudo-panel by following each cohort over time. Differences across cohorts are the ones more directly related to the demographic transition, so that, we need to identify them separately from the age and year effects that come with the data. Nevertheless, while doing that, we also analyze the life cycle patterns on the variables under analysis, which provide important additional insights.

The remaining of the document is organized as follows. Section II discusses the identification strategy for the age, cohort and year effects proposed in this document, which is based on Heckman and Robb (1995). Section III discusses the estimated age and cohort effects for household size and structure, while section V presents the results for household savings. Section VI ends up with some final remarks.

Disentangling Age, Cohort and Year Effects

As indicated in the previous section, the idea in this paper is to infer the life cycle path and cohort differences for variables such as household size, household structure and savings. It is clear that we can not obtain cohort and life cycle (age) effects from a cross-section of individuals or households, since in that case we observe each generation at a certain age. A panel would be the best case, since we observe each individual at different ages, although we still need to consider that part of the differences across cohorts may be explained by differences in the characteristics of the individuals. The issue is more complicated here since the data available (LSMS) is not a panel but four repeated cross-sections (1985-86, 91, 94 and 97). [5] In what follows, we first describe the factors that are understood to be behind the age-cohort and year effects, and then explain the strategy followed to identify them depending of the characteristics of the variable.

Understanding the Age, Cohort and Year Effects

The age effect is associated with varying abilities or preferences of individuals over the life cycle. For instance, we would expect a hump shape profile for individual log income over the life cycle. Initially, log income increases with productivity as a result of the accumulated experience. The marginal increase diminishes the more experienced the individual, and as the individual ages, he may loose some of his ability to perform certain activities. Consequently, at certain age, income may start to decrease with age, with retirement being the consolidation of such a process. In the case of the labor force participation of females over the life

[5]. See Appendix A for details on the construction of the pseudo-panels used for the analysis presented here.

cycle, fertility decisions are identified as crucial in the expected nature of the age effects.

The identification of the cohort effect is more subtle. The more direct components of the cohort effect refer to behavioral changes, such as those of females from younger cohorts that tend to stay longer in school, have fewer children and work more. For productivity or earnings, the empirical literature for developed countries seems to relate the cohort effect with aggregate factors that affect certain cohorts relatively more. Examples of such factors include:

i) *demographic changes affecting the cohort's size*. The idea is that labor markets for different cohorts are not totally integrated, so individuals that belong to larger cohorts may face more competition, which may have a negative effect over earnings. (MaCurdy and Mroz, 1995) This factor has been particularly important in the case of the American *baby boom*, but also in developing countries with an important rural-urban migration process.

ii) *differences in the access and quality of productivity enhancing public and private goods*. Access and quality of education and health services and nutritional standards during childhood may vary across cohorts as a result of changes in public investments in human capital, or in the economic welfare of the previous generation. Differences in education, health and nutritional investments can affect permanently the productivity of individuals.(Deaton and Paxson, 1993). In the case of Peru, migration to urban areas and the deterioration in the quality of public education and health services would play an important role in the determination of cohort effects among Peruvian households.

Finally, year effects generally capture macroeconomic effects that condition the income generating capabilities of all individuals and households. For the Peruvian data used here, this effect is particularly important since a major long recession occurred between 1985 and 1994. In that sense, the data of 1991 implies lower income and expenditures for all households.

Identifying Age, Cohort and Year Effects

We first discuss here the simplest case, the one in which there are none or negligible age and year effects. That would be the case, for instance, of educational attainment by adult individuals, considering that formal schooling is normally pursued during the first 25 years.[6] We may assume, then, that for individuals older than 25 years old there will not be further changes in educational attainment. Consequently, for these types of variables, we can concentrate on the cohort differences without any concern on age and year effects.

The second case is that of variables that would arguably have age and cohort effects, but negligible year effects. For instance, differences in the number of children among women may come as a result of age differences, since fertility years go from, say, 12 years to about 45 years old, but also to fertility decisions associated

[6]. Excluding training activities that usually continue through adulthood. College education might also continue after that age, but the size of that group is negligible in the sample.

to differences in information and preferences across cohorts. Although the timing of births may be affected by the economic situation of the family in a particular year, that would arguably be less true for the number of children.

What we can do in that case is to mimic a panel by following the different cohorts over the years. By pooling the individuals that were born in 1975, those that were 20 years old in 1985, we can follow the same cohort when they are 26 in 1991, 29 in 1994 and 31 in 1997. We can do the same for the individuals born in 1974, who are 21 in 1985, and so on. Then, we can plot the cohort averages on the age of the individual. This kind of plot does indeed reveal important information on the life cycle path of the variable of interest as has been shown extensively in the literature. (see, for instance, Browning, Deaton and Irish, 1985). Formally, we can obtain the age and cohort effects by running a regression based on the following expression:

$$y(a,c) = \alpha_c D^c + \alpha_a D^a \qquad (1)$$

where D^a and D^c are vectors of dummies identifying the age group and cohort, respectively, at which the individual or household head belongs to.

The issue is that the life cycle path obtained this way is somewhat distorted by the simultaneous presence of cohort and year effects, which may be very important for household savings. In order to estimate a clean life cycle path, we need to control for these other effects. However, that correction is not that simple because of an identification problem that we describe below.

The Identification Problem

The empirical identification of age, cohort and year effects has been vastly discussed in the literature. In general, the empirical analysis is based on the estimation of an expression like (2),

$$y(a,c,t) = \alpha_c D^c + \alpha_a D^a + \alpha_t D^t \qquad (2)$$

where D^a and D^c are defined as in (1), and D^t is a vector of dummies identifying the year in which the household was interviewed. The identification problem is associated to the fact that the three effects are linearly dependent; that is, once we know the cohort at which the individual (household head) belongs to and the year in which he/she was interviewed, we also know exactly his/her age $(a = t - c)$.

A popular solution to this identification problem is to restrict the year effects (α_t). The work by Deaton and Paxson (1993), Attanasio (1998), for example, force the year effects sum to zero and to be orthogonal to deterministic trends.[7] By doing that, we guarantee that any deterministic time trend would be attributed to age and cohort effects and not to time. The limitation of this approach is that it does not make any specific use of all the available information about the nature of age, cohort

7. Actually, Attanasio's procedure is slightly different from that derived from (2), since he assumes a specific functional form for the age effect, a five-degree polynomial on age. See also, Attanasio and Székely (1998).

or year effects for the different variables under analysis. In what follows, we discuss the strategies followed to identify these effects for the variables of interest.

The Proposed Identification Strategy

Business cycle fluctuations are the most common source of the year effect associated to variables such as labor force participation, returns to schooling and savings. Peruvian and international empirical literature presents clear evidence about the procyclical nature of the fluctuations in these variables. For the Peruvian case, the procyclicality of the labor force participation is documented in Terrones and Calderón (1993).

In this sense, it could be argued that the year effect is closely related to the evolution of the per capita GDP. If the per capita GDP has a trend over the period of analysis, the incorporation of this information may generate estimated age and cohort effects significantly different of those obtained using the identification restriction of Deaton and Paxson (1993) and Attanasio (1998). Heckman and Robb (1995) show that the latent variable model would provide an appropriate framework to operationalize the inclusion of this type of information. We could first generalize (2) as follows,

$$y(a,c,t) = P_a + E_c + M_t \tag{3}$$

where P_a denotes the age effect, E_c denotes the cohort effect, and M_t denotes the year effect, which are assumed to be linearly dependent. Although all these effects are actually unobservable, we may know their functional form, say, those in (4)-(6).

$$P_a = f(Z_a;\theta_a) + \eta_a \tag{4}$$

$$E_c = g(Z_c;\theta_c) + \eta_c \tag{5}$$

$$M_t = h(Z_t;\theta_t) + \eta_t \tag{6}$$

where Z_a , Z_c , and Z_t denote the vectors of observable variables that affect the age, cohort and year effects, respectively. η_a, η_c, η_t are the error terms associated to unobservable variables or measurement error, $E(\eta_j / Z_j) = 0$, $j = a,c,t$, and $E(\eta'\eta) = \sum$. Since we do not observe the age-cohort-year effects, we cannot run the regressions in (4)-(6). What we can do, though, is to replace them in (3), and estimate the reduced form equation. We do that here by specifying the functional forms for the three effects as presented in (4')-(6'):

$$P_a = \alpha_a D^a + \eta_a \tag{4'}$$

$$E_c = \alpha_c D^c + \eta_c \tag{5'}$$

$$M_t = \alpha_t Y_t + \eta_t \tag{6'}$$

where Y_t is the log per capita GDP for year t. That is, we assume no specific functional form, nor specific observable variable associated to the year and cohort

effects. We do solve the identification problem in (2) by assuming that the log of per capita GDP is a good proxy of the year effect. Then, we estimate the age and cohort effects by running the following regression:

$$y(a,c,t) = \alpha_a D^a + \alpha_c D^c + \alpha_t Y_t + \eta_{act} \quad (7)$$

where $\eta_{act} = \eta_a + \eta_c + \eta_t$.

