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The elderly and the extended household in Portugal: an age-period-cohort analysis

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The elderly and the extended household in Portugal: an age-period-cohort analysis

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Abstract

Portugal, a South-European country, is expected to exhibit relatively large proportions of extended families. However, following the general trends that came with social transformations like urbanisation, generalised busy living styles, the change in the feminine role in the family, and the postponement of marriage to later ages, Portugal is also expected to have increasingly larger proportions of nuclear families. We use data from the eight waves of ECHP, that cover the years 1994 to 2001, to find out if these expectations are justified.

We also project the living arrangements until 2005, based on an age-period-cohort analysis.

Keywords: elderly, living arrangements, age-period-cohort model

JEL: J12, J14

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0. Introduction

Portugal, as the generality of Western developed countries, has an aging population. According to data from INE presented in Carrilho and Patrício (2004), between 1960 and 2001, people aged 65 or more passed from 8% of the population to 16,5%. Besides, for every 100 people under 15, there were 27 people aged 65 or more, in 1960, whereas in 2001 there were 104.

Western societies have changed also in other ways. The family has lost the basic cell position to the individual. More women participate in the labour market. The first child has been delayed on average, still demanding special care when grandparents become old, which imposes conflicting demands on prime age adults. There was a strong trend towards urbanisation, and this is usually associated with more expensive land, and therefore, smaller houses. All these aspects may act as deterrents of coresidence with elderly parents, especially frail elderly parents. However, some of them may also act as stimuli to coresidence. For instance, with both parents in the labour market, grandparents' presence may become more important. Also, if children are born when the grandparents are already old, these are probably not active workers any more and have more time to help children and grandchildren. Therefore, considering this combination of forces, it is not totally clear that the elderly should be more and more living alone or with spouses.[1]

The living arrangements of the elderly are an important determinant of the elderly's well-being.

Reasons may be pointed to justify that coresidence improves the old person's well-being: there are increasing returns in sharing a house, for instance, in domestic services (cleaning, laundry, meals), in the rent payment, in consumption (electricity,

[1] For a nice study about the change in industrialised societies associated with demographic aging, see Harper (2003).

telephone, cable TV). Help with personal care, entertainment and companionship may also be more easily available when the elderly share a house than when they live alone.[2] There may be less opportunity for feelings of loneliness – although that depends on the amount of contacts that the old person has during the day and the number of contacts he would have if not living with kin.

In spite of the motives that justify the increase in the well-being of the elderly originated by coresidence, there are also potential negative effects. Loss of independence, loss of authority, negative personal relations or difficulty in adapting to the living style of the new coresidents may prove damaging to the elderly's well-being.

Although data on living arrangements do not allow an inference about the level of older people's well-being, they reveal the way society organises itself to take care of its elderly. Also, as Domingo and Casterline (1992, p.63) have put it, "It is those with whom they co-reside that the elderly most rely on, and, in turn, to whom they offer the most services." Concerning living arrangements of community-living seniors, the fundamental distinction to be made is whether an elderly lives in an extended or in a nuclear household.[3] [4] If family structures change, the need for formal support will consequently also change. Hence, this is a subject that is particularly relevant for policy makers. But there are also implications for the demand for certain consumption goods and for housing. Hence, this is a subject that is also relevant to private business.

Traditionally, Southern European families are believed to show a significant tendency towards extended residence with the elderly, compared with other cultures. See Clarke and Neidert (1992) and all references within. Nevertheless, Portuguese families are not specifically identified in those studies.[5] Furthermore, admitting the pattern applies to Portuguese families, that could be changing.

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[2] Burch and Matthews (1987) (referred in Wolf (1994)) and also Palloni (2000) note that each household living situation is like a composite good that includes physical shelter, domestic services, personal care, privacy, power/authority, independence, recreation, companionship and consumption of economies of scale.

[3] We consider only people living in the community, not in institutions.

[4] The precise way in which we define extended and nuclear households is clarified in section 1.

[5] Fine exceptions are Iacovou (2000a) and Iacovou (2000b). ECHP data are used to compare the living arrangements of older people in thirteen countries in the European Union, including Portugal. They are cross-sectional analyses, using only one wave of the survey.

In this paper we provide some insights into the recent evolution of the living arrangements of community-living elderly in Portugal. We have two main purposes: 1) to describe the effective Portuguese situation; 2) to project the evolution since the date of the last available data until the present.

In order to accomplish our purposes we use the APC (Age-Period-Cohort) methodology.

The rest of the paper is organized as follows:

1. The data.
2. The model.
3. The results.
4. The projection.
5. Conclusion.

1. The data

We base our empirical study on the recently available eight waves of ECHP – European Community Household Panel – for Portugal. The ECHP is an annual survey targeted at individuals living in private households. The first year of the panel is 1994 and the last one is 2001.

We focus on individuals aged 65 or more, which coincides with the most frequent definition of old age. The oldest cohort is the one born in 1909, and the youngest is the one born in 1936.

The ECHP provides weights designed to correct any sampling distortion and ensure that the data reflect the population structure by sex, age, household size, and other criteria.