We use this particular identification strategy, but add more structure to the econometric models to control for certain important other effects. For instance, the age and cohort effects for family size and savings are obtained by estimating a variant of (7) that considers differences across levels of education (3 in the case or urban households and 2 in the case of rural households). We also allow for different year effects, as approximated by the log per capita GDP, depending on the nature of the "centro poblado" (urban/rural). The estimation of age and cohort effects for the returns to schooling adds additional controls, such as the individual experience, among others.

Another issue is that, for certain variables, the relevant unit of analysis is not the individual but the household. That would be the case, for instance, for savings. In such a case, we can use the age and cohort of the household head as reference, but such a solution is affected by household formation decisions over the life cycle. Changes in household size as a result of the birth of a child, or the moving away of an older son/daughter as a result of marriage can potentially affect the life cycle path. This issue is addressed later where necessary.

Household Structure Decisions

We analyze here the age and cohort patterns of household size and age composition, as well as important household decisions. In particular, we analyze the household decision to host more than one nuclear family, and in that case, the decision on who is reported as the head of the household.

Family size

In this section we analyze age and cohort effects that are behind family size patterns, by level of schooling of the self-reported head. We assume that year effects are unimportant for this variable. Following the general methodology in section II.2, we estimated the following regression for each educational level:

$$FS = \alpha_0 + \sum_i \alpha_{1i} A_i + \sum_i \alpha_{2i} C_i \quad (8)$$

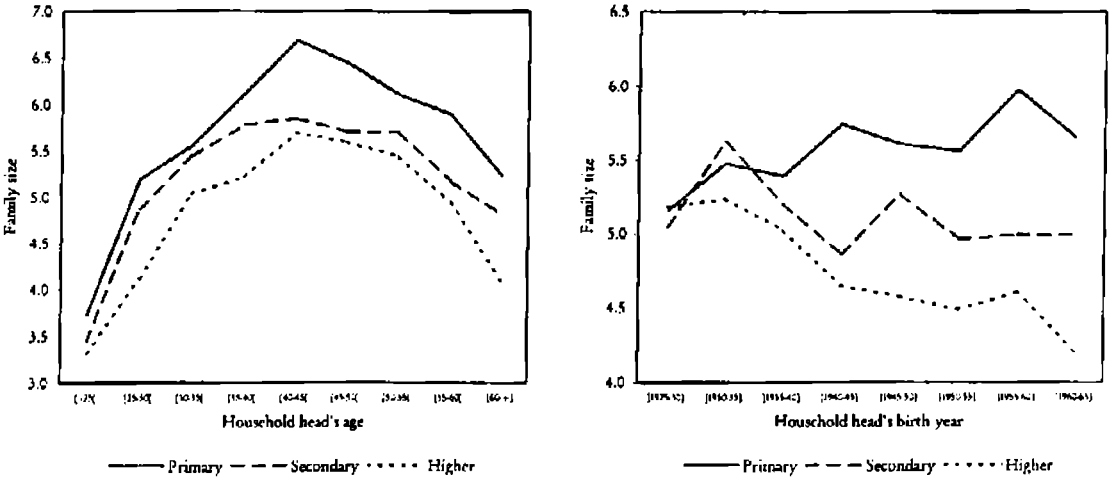
where FS = Family size
A_i = Age dummies
C_i = Cohort dummies.

Figure 1 (left) shows that family size grows sharply until the head is around 42 years old, and from then on it starts to fall at a slower pace. Education plays a

significant role in explaining family size patterns. Heads with primary education have larger families than heads with secondary education which in turn have larger families than university educated workers. Less educated heads have more children and at younger ages than more educated heads, and family size reaches a peak of 6.7 members at age 43. For the more educated the peak is reached at the same age and it is of 5.5 members.

On the other hand, the cohort effects (right) on family size show a decreasing trend, consistent with the important reductions observed in the fertility rate. The exception are families whose heads have primary education or less, whose pattern is increasing. (see figure 2.b) Different hypotheses would relate this to larger extended families and/or to access to better health care.

Figure 1: Age and Cohort effect on family size by educational level



Source: 1985, 1991, 1994 & 1997 Peruvian LSMS Household Surveys.
Note: The jungle and rural coast regions are not included because they were not surveyed in the 1991 LSMS.

Children and elderly in the household

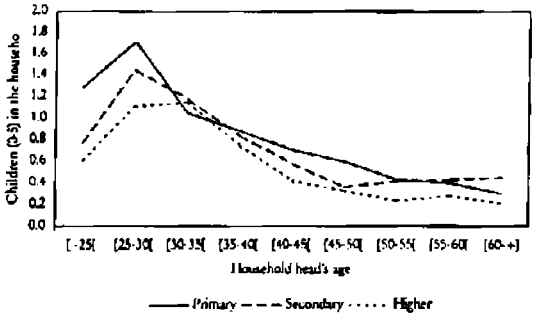
According to the LSMS data, in 1997 there were 0.86 young children per household, slightly down from 0.9 in 1985. As, expected, the number of children per household is the largest if the head only has primary education (0.97) and lowest if he/she has university education (0.69). Using the same regression methodology as in family size, we analyzed life cycle and cohort patterns for the number of young children (0 to five years old), older children (6 to 15 years old) and the elderly (60 years or older).

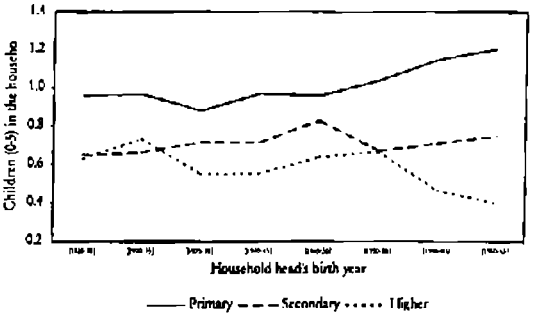
As shown in figure 2, the number of children peaks between the age of 25 and 30, and falls monotonically. Differences across levels of education are observed at young ages, with primary and secondary educated workers having more young children in their twenties. After the thirties, all education groups have roughly the same average number of young children. Regarding cohorts, there are important differences among younger cohorts. While for secondary and primary educated

workers the number of young children is stable or increases the younger is the cohort, for university educated, there is a clear downward trend.

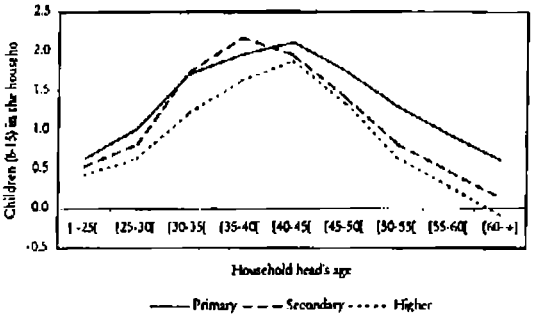
Figure 2: Household demographics by educational level, Age and cohort effects

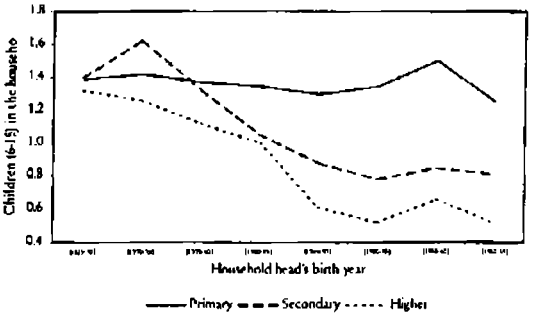
a. Proportion of children (less than 6 years old)



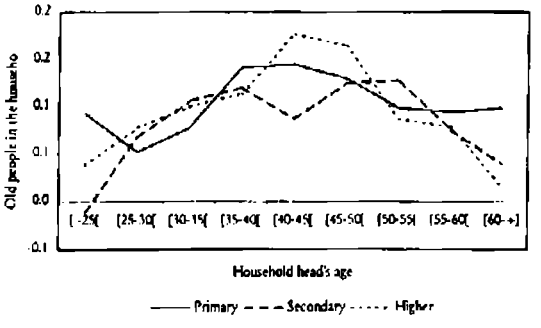


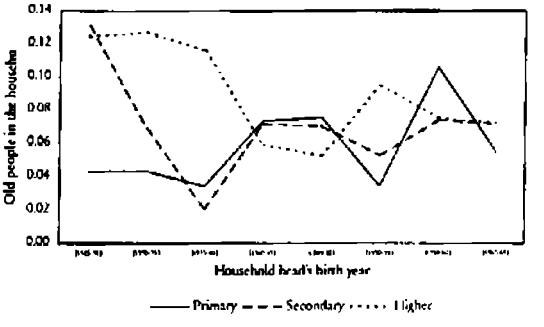
b. Proportion of children (6-15 years old)





c. Proportion of elders (60 or older)





Regarding children of ages 6 to 15, the life cycle peak is in the early forties. The life cycle pattern for university educated is clearly below and with a peak at a

later age. Finally, the number of elders in the household increases as the head ages, and there are no clear differences between education groups.