Our study decomposes households in nuclear and extended. We need to obtain the respective proportions (one proportion is equal to 1 minus the other proportion), and they are not directly available from the ECHP data. We calculate the proportion of nuclear households (pnuc). One household is classified as nuclear if its composition is one of the following:

- A single person.
- A couple with no children.
- A parent or a couple with all children under 26[6].

All other kinds of households are extended. These include:

- Households with siblings older than 25.
- Households with children older than 25.
- Households with grandparents, grandchildren (even under 26) and no parents.
- Households with nephews or other relatives other than children or siblings.

After classifying all individuals as living in a nuclear or in an extended household, they are grouped in age categories for each survey year.

$Pnuc_{ij}$ is the ratio of all individuals living in nuclear households over the sum of all individuals, for a certain age group i and a certain survey year j.

From all the types of households that are included in the concept of nuclear households, single households deserve special attention, since their needs may be qualitatively different from the needs of elderly integrated in any other types of households. Therefore, we calculate $psingle_{ij}$, the ratio of single households over the sum of all individuals, for a certain age group i and a certain survey year j.

As we need data for age-cohort pairs, and not for age-year pairs, we make the conversion using the information contained in Table 1 (cohort-period-age relationships in our data).

[6] The consideration of age 26 is slightly arbitrary. The intent is to capture adult children that could have their own households, that are not really dependent on their parents, but choose to live with them. 26 seems to be a reasonable age, although there will certainly be children who are still dependent by that age and children that are not dependent any more before that age.

The data set yields 168 observations resulting from 8 years of observations of 21 age categories. The proportions are calculated based on 20597 cells, each cell corresponding to a certain individual with a certain age. The same individual with another age will correspond to another cell. We apply the cross-sectional weights PG002 to the data.The last age category is a composite category: it includes all those who are 85 or older.

We present graphically some features of the proportion of nuclear households (pnuc) with elderly. Chart 1 shows the evolution of the proportion of nuclear households. We can see that, despite the fact that most of the elderly live in nuclear households (between 59 and 67% of the elderly) that proportion has been decreasing.

Chart 1 does not provide any information about the nature of this tendency. We investigate the nature of the identified trend through an Age-Period-Cohort model.

2. The model

Observing Chart 1, a declining trend in the proportion of nuclear households is evident. pnuc decreases with time. Nuclear households include individuals living alone. For policy reasons, it is interesting to isolate this group, since its need for formal care is, on average, more compelling. Taking the proportion of single households (psingle) observable in Chart 2, we find that it has also been decreasing.

In order to understand and project the evolution of the living arrangements it is useful to identify the nature of the observed evolution. Is it the aging of the population that, with the change in the age structure of the population, alters the proportion of the individuals that live in extended or nuclear families? That would be the age effect. Is it the entrance of new cohorts in old age that alters the referred proportion? That would be the cohort effect. Is it something that is affecting everyone in the selected time interval, irrespective of age or cohort? That would be the period effect.

The Age-Period-Cohort (APC) model decomposes the evolution of a variable in three parts: one that is a function of age (or duration, time since system entry), another that is a function of the time period (the moment at which the data is observed), and finally, one that is a function of the cohort (the set of individuals that entered the system at the same time).

This kind of model has been widely used in fields like epidemiology in life sciences, and life cycle behaviours in economics. To our knowledge, the only study that applies this methodology to the subject of living arrangements is Mason and Lee (2004).

We use the following general APC model:

$$\Psi_{i\,j\,k} = \mu + \alpha_i.D^{Age} + \beta_j.D^{Period} + \gamma_k.D^{Cohort} + e_{i\,j\,k}\,.$$

$\Psi_{i\,j\,k}$ is the dependent variable; μ is the overall mean; α_i represents the effects of age; D^{Age} are the age dummies; β_j represents the effects of time period; D^{Period} are the period dummies; γ_k represents the cohort effects; D^{Cohort} are the cohort dummies; $e_{i\,j\,k}$ is a normally distributed error term.

It is well known that the above equation is not estimable, since it is possible to derive one of the variables from the other two. For example, Age = Period – Cohort (birth year). As there is this perfect linear relationship between the three effects, they cannot be separately estimated.

There are several alternatives that provide a solution to the identification problem.

It is possible to consider *a priori* that one of the effects is unimportant, and drop it. Another possibility is to set constraints to the parameters to be estimated. The choice of constraint must be careful and several approaches have been proposed in the literature.[7] Setting constraints is a dangerous route since apparently not very different constraints may produce very different age, period and cohort effects (cf. Mason and Wolfinger (2001)). Still another alternative is to replace one of the effects with one variable or a function of variables that reflects the underlying process thought to be present in the considered effect. (cf. Fienberg and Mason (1979)). The choice of that (those) variable(s) must make sense.

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[7] See, for instance, Robertson and Boyle (1998). The most popular approach is the one of Deaton and Paxson (1994).

This paper follows the last alternative because we consider that it is the one that is better able to improve our understanding of the process underlying the evolution of the variable.

The effect we replace by variables is the period effect. We try three candidates: the per capita real income, the capacity of institutions for the elderly, and the variation in the price index of "Housing, water, electricity, gas and other fuels". They all may influence the option to live in extended or nuclear households, and the option of living alone, and they affect all cohorts and elderly people of all ages.

As pointed out in the Introduction, the decision of living in an extended household may be an economic one. By sharing accommodation, each individual may reduce expenditure in certain items, namely housing and energy costs. Therefore, times of higher growth in this category of costs could motivate an increase in the proportion of extended households.

The availability of places in institutions for the elderly may determine the use of an alternative living arrangement for those elderly who cannot live alone. A larger capacity of these institutions probably induces a reduction in the number of extended households. However, institutions may also be an alternative chosen by those who would otherwise be alone, and this would mean a decrease in a segment of nuclear families. Therefore, although it is probably a factor that is relevant to the choice of the living arrangement, its expected net effect is not obvious.

Empirical studies - like Kotlikoff and Morris (1990), Boersch-Supan, et al. (1988), and Bethencourt and Ríos-Rull (2004) - have established a relationship between the level of income of the family members and the chosen living arrangement. They find a positive influence of the income level on the probability of the old person living alone. Possible explanations are the preference for "intimacy at a distance" with the affordability of formal home care, which allows the parent to age in place, or the higher opportunity cost of restricting the supply of working hours for the children with higher income levels. Hence, in times of higher per capita real income levels, a larger proportion of nuclear households is expectable.

The models we want to estimate are, therefore, the following:

$$pnuc_{i\,k} = \mu + \alpha_i.D^{Age} + \gamma_k.D^{Cohort} + \delta 1.CPI4_{k+i} + \eta 1.Capinst_{\,k+i} + \kappa 1.Y_{\,k+i} + e1_{i\,k}. \quad (1)$$

and

$$psingle_{i\,k} = \omega + \xi_i.D^{Age} + \nu_k.D^{Cohort} + \delta 2.CPI4_{k+i} + \eta 2.Capinst_{\,k+i} + \kappa 2.Y_{\,k+i} + e2_{i\,k} \quad (2)$$

$pnuc_{i\,k}$ is the proportion of individuals aged i, from the cohort born in year k, that live in a nuclear household.

$psingle_{i\,k}$ is the proportion of individuals aged i, from the cohort born in year k, that live alone.

CPI4 is the variation in the Consumer Price Index for “Housing, water, electricity, gas and other fuels” (4^{th} category). The data source is the National Statistics Institute of Portugal.

Capinst is the capacity of institutions for the elderly in Continental Portugal. The data source is Social Security Statistics.

Y is the real per capita income (prices of 2000). The data source is the European Commission's Directorate General for Economic and Financial Affairs (AMECO database).

$e1_{i\,k}$ and $e2_{i\,k}$ are error terms.

We consider that the effects are fixed (in the sense that they are not variable). If, for example, different cohorts aged differently, there should be an interaction between age and cohort effects.

We do not consider interaction of the different effects for several reasons. First, the span of time is not sufficiently long to expect important interactions. Second, one of the criteria in modelling is parsimony. Third, as explained in Rodgers (1982), the inclusion of interactive effects exacerbates the basic problem of nonestimability of the effects.

3. The results

Since the data are proportions, the straight use of OLS could lead to inconsistent results, like proportions larger than one or less than zero. Therefore, we estimate the model using weighted least squares after applying the logistic transformation to the proportions data. This closely follows a suggestion in Green et al. (1977).

In Tables 2 and 3, the results of the estimations are presented. The used software was SPSS. The values themselves are not directly interpretable. Although for our purposes it would be sufficient to look at the signs and the relative dimensions of the parameters, if we want to pick the Age and Cohort effects, we are not interested in the effects on the logits of the proportions, but in the effects on the proportions themselves. We would like to have the α_i and the γ_k of equation (1), and the ξ_i and the ν_k of equation (2). The conversion is made recognizing that

$$d\, pnuc_{i\,k} / d\, D^{Age} = \alpha L_i .\, pnuc_{i\,k} .(1- pnuc_{i\,k}), \qquad (3)$$

$$d\, pnuc_{i\,k} / d\, D^{Cohort} = \gamma L_k .\, pnuc_{i\,k} .(1- pnuc_{i\,k}), \qquad (4)$$

and that

$$d\, psingle_{i\,k} / d\, D^{Age} = \xi L_i .\, pnuc_{i\,k} .(1- pnuc_{i\,k}), \qquad (5)$$

$$d\, psingle_{i\,k} / d\, D^{Cohort} = \nu L_k .\, pnuc_{i\,k} .(1- pnuc_{i\,k}), \qquad (6)$$

where αL_i, γL_k are the parameters relating the dummies for Age and Cohort to the Logit of pnuc and ξL_i and νL_k are the parameters relating the dummies for Age and Cohort to the Logit of psingle, that is, the parameters that we estimate. The coefficients that reflect the age effect (equivalent to α_i or ξ_i and equal to the above derivatives (3) and (5)) for each age are obtained with the average over all cohorts of the pnucs for that age. Likewise, the coefficients that reflect the cohort effect (equivalent to γ_k or ν_k and equal to the above derivatives (4) and (6)) for each cohort are obtained with the average over all age levels of the pnucs for that cohort.

The estimated models include only one variable standing for the period effect, since the hypotheses that the parameter associated with any of the other two variables is zero was not rejected at any conventional level, using Likelihood ratio tests.