Types of households

As shown in Table 1, more than half of Peruvian households are made up by couples with children (nuclear households), while extended households (couples or single parents with or without children that live with relatives) represent around 35% of Peruvian households[8]. Little more than a third of those households do not have children.

Table 1: Household-level and individual-level structure by household type*

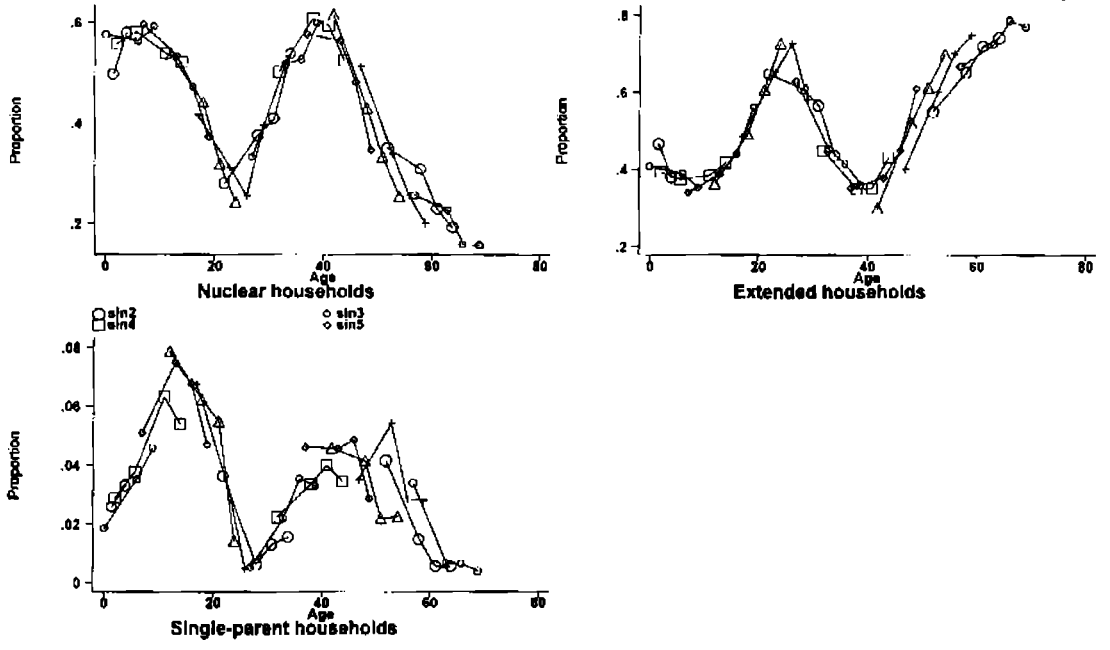
	Household-level structure				Individual-level structure			
	1985	1991	1994	1997	1985	1991	1994	1997
Couple with children	55.8	56.5	52.9	54.5	56	56	52.7	53.5
Single father with children	1.3	0.9	1	0.7	1.1	0.5	0.7	0.5
Single mother with children	4.8	4.7	3.7	3.5	3.5	3.7	2.7	2.6
Couple without children	2.1	2.1	2	1.9	0.7	0.8	0.7	0.7
Extended families	34.1	35.3	39	38.3	36.4	38.4	41.6	41.5
Couple or single parent with children plus other relatives	23.9	24.8	25.4	26.5	28.6	30.4	30.6	31.8
Head or couple without children plus other relatives	10.2	10.5	13.6	11.8	7.8	8	11	9.7
Other	1.9	0.6	1.3	1	2.4	0.6	1.5	1.1

Source: 1985, 1991, 1994 & 1997 Peruvian LSMS Household Surveys.
*

Figure 3 shows the proportion of nuclear and extended households along the life cycle. It suggests that people increase their probability of living in an extended household from their early twenties and until their mid thirties, when it is more likely that old children stay with their parents and bring their own offspring to their parents home. The likelihood of living with relatives, increases again as heads approach their fifties, as they start to live with their children's families. If the head's children just left the household to form a new family, there would be no obvious reason for a clear increase in the proportion of extended families as the head grows older. The observed pattern reveals that in many cases as the head ages, his/her children bring their own families to the household, instead of leaving their parents. Or alternatively, older parents stay with their children as a way of surviving.

[8]. Extended families are those in which in addition to the parent or parents and children younger than 24 there is an additional family member. Note that a son that is older than 24 and live with his /her parents is considered from an extended family.

Figure 3: Proportion of individuals in different kinds of households over the life cycle



We also analyzed life cycle and cohort effects using regression a probit regression for the probability of being extended families that included age and cohort dummies. As shown in Figure 4, there is an increase in the probability of constituting an extended family for 25 to 35 years old, and then there is a monotonic increase of the probability, that reaches its peak at age 55. That is, these adjustments in household structure seem to be very important early and late in the life cycle of the head. The cohort effect shows a clear decreasing pattern for those born after the mid-forties, with no important differences between education groups. This similarity indicates that these type of adjustments in household structure cannot be behind the constancy of family size among the less educated younger cohorts, as reported in the previous section. It supports the notion that such constancy is related to the fact that the number of children is stable across these cohorts. Introducing demographic and other controls do not affect the shape of the age or cohort profiles.

Figure 4: Age and cohort effects on the probability of having an extended family

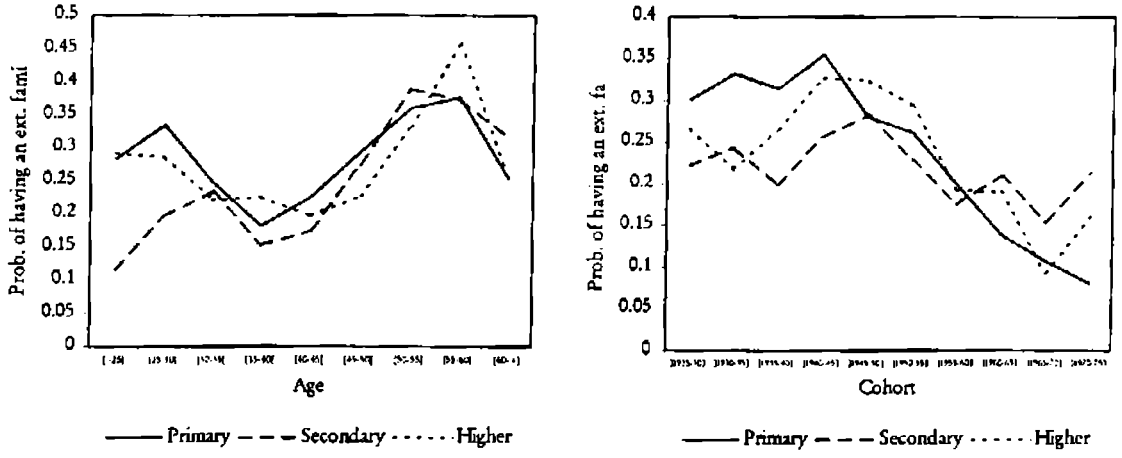


Table 2 shows who are the "other relatives" in extended families. Notice that these percentages do not need to add up to 100%, as there can be more than one "other relative" in the household (an old son and his wife, for example). Around 50% of the extended families have their old (24 or older) son or daughter in the household. The number of grandchildren is also important, rising up to 40% in 1994, followed by parents or parents in law.

Table 2: Who are the "other relatives" in extended families?

	1985	1991	1994	1997
Son / Daughter	39	49	52	47
Son in law / Daughter in law	14	11	16	17
Grandchildren	35	29	42	41
Parents / Parents in law	21	27	20	23
Other relatives	33	29	24	25

Source: 1985, 1991, 1994 & 1997 Peruvian LSMS Household Surveys.

* The jungle and rural coast regions are not included because they were not

Who is the Boss?

The previous analysis relies on the self-identification of the head of the household, considering that he/she is the one leading the decision process within the household. This assumption would be particularly harmless if the self-reported head is at the same time the main income earner. This need not be the case here, considering that Peruvian households tend to host extended families, as shown in the

previous section. Extended families tend to host adults other than the head and his/her couple. Figure 5 shows clearly the increasing pattern of this type of members over the life cycle. The question is whether the older male or female adult remains as the self-reported head or this one changes when another adult becomes the main income earner.