The cohort effects are presented in charts 3 and 5. Zero corresponds to the level of cohort 1909, the reference category. We can see a clear declining trend in the proportion of nuclear households: more recent cohorts generally exhibit larger proportions of extended households than the previous cohorts. The evolution of the proportion of single households by cohorts is a little more irregular. However, we can say that the first cohorts in the sample have larger proportions of single households than the rest.

The age effects are represented in charts 4 and 6. They show clear monotonous trends. As individuals age, they tend to live more in extended households, despite the fact that they increase their chances of living alone (the increasing tendency is present until age 80).

Likelihood ratio tests definitely reject the null hypotheses of insignificant age effects or insignificant cohort effects.

The period effect, captured by the capacity of institutions for the elderly is significant. Its associated parameter is positive, meaning that it is when more places in institutions are available that the elderly live more in nuclear households. This is consistent with the hypothesis that institutions are more important as an alternative to those elderly that would otherwise live in extended households.

The period effect is not significant in the explanation of the proportion of single elderly households. Nevertheless, from the three tried variables that might represent period, CPI4 was the most significant.

4. The projection

In this section, the estimated model is used to project the proportion of nuclear households. The projections do not go into the future since they are based on data from only 8 years.

The procedure that we use to forecast the evolution of the living arrangements of the community-living elderly in Portugal is a two-step procedure. First, we project the proportion of nuclear households for each age class. Then the estimations are weighted by the proportion of the population that are projected by the National Institute of Statistics for the respective year, and they are added in order to find the forecasts of the average proportions of nuclear households with elderly in Portugal.[8]

There is one difficulty with this procedure: each new year a new cohort enters the 65 years old group, but there is no estimated cohort effect for that specific cohort. Two solutions were tried: 1) to consider the coefficients for each new cohort the same as the last cohort coefficient, the one for cohort 1936; 2) to extrapolate the coefficients for each new cohort based on a linear trend. Since the results are not much different, it is not important which of the solutions is chosen: the message that pervades is the same. The charts that are presented correspond to the first solution.

As we use the logit regression, the estimations made in the first step of the procedure must be converted to proportions before the second step.

The result of the projection may be seen in charts 7 and 8.

We can see that from 2001 to 2005, the proportion of nuclear households with elderly in general, and the proportion of elderly individuals living alone have, kept on decreasing.

5. Conclusion

Based on the distinction of extended and nuclear households, we analyse the evolution of the living arrangements of the elderly, in Portugal, since 1994. We offer the view of rapidly changing living arrangements of the elderly.

More than half of the elderly (between 59% and 67% of those living in the community) live in nuclear households: they either live alone, with a spouse or with children under 26. Nevertheless, these proportions decreased between 1994 and 2001, and have continued to decrease in the following years, according to our projections. Extended households are, therefore, a very significant form of household when

[8] A procedure that is similar to ours can be found in Rentz and Reynolds (1991).

considering the elderly. Not only has the proportion of nuclear households as a whole decreased, but also the proportion of the elderly that live alone. Those living alone accounted for around 20 percent of the elderly in the beginning of the period; that decreased to about 16 percent in 2001, and kept on decreasing according to our projections. Considering that less than a decade elapsed, the decrease was quite impressive.

It is not true that the reduction in the proportion of single households is the main responsible for the reduction in the proportion of nuclear households, because the ratio between those two categories is approximately stationary.

The knowledge about the type of households is relevant for those interested in studying the demand for housing, the demand for consumer goods, or the need for formal caregivers. The increase in the proportion of extended households with elderly may signal that larger houses are necessary and that even the houses for younger generations should be designed to be elderly friendly. The decrease in the proportion of single households may have several interpretations and implications. Maybe it is a signal that single elderly have no conditions to live by themselves, and that is why they move to extended households or to institutions. This would indicate that more formal care addressed to lonely elderly is needed. But it may also be a signal that the importance of kin caregivers is growing, and that they deserve special attention.

Our results are a portrait of a situation, they do no offer an explanation for what is found. It would be interesting to follow that direction in future research.

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Table 1

Age Period Cohort Matrix

	1994	1995	1996	1997	1998	1999	2000	2001
85	*1909*	*1910*	*1911*	*1912*	*1913*	*1914*	*1915*	*1916*
84	*1910*	*1911*	*1912*	*1913*	*1914*	*1915*	*1916*	*1917*
83	*1911*	*1912*	*1913*	*1914*	*1915*	*1916*	*1917*	*1918*
82	*1912*	*1913*	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
81	*1913*	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
80	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*
79	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*	*1922*
78	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*	*1922*	*1923*
77	*1917*	*1918*	*1919*	*1920*	*1921*	*1922*	*1923*	*1924*
76	*1918*	*1919*	*1920*	*1921*	*1922*	*1923*	*1924*	*1925*
75	*1919*	*1920*	*1921*	*1922*	*1923*	*1924*	*1925*	*1926*
74	*1920*	*1921*	*1922*	*1923*	*1924*	*1925*	*1926*	*1927*
73	*1921*	*1922*	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*
72	*1922*	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*
71	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*
70	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*
69	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*
68	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*	*1933*
67	*1927*	*1928*	*1929*	*1930*	*1931*	*1932*	*1933*	*1934*
66	*1928*	*1929*	*1930*	*1931*	*1932*	*1933*	*1934*	*1935*
65	*1929*	*1930*	*1931*	*1932*	*1933*	*1934*	*1935*	*1936*