Figure 5: Adults other than the head and partner over the life cycle

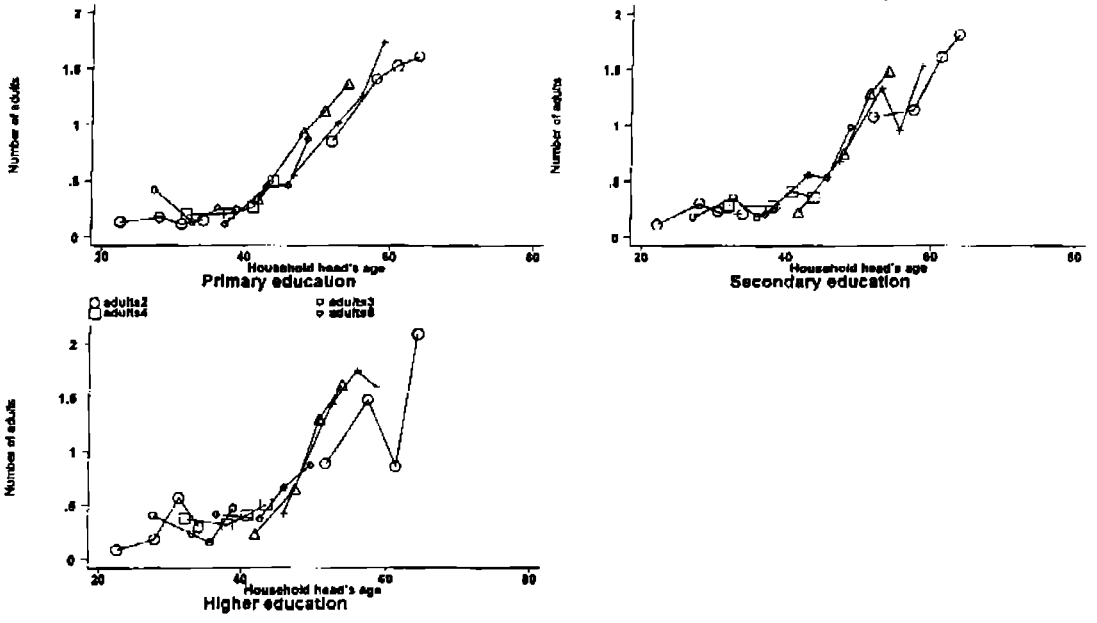
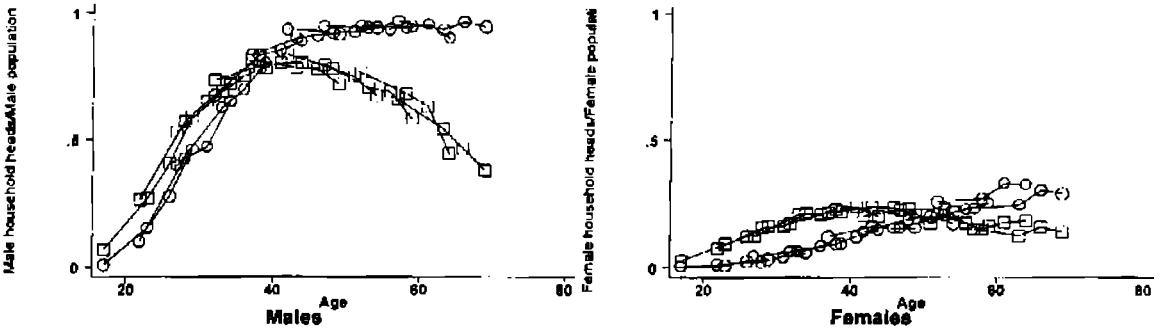


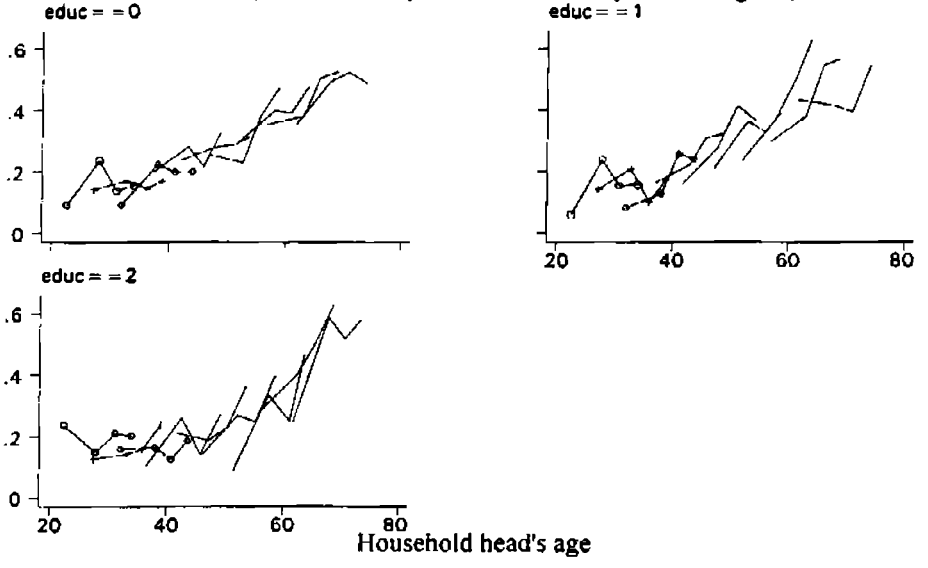
Figure 6 shows the proportion of individuals of each age group that are identified as household heads. This proportion increases steadily over the life cycle for both genders, but the likelihood of a male being identified as a household head is substantially larger. About 90% of males above 50 years old are identified as such, while the corresponding figure for females is only 25-30%. The issue is that these older members are not always the main income earners in the household, especially for heads older than 40 years old. The proportion of adult males (females) that are main income earners reaches a peak at about 75% (25%) when the individuals reaches approximately that age. (40) At about age 70, though, this proportion falls to only 45% for males. (about 15% for females) Peruvian households, then, tend to identify the older male adult as the head of the household, even way after he stops being the main income earner.

Figure 6: Proportion of household heads over the life cycle by gender
○ Self-reported heads □ Main wage earners



Another way to observe this fact is by looking at the proportion of self-reported heads who are not the main earners. Figure 7 indicates that proportion seems to be flat at around 15% until age 40 and then increases steadily. One possible explanation for this feature is that the probability of change in headship increases when the self-reported head –one of the parents- is less educated than at least one of their children. Even if differences in labor market experience give earnings advantage to the parent, eventually, the more educated son or daughter may catch up. A somewhat surprising finding, however, is that there does not seem to be major differences by level of education.

Figure 7: Proportion of self reported household heads who are not main earners
(0 = Primary, 1 = Secondary, 2 = Higher)



The next question is to analyze who are not the bosses, or what are the characteristics of the families in which the family head stops being the main supporter of the household and in which case the main supporter is one of his/her

adult children. The main earner's relationship with the self-reported head is shown in Table 3. In more than half of the cases where the head does not have the highest income, the main earner is one of his/her children. In around 30% of the cases it is the spouse the one who has the household's highest income. These proportions were basically the same during the last years and only the percentage of cases where the main earner is the head's son/daughter increased slightly between 1985 and the 90s.

Table 3: Main-earner's relationship with self-reported head 1985-1997

	1985	1991	1994	1997
Spouse	28.0	31.0	27.5	30.5
Son / Daughter	54.0	51.2	52.8	50.6
Son in law / Daughter in law	6.6	9.2	8.8	8.3
Grandchildren	1.8	1.0	2.0	1.4
Parents / Parents in law	0.5	0.9	0.6	0.9
Other	8.5	6.6	8.2	7.8
Non-related	0.7	0.0	0.1	0.4

Source: 1985, 1991, 1994 & 1997 Peruvian LSMS Household Surveys.

* The jungle and rural coast regions are not included because they were not

Summarizing, the main findings in this section are the following. Household size has decreased significantly for younger Peruvian cohorts with relatively more educated heads, but this is not true for households with less educated heads. The slight increase in family size among the less educated seems to be related to differences in the number of children in the household -a variable related to fertility. It is not related to differences in household strategies, because we find that the proportion of extended families has been decreasing for the younger cohorts regardless of the educational level. Still, extended families remain an important feature of family arrangements in Peru over the life cycle, in particular when the individual is in her early twenties and later as she approaches retirement. This household strategy affects the meaning of headship, since the self-reported head stops being the main income earner as he ages. In the following sections, we explore the possible implications of these adjustments in household structure upon household savings.

Household Savings

One of the predictions of the life cycle model is that the causal relationship goes from productivity growth to a higher savings rate. In the simplest version of this model, the young save while the old dissave. If the income of the young is the same as were the income of the old, savings and dissavings cancel out. With productivity growth, though, the young will be richer than were their parents at the same age and net savings become positive. The same is true for population growth.

Even with productivity constant, if the young outnumber the old, net savings will also be positive. In both cases, the faster the growth, the higher the saving rate.