<u>Table 2</u>

Weighted least squares (Logistic transformation)

Dependent variable **Pnuc**

Variable	Estimated coefficient	Std. Error	t-statistic	P-value
(Constant)	2,037106	0,346532	5,878553	3,87E-08
γL1910	-0,37047	0,221452	-1,67292	0,09697
γL1911	-0,38258	0,226552	-1,6887	0,093897
γL1912	-0,38848	0,255502	-1,52046	0,131049
γL1913	-0,75268	0,282339	-2,66588	0,008746
γL1914	-1,35413	0,327394	-4,13609	6,62E-05
γL1915	-1,15381	0,366833	-3,14532	0,002096
γL1916	-1,48824	0,429223	-3,46729	0,000732
γL1917	-1,29678	0,481994	-2,69045	0,008162
γL1918	-1,98704	0,522773	-3,80096	0,000229
γL1919	-1,69596	0,576213	-2,94329	0,003905
γL1920	-1,84083	0,626034	-2,94046	0,003939
γL1921	-1,9271	0,675611	-2,85239	0,005118
γL1922	-2,12949	0,728495	-2,92314	0,004149
γL1923	-2,25556	0,779336	-2,89421	0,004523
γL1924	-2,2626	0,82982	-2,72661	0,007367
γL1925	-2,65429	0,88264	-3,00721	0,003217
γL1926	-2,12256	0,93722	-2,26474	0,025339
γL1927	-2,73158	0,987031	-2,76747	0,006553
γL1928	-2,94423	1,038758	-2,83438	0,005396
γL1929	-3,07634	1,09214	-2,8168	0,00568
γL1930	-3,52967	1,143785	-3,08595	0,002524
γL1931	-3,59768	1,194034	-3,01305	0,003161
γL1932	-3,40379	1,249283	-2,7246	0,007409
γL1933	-3,28562	1,302105	-2,52331	0,012944
γL1934	-4,26681	1,359159	-3,1393	0,002136
γL1935	-5,02313	1,423277	-3,52927	0,000593
γL1936	-4,4387	1,508719	-2,94203	0,00392
αL66	-0,07344	0,100938	-0,72761	0,468281
αL67	-0,27593	0,140018	-1,97065	0,051085
αL68	-0,44691	0,184746	-2,41905	0,017075
αL69	-0,6463	0,233269	-2,77061	0,006494
αL70	-0,75881	0,288466	-2,63051	0,009653
αL71	-0,90852	0,341024	-2,66408	0,00879
αL72	-0,90358	0,394907	-2,28808	0,023898
αL73	-1,04144	0,44928	-2,31802	0,022156
αL74	-1,18947	0,50019	-2,37804	0,018998
αL75	-1,19893	0,549977	-2,17997	0,031229
αL76	-1,41776	0,60693	-2,33596	0,021167
αL77	-1,55934	0,665493	-2,34313	0,020782
αL78	-1,63131	0,71345	-2,2865	0,023993
αL79	-1,76773	0,769233	-2,29805	0,023305
αL80	-1,99679	0,826849	-2,41494	0,01726
αL81	-2,23699	0,883658	-2,53151	0,012661
αL82	-2,52652	0,936547	-2,6977	0,007997
αL83	-2,56823	0,9942	-2,58321	0,010999

Variable	Estimated coefficient	Std. Error	t-statistic	P-value
αL84	-2,89778	1,043048	-2,77818	0,006354
αL85	-3,40332	1,090944	-3,11961	0,002272
Capinst	4,93E-05	2,38E-05	2,072454	0,040383

Number Observ.	168,000
R^2	0,777
Adjusted R^2	0,688
Log likelihood	32,826

Note: C is the constant term. αi are the coefficients of the age dummies. i= 66,…85. Age 65 is the omitted age category. γ_k are the coefficients of the cohort dummies. k= 1910,…,1936. Cohort 1909 is the omitted cohort category. Capinst is the capacity of institutions for the elderly.

Table 3

Weighted least squares (Logistic transformation)

Dependent variable **Psingle**

Variable	Estimated coefficient	Std. Error	t-statistic	P-value
(Constant)	-1,20166	0,280898	-4,27791	3,83E-05
νL1910	0,225081	0,213156	1,055946	0,293132
νL1911	0,472461	0,205217	2,302245	0,023059
νL1912	-0,23664	0,201796	-1,17268	0,243266
νL1913	0,151725	0,199623	0,760058	0,448723
νL1914	-0,37212	0,200977	-1,85157	0,066567
νL1915	0,266204	0,198619	1,340274	0,18271
νL1916	-0,31343	0,198838	-1,5763	0,117612
νL1917	-0,71677	0,210364	-3,4073	0,000896
νL1918	-0,55749	0,210431	-2,64925	0,009162
νL1919	-0,34455	0,2138	-1,61157	0,109706
νL1920	0,049732	0,215673	0,230587	0,818031
νL1921	-0,74175	0,218843	-3,38941	0,000951
νL1922	-0,19382	0,22204	-0,87289	0,384483
νL1923	-0,6283	0,226206	-2,77753	0,006366
νL1924	-0,03255	0,227089	-0,14332	0,886281
νL1925	-0,53641	0,232745	-2,30472	0,022915
νL1926	-0,67323	0,236706	-2,84417	0,005243
νL1927	-1,54531	0,243872	-6,33658	4,36E-09
νL1928	-0,551	0,241705	-2,27964	0,02441
νL1929	-0,97806	0,246716	-3,96431	0,000126
νL1930	-1,5046	0,255373	-5,89175	3,64E-08
νL1931	-1,30521	0,258158	-5,05585	1,57E-06
νL1932	-0,5071	0,261272	-1,94089	0,054636
νL1933	-0,25183	0,266522	-0,94487	0,34664

Variable	Estimated coefficient	Std. Error	t-statistic	P-value
νL1934	-0,83376	0,277661	-3,00281	0,003261
νL1935	-1,86935	0,305287	-6,12327	1,22E-08
νL1936	-1,57476	0,353902	-4,44972	1,95E-05
ξL66	0,104062	0,106503	0,977082	0,330511
ξL67	0,199057	0,108287	1,838235	0,068522
ξL68	0,166766	0,111137	1,500548	0,136121
ξL69	0,202825	0,115052	1,762895	0,080485
ξL70	0,178505	0,119028	1,499685	0,136344
ξL71	0,180884	0,123952	1,459302	0,147117
ξL72	0,24066	0,126574	1,90134	0,059676
ξL73	0,356537	0,131195	2,71762	0,007557
ξL74	0,439711	0,136067	3,23158	0,001593
ξL75	0,445568	0,139274	3,19923	0,001766
ξL76	0,475381	0,143305	3,317259	0,001206
ξL77	0,554542	0,147556	3,758192	0,000267
ξL78	0,630977	0,153162	4,119661	7,04E-05
ξL79	0,679292	0,157444	4,314494	3,32E-05
ξL80	0,69323	0,162354	4,269871	3,95E-05
ξL81	0,608661	0,168502	3,612197	0,000446
ξL82	0,663748	0,173986	3,814949	0,000218
ξL83	0,587616	0,179572	3,272318	0,001396
ξL84	0,704202	0,186655	3,772734	0,000253
ξL85	0,466107	0,183975	2,533536	0,012592
CPI4	-0,01832	0,01196	-1,53142	0,128321

Number Observ.	168,000
R^2	0,933
Adjusted R^2	0,906
Log likelihood	55,337

Note: C is the constant term. ξi are the coefficients of the age dummies. i= 66,85. Age 65 is the omitted age category. ν_k are the coefficients of the cohort dummies. k= 1910,1936. Cohort 1909 is the omitted cohort category. CPI4 is the variation in the Consumer Price Index for "Housing, water, electricity, gas and other fuels".