But this neat implication from the simplest life cycle model is not so clear when the model is complicated. For instance, concentrating on population growth, if the income path has a hump shape, young individuals may want to borrow instead of saving early in their careers. Also, if the individual has three stages in life: childhood, young adulthood and older adulthood, and children live with their parents, these young adults will tend to borrow for consumption instead of saving at that point in their lives. Then, it will be not so clear that aggregate savings will go up under high population growth since the increase in the ratio of children to young adults could partially compensate for the previous positive effect.

The demographic transition described in the introduction, and its impact upon household structure analyzed in section IV, makes the evaluation of savings patterns over the life cycle and across cohorts by Peruvian households particularly appropriate. Under the demographic transition, the trends of the dependency rates will benefit growth in saving rates. As the number of working individuals reaching their peaks in income increases faster than the number of children and old people, the aggregate savings rate will be higher. The possibility of this *window of opportunity* opening for a country like Peru raises the importance of evaluating the empirical validity of the life cycle model in Latin American economies.

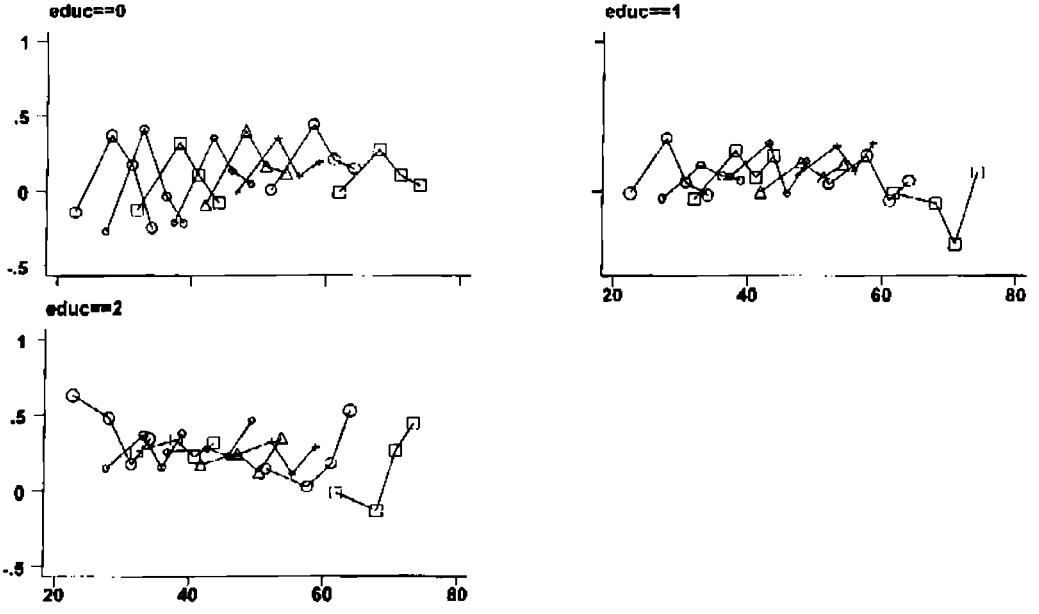
Recent empirical evidence supports the view that household current consumption and income are highly correlated over the life cycle. (see, for instance, Deaton, 1992). One of the key factors raised to explain this result is that consumption grows with household size, which also presents a hump shape over the life cycle. (see figure 1 in section IV.1) When controlling for these demographic changes over the life cycle, the savings pattern recovers the hump shape predicted by the LCH. The issue here is that, as seen in section IV.2, Peruvian households tend to host extended families as the self-reported head ages, including other younger income earners. In this context, we need to evaluate the effect of these household strategies on the life cycle pattern of household income, since the previous argument also rely on household income having a hump shape over the life cycle.

In this section, we analyze the patterns of household savings over the life cycle and across cohorts. Households are identified according to the age of the household head, and we take into account the important changes that occur within the household over the life cycle, in terms of the number of income-generating members. In particular, we analyze household savings, as measured by $\tilde{s} = \ln y - \ln c \approx s/y$.[9] Figure 8 displays the age-cohort averages for this measure of

[9]. Household consumption excludes expenditures in durables, education and health. See appendix A for further details on the construction of the series for household income and consumption.

household savings, by level of education of the self-reported household head.[10] These averages do not show any clear pattern over the life cycle, except for households with more educated heads (more than 11 years of schooling) for whom a clear decreasing trend is observed.

Figure 8: Log Savings over the Life Cycle



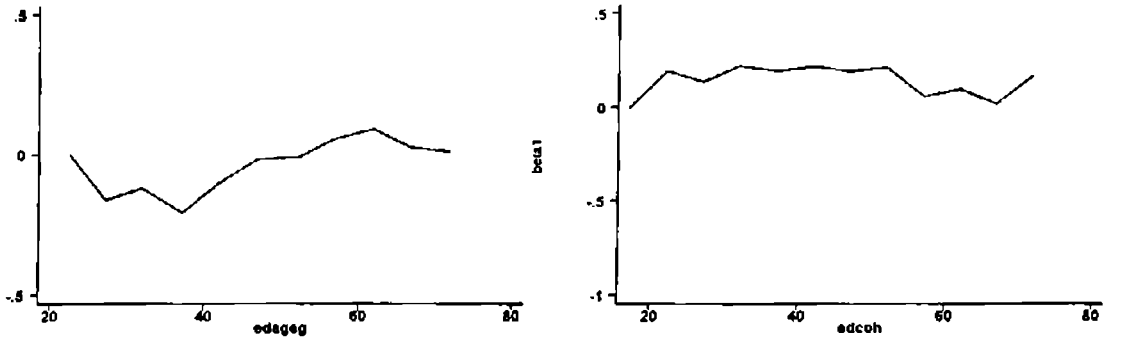
Since the year effect cannot be considered negligible a priori for savings, these plots do not help us much to capture the age and cohort effects. Figure 9 presents the age and cohort effects estimated by running the regression in expression (7) for each level of education.[11] Cohort effects appear very flat for households with less educated heads, but become decreasing when we switch to the more educated ones indicating that older educated cohorts tend to save substantially less than their younger counterparts. Indeed, households whose heads were about 60 years old in 1985 save about 40 points less than those that were about 20 that same year. This result indicate that some long-term changes seem to have affected educated households more, which is fairly consistent with previous findings for other Latin American countries such as Mexico. (see Attanasio and Székely, 1998, figure 14)

[10]. We drop from the sample households whose heads are younger than 20 years old or older than 79 at the moment of the interview. See Appendix A for further details on the sample used for this analysis.

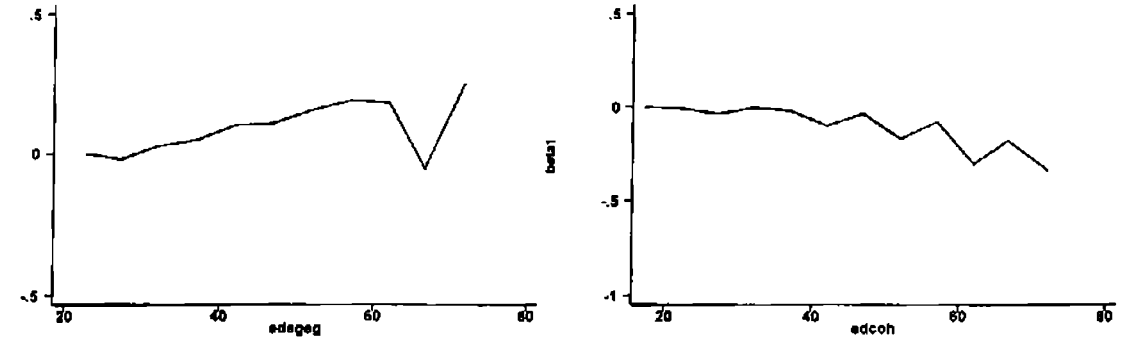
[11]. As indicated in section II, we do allow for the year effects to be different for households living urban and rural *"centros poblados"*. Appendix B presents the estimated age and cohort profiles

Figure 9: Total Savings Rate – Age and Cohort effects by level of education

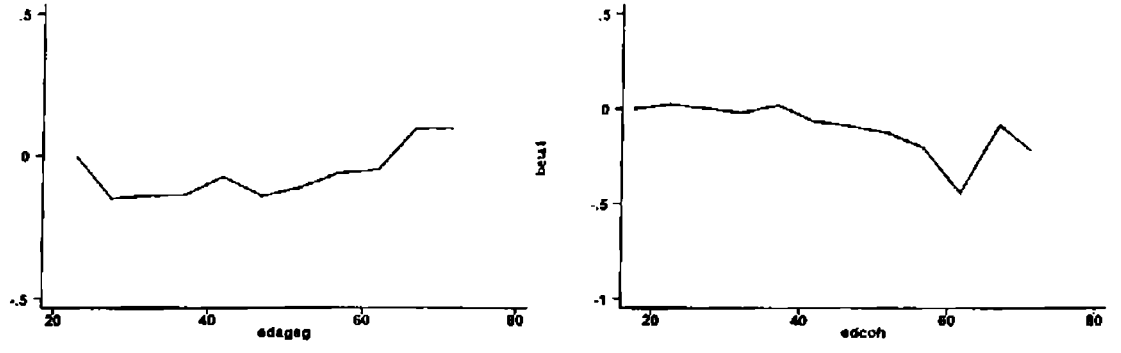
a. Primary



b. Secondary



c. Superior



The estimated age effects do not show a monotone pattern, but a rather inclined J shape at least until heads become sixty, when it becomes flat. Indeed, the peak in the savings rate is around that age for less educated heads, although it seems to be 65 for heads with some college education. The bottom is reached at about 35 years for the less educated household heads but at 25 for heads with some college education. Also, the savings rate at the peak is only 10 or 15 points higher than at the beginning of the life cycle but 25-30 points higher than at the bottom. These age