Chart 1
Proportion of nuclear households

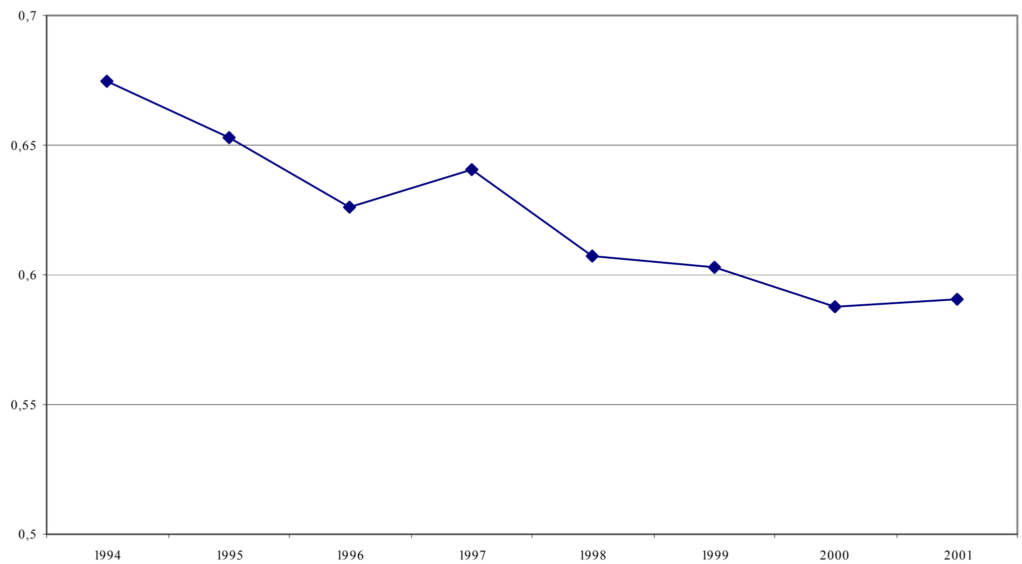

Chart 2
Proportion of single households

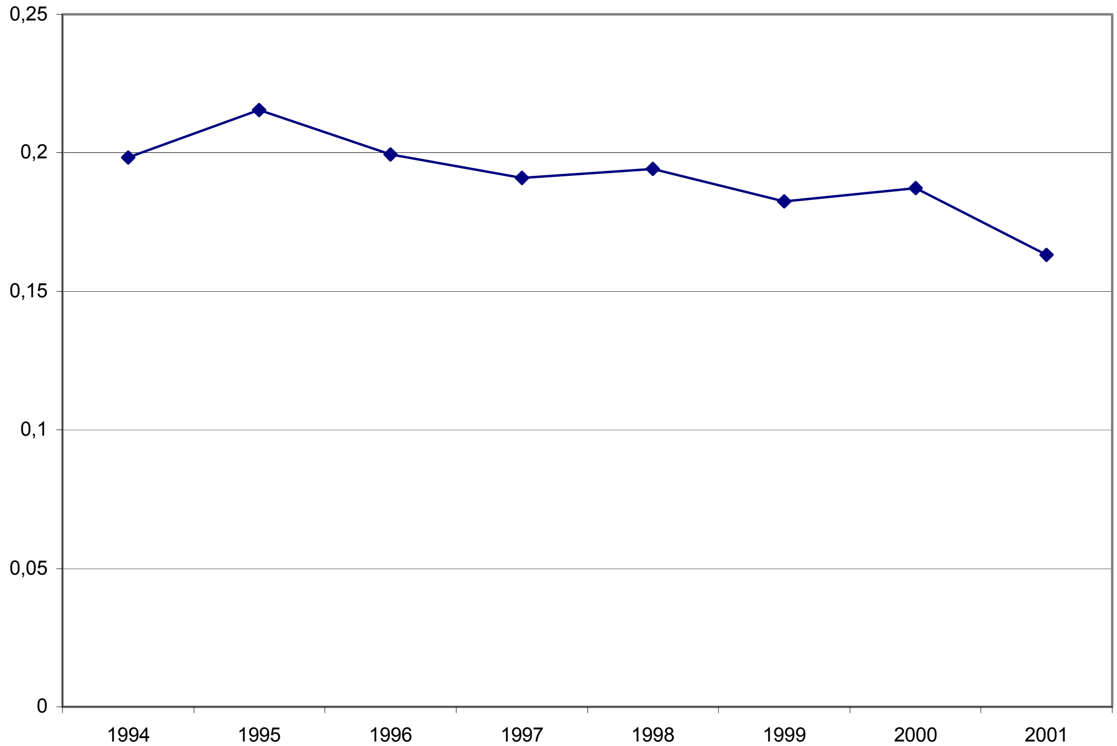

Chart 3
Cohort effects (proportion of nuclear households)