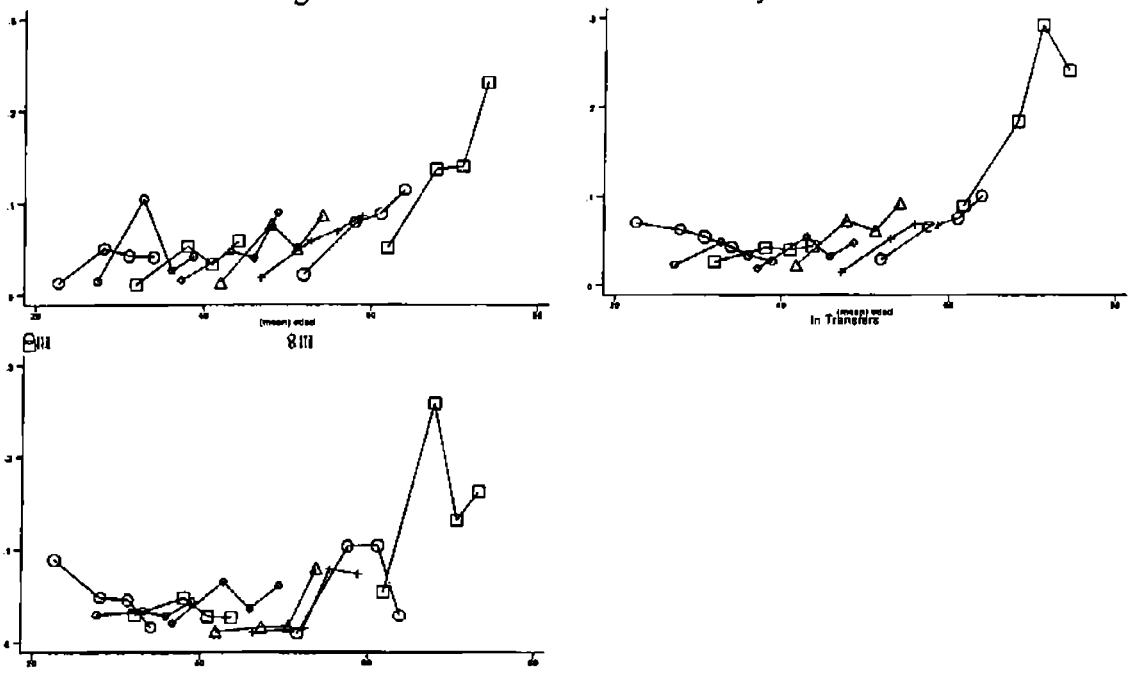
when using the traditional identification strategy described for the estimation of expression (2) in section II.2.

effects do not match with the predictions of the simplest life cycle theory, that is, we do not observe a hump shape over the life cycle of savings by Peruvian households. The strong decreasing trend early in the life cycle seems to be generated by consumption pressures, probably as a result of the increases in the size of the household. The non-decreasing pattern of household savings as the head reaches his/her retirement years might indicate that a bequest motive is important to explain savings by Peruvian households.

Still, these implications need to be taken with care since the definition of savings used here might not be the appropriate one for Peruvian households as a result of the family arrangements that these households generate to overcome the lack of formal pension arrangements. We have seen in section III that the number of income generating members in the household increases with the age of the self-reported household head. (figure 5) The incorporation of other income earners could potentially affect the shape of the household income pattern over the life cycle. Moreover, the fact that these additional income earners become the household's main source of income and that they are increasingly younger (table 3) could affect the way the decisions are taken within the household.

Another related issue is the inclusion of net transfers from relatives and friends in the construction of household income might be over-estimating income, especially late in the life cycle. Figure 10 shows the life cycle pattern for net transfers from relatives and friends as a proportion of household income. These transfers show a relative flat pattern until the head reaches about 50 years old, but after that they increase sharply to become up to 25% of household income. These two family arrangements need to be considered carefully before stating any conclusions.

Figure 10: Net Transfers over the Life Cycle

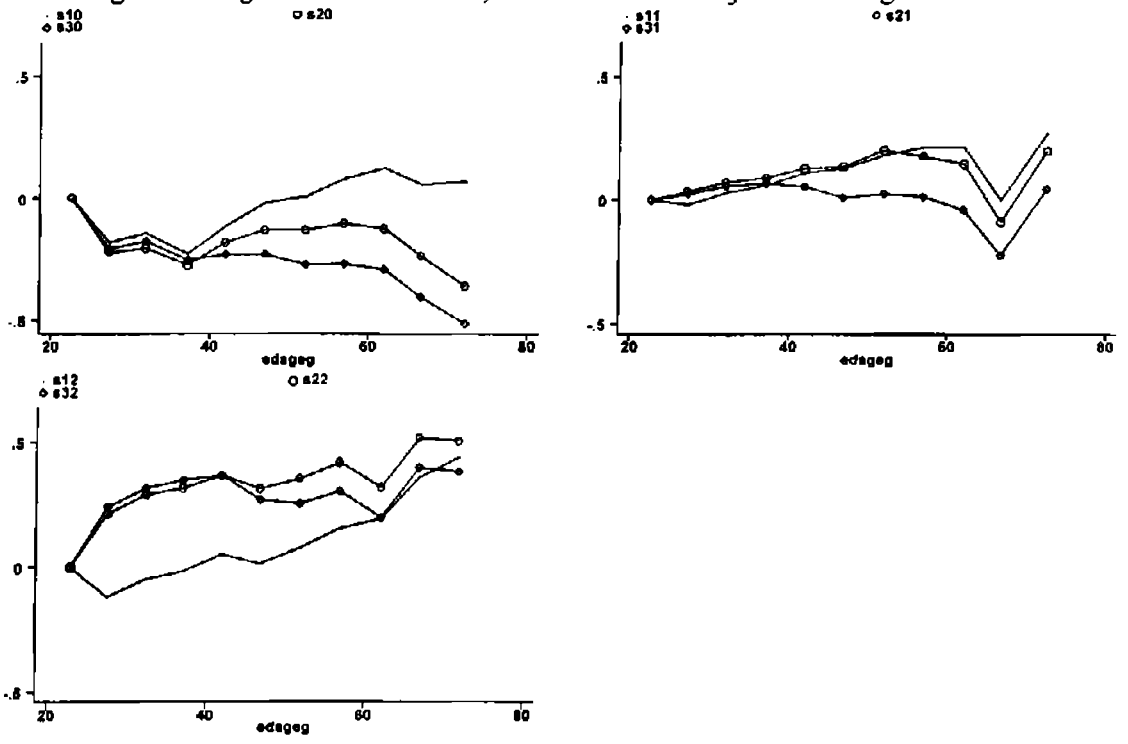


To evaluate the role of these family arrangements on the age effects for Peruvian household savings, we compare three differently estimated age profiles over the life cycle for the household savings rate. (figure 11) The first one is the unadjusted-undiscounted age profile for s_1 already shown in figure 9, which includes net transfers from relatives and friends as income. The second profile is obtained from $s_2 = \ln \hat{y} - \ln c$, where $\hat{y}$ denotes the discounted household income. (net of transfers) Finally, the third age profile (s_3) is also obtained from s_2, but demographic controls are included in the associated regression (7).[12]

The comparison is quite interesting. It shows that family arrangements are quite important as an strategy to smooth income over the life cycle among Peruvian households. The effects of those strategies differ across levels of education, though. In the case of the less educated heads (educ=0), both types of arrangements seem to become important only after the head reaches about 35 years old. From then on, savings do present a hump shape when we omit transfers from income (s_2) with a sharp decline after the head reaches 60 years of age. The inclusion of demographic controls, though, generate a declining pattern for savings over all the life cycle.

12. The results in figure 11 include household size, the proportion of children and elders as demographic controls. We also tried including an indicator variable for households with extended families, and other alternatives, obtaining basically the same results.

Figure 11: Age Profiles for Total, Discounted and Adjusted Saving Rates



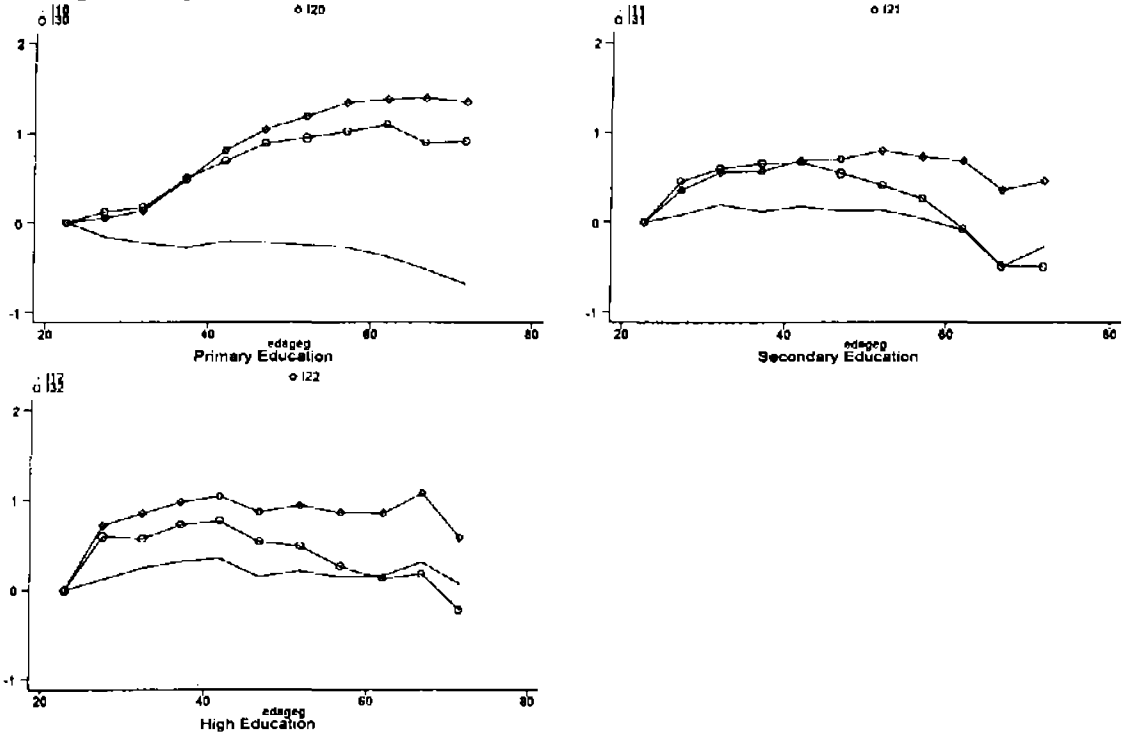
Note: S_{10} denotes the age effects for the total saving rate for household heads with less than primary education. S_{21} denotes the age effects for the discounted savings rate (net of transfers) for household heads with up to secondary education. The other lines are defined accordingly.

The effects are quite different for households with more educated heads. In the case of heads with some secondary education (educ=1), only adjustments in household structure seem to be important and generate a flat pattern over the life cycle. For household heads with some college education, only transfers from relatives and friends seem to play an important role for savings, especially in the early stages of the life cycle. When omitting transfers from income, we find a sharp increase in savings from the beginning, although no major drop in savings appear as he/she approaches retirement years. But this last finding needs to be taken with care considering the limitations of the sample size for older cohorts of this group. (see table A.1 in Appendix A)

The differences observed in figure 11 suggest the importance of household demographics and transfers from relatives over the age pattern for household savings. The relative importance of each of these effects vary across educational groups. The adjustment in income -the exclusion of transfers- only generates the expected hump shape pattern for savings in the case of households with more educated heads. One possible explanation is that there are firther income-related adjustments.

One way to indicate the importance of the latter is to compare household total income (I_1) with the household labor income, (I_2) and the labor income of the head. (I_3) Figure 12 shows the age patterns for these three income variables. First, we notice that total household income present no significant age patterns. On the other hand, the labor income of the head does show a clear hump shape for households with more educated heads, with the peak reached at about forty years old. The age pattern for heads with less than primary education is strictly increasing until age sixty and remains constant after that. Another clear point is that the differences between these three income variables increase with the age of the household head, regardless of their level of education. It is relatively clear, then, that Peruvian households use several family arrangements over the life cycle and that they affect income patterns over the life cycle. Indeed, these arrangements eliminate any age patterns for total household income, regardless of the educational level of the head.

Figure 12. Age Effects for Total Income, Labor Income and Income of the Head, by level of Education



Note: I_{10} denotes the age effects for household total income for heads with less than primary education. I_{21} denotes the age effects for household labor income for household heads with up to secondary education. The other lines are defined accordingly.

In conclusion, age patterns of savings by Peruvian households are partially consistent with the implications of a life cycle model when we take into consideration family arrangements, especially for those with more educated heads.

For households with less educated heads, the flatness of the age pattern of savings may be related to the fact that families have flat income patterns over the life cycle. In other words, Peruvian households do smooth consumption over the life cycle, but not only by the typical saving-dissaving mechanism, but by smoothing household income.

We ought to model the decisions on the adjustments in household structure, and its effect upon savings, before we can state a more definitive answer in this regard. That is, we need to understand the factors household members consider when they decide to incorporate or retain adults, what makes an elder join the household of her offspring, and which of them is the one that shares the household with their parents, and who is *only* bounded to remit. An alternative research agenda would go in the direction of Deaton and Paxson (1998), who obtain individual savings profiles, and compare them with the ones of the household.

Disentangling these issues, for each educational level of the head, would very likely be an important step towards understanding the household decision to save, and to determine the potential impact of the demographic transition on aggregate savings. The results presented here would clearly indicate that we not only need to look at consumption adjustments as a result of demographic changes, but also to the income smoothing implications of the family arrangements that Peruvian households implement over the life cycle.

Summary and Final Remarks

Demographic changes in Peru have been slightly faster than the Latin American average. Peruvian population is already aging, with youth dependency ratios falling and elderly dependency ratios already slightly increasing. These changes are very promising in the sense that they improve the viability of the Peruvian economy to take proper care of their children and elders. Nevertheless, the differences in these achievements by level of education, reported in this study, raise important policy concerns relating the future trends of the income distribution in Peru.

Household size has decreased significantly for younger Peruvian cohorts with relatively more educated heads, but this is not true for households with less educated heads. The slight increase in family size among the less educated seems to be related to differences in the number of children in the household. The connection of this variable with fertility would suggest an important role for family planning programs among the poor.

The previous result is not related to differences in household strategies since we find no significant differences in the proportion of extended families by educational level of the head. Indeed, this proportion has been decreasing for the younger cohorts for all household types. Still, junctions with relatives remain an important feature of family arrangements in Peru over the life cycle, in particular

when the individual is in her early twenties and later as she approaches retirement. This household strategy affects the meaning of headship, since the self-reported head stops being the main income earner as he/she ages.

The analysis of household savings patterns across the life cycle shows that family arrangements by Peruvian households affect income patterns over the life cycle. Peruvian households do smooth consumption over the life cycle, but not only by the typical saving-dissaving mechanism, but by smoothing household income. Under these circumstances, it is not easy to predict the implications of the demographic transition on aggregate savings in Peru. If anything, these initial findings on the savings age and cohort profiles stress the importance of additional research on the decisions on household structure over the life cycle in Peru. Another important issue is that the optimality of this income smoothing by Peruvian households over the life cycle may be related to the lack of development in Peruvian long-run capital markets. Again, we need to understand better this connection before trying to understand the potential effects of reforms in the pension system. (Cox y Jimenez, 1992)

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Appendix A: Technical Notes

The PLSMS Pseudo Panel

We first pool the four cross-section surveys at both, individual and household level, considering that the unit of analysis would vary according to the nature of the variable under consideration. Then, we stratify the data based on age, cohort, education and gender. First, we defined the interval for the age and cohort groups to be 5 years, partly based on the limitations of the sample size but also on the length of the time interval between surveys. We distinguish three educational levels: up to six years of schooling (primary school - educ = 0), up to 11 years of schooling (secondary school - educ = 1), and with more than 11 years of schooling (at least some post-secondary school - educ = 2). For the household-level pool, the sample is stratified based on the characteristics of the self-reported household head.

The household-level pool has been restricted to "normal" households. In that sense, we excluded one person households and households with single heads. It is usually argued that this type of households will not necessarily fit the typical behavior pattern assumed for the LCH. (see, for instance, Attanasio and Browning, 1995) Still, we included households whose heads had a present partner, even when they were not married, as well as households with widowed, divorced or separated heads. Also, we decided to keep households with heads employed as independent workers. These households have often been excluded because it is difficult to separate the expenses of the household as a firm, from the household's consumption. Nevertheless, had we excluded this group, our sample size would have been reduced too much, limiting our ability to differentiate our analysis by levels of education.

The other discriminating criterion was the age of the household head. Generally, it is argued that households with heads approaching retirement change their saving patterns away from the life cycle motive. We decided to limit the analysis to cohorts 79 years of age or younger in 1985. Pooling all households together would generate biases if they differ not only on their income levels but also on their life cycle paths (see Attanasio and Székely, 1998)

After all these discrimination procedures, the sample is reduced to a total of 13,311 observations, distributed in twelve five-year cohorts as follows:

Table A.1 Sample size by cohort and level of education
Household level pseudo panel – PLSMS 1985, 91, 94 and 97

Cohort	Age in 1985	Educ = 0	Educ = 1	Educ = 2	Peru
1	20-24	208	326	95	629
2	25-29	358	447	216	1,021
3	30-34	478	718	315	1,511
4	35-39	719	665	330	1,714
5	40-44	795	552	304	1,651
6	45-49	873	378	250	1,501
7	50-54	1,006	313	161	1,480
8	55-59	945	252	110	1,307
9	60-64	710	189	106	1,005
10	65-69	542	135	65	742
11	70-74	388	69	24	481
12	75-79	214	36	19	269
Total		7,236	4,080	1,995	13,311

Definition of Variables

The operational definition for income is based on net labor income, including in-kind payments, property rents, capital gains plus other non-labor income. We tried to include contributions to a pension system as income, but unfortunately, the PLSMS does not allow for the identification of such variable. On the other hand, we did exclude pension payments because we wanted it to appear as negative saving for retired individuals or their relatives.

The operational definition for consumption is based on the expenditures on non-durables. The Instituto Cuánto identifies 9 groups of expenditures for the PLSM surveys:

Group 1: food, beverages and tobacco
Group 2: Clothing
Group 3: Household rent, payments and utilities
Group 4: Furniture and other household expenses
Group 5: Health
Group 6: Transportation and communications
Group 7: Education, entertainment and culture
Group 8: Net transfers
Group 9: Other

We constructed a different aggregate by excluding several sub-categories because they correspond to expenditures on durables. In particular, we excluded household rent and payments from group 3. Household payments correspond to the purchase of the home, so it is definitely a durable. We also excluded rents since the

collected information had several inconsistencies across survey runs.[13] We also excluded furniture from group 4, education from group 7 and all health expenditures (group 7). Education and health expenditures were excluded because they are considered investments in human capital.[14]

Figure 2 plots year-decile averages for log income (linc), and log of consumption (eg), as defined here, as well as two alternative expenditure aggregates on the year of the survey. g denotes the cohort averages for the total expenditures reported by Instituto Cuánto and fg denotes an aggregate that adds health and education expenditures to consumption (eg). The patterns across years for the two measures of expenditures and our measure of consumption do not seem to vary much, especially those of eg and fg. A somewhat puzzling feature is that household income seems to be less sensitive than expenditures to the crisis between 1985 and 1994, especially for households in the lower bottom of the distribution.

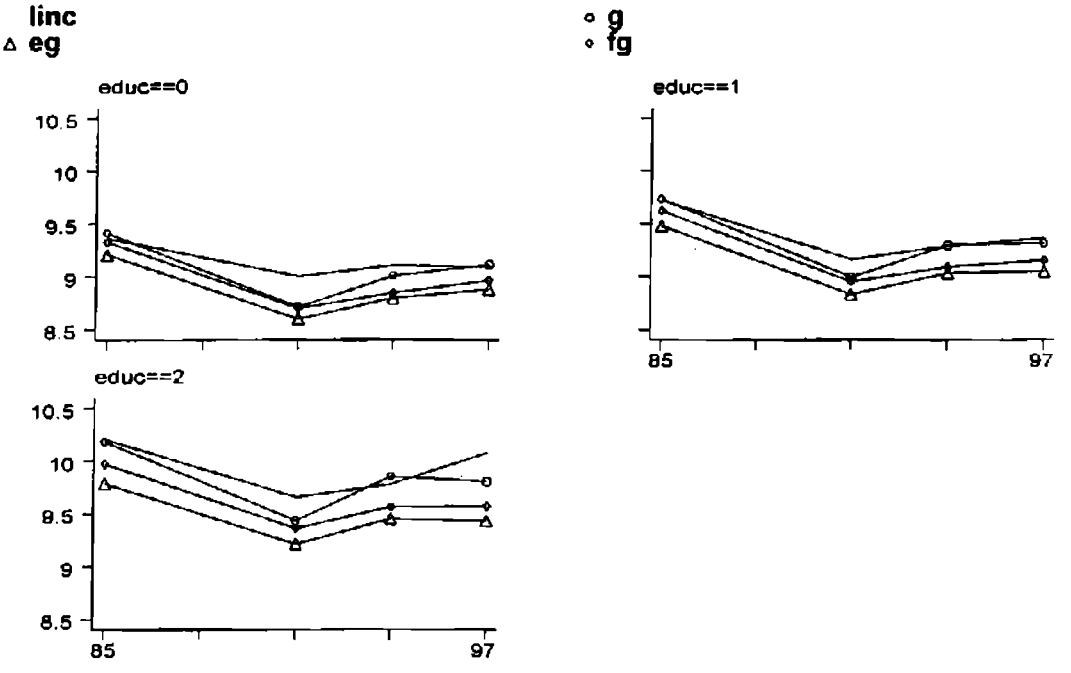


Figure A.1: Log income, log expenditures and log consumption over the years, by level of education

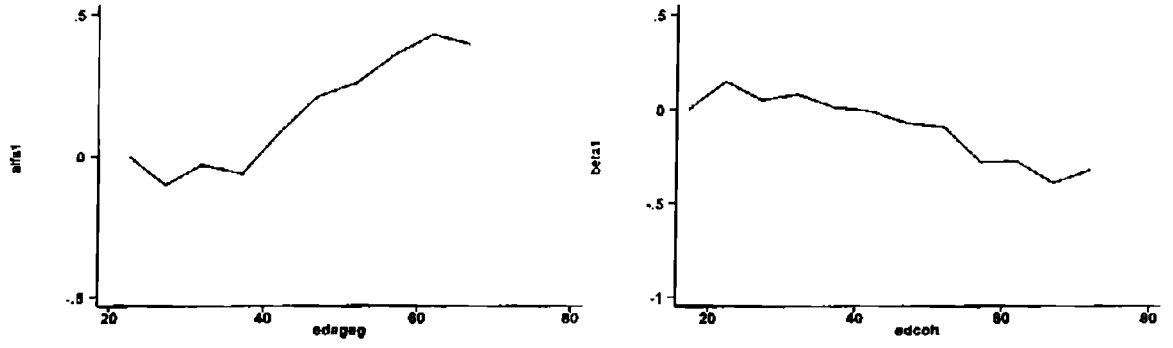
[13]. In 1985, home-owners were asked about the estimated rent they would charge for somebody else to live in their house. After that, the question changed to the estimated rent they think they would have to pay had they not owned the house.

[14]. As life cycle investments, expenditures in education and health have a strong pattern over the life cycle. That is, expenditures in education are higher when the household head is relatively young and have kids in school age (figure 4). In the case of health, also, it is known that households tend to spend more on health while they have kids younger than 5 years old. This would also be the time when expenditures on health would be more an investment in human capital (see Valdivia, 1999).

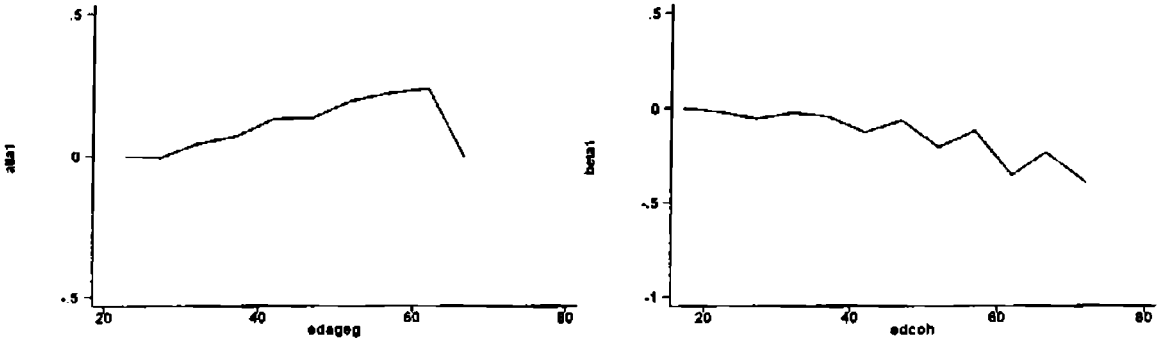
Appendix B

Log Savings – Age and Cohort effects by level of education – Traditional Identification Strategy

a. Primary



b. Secondary



c. Superior