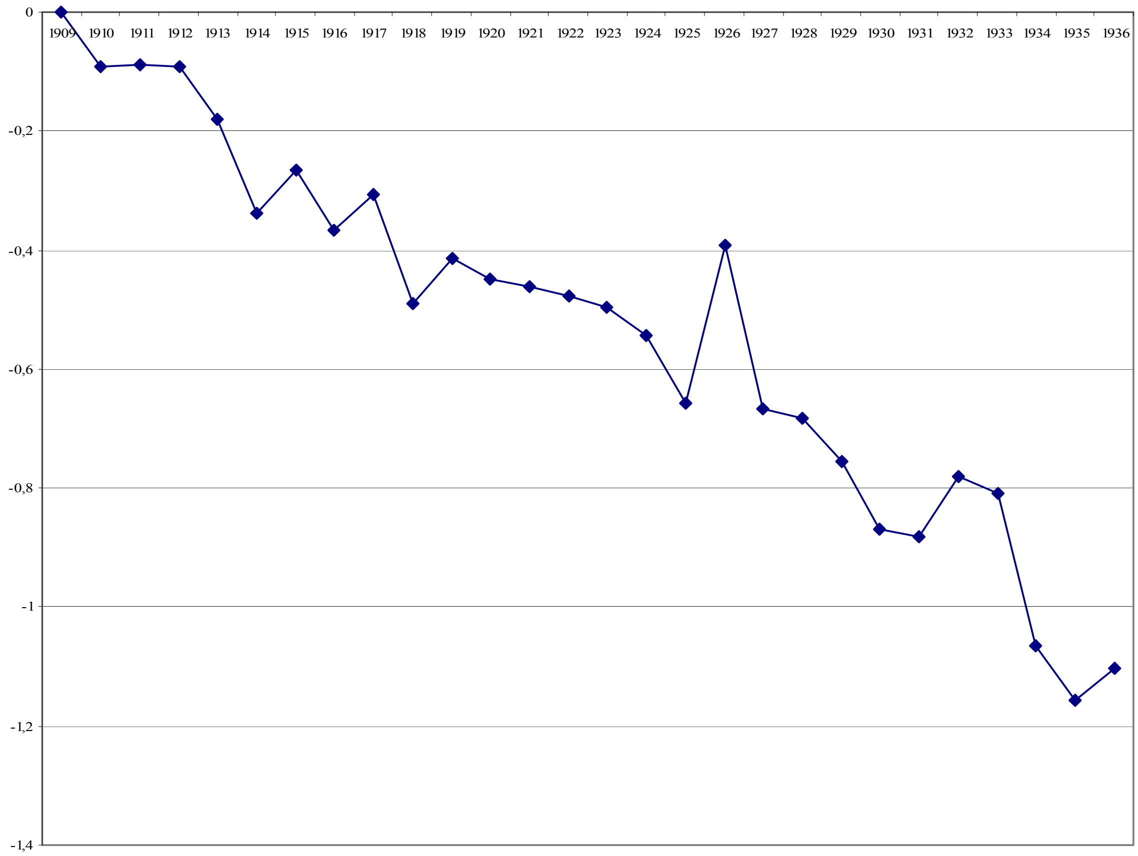

Chart 4
Age effects (proportion of nuclear households**)**

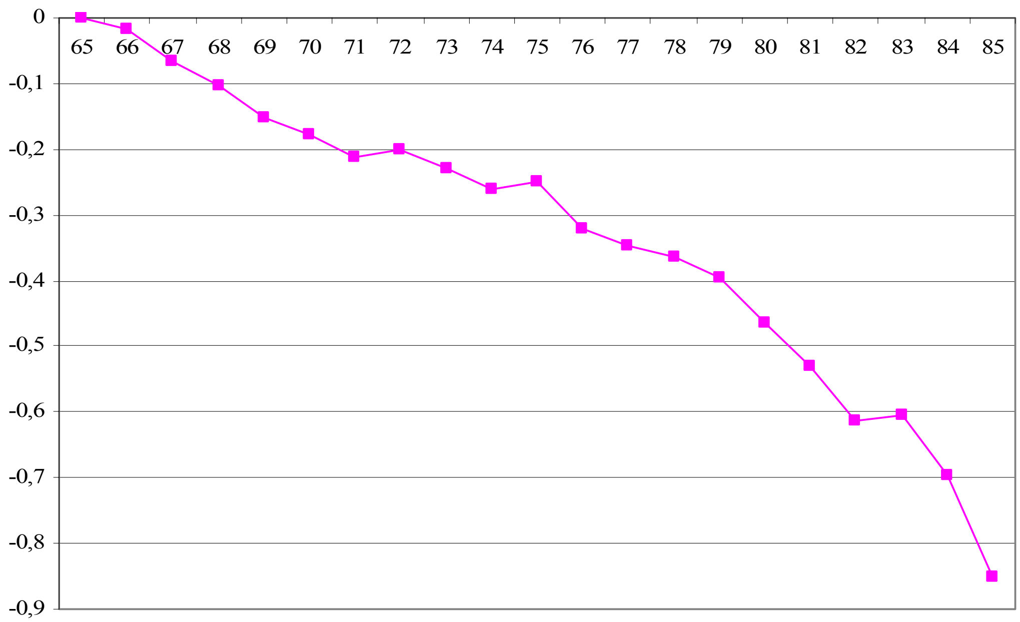

Chart 5
Cohort effects (proportion of single households**)**

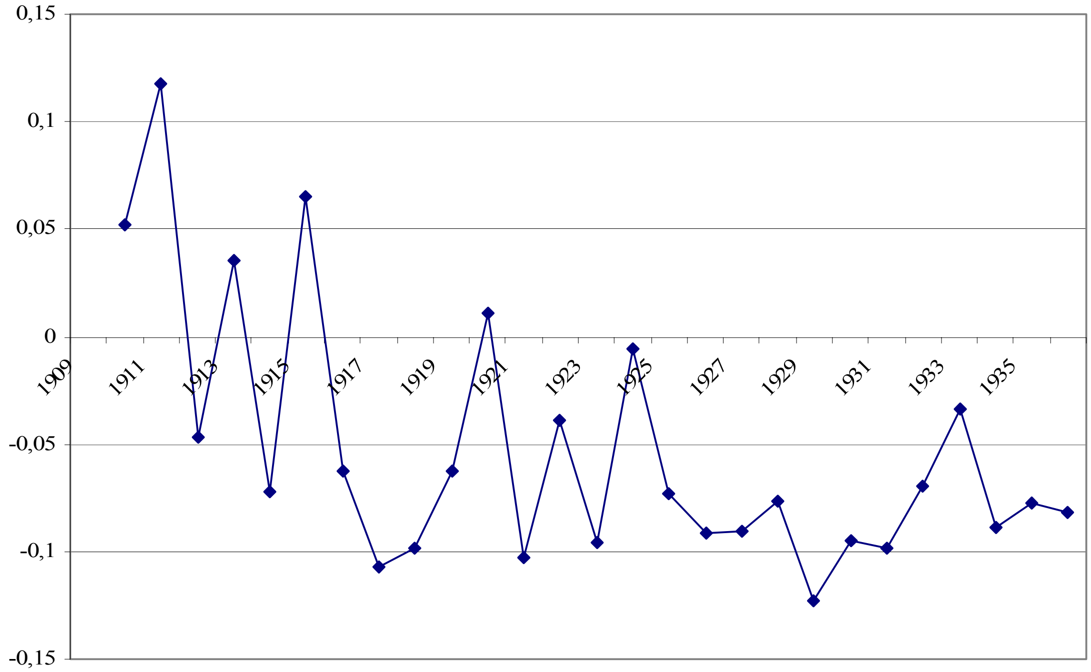

Chart 6
Age effects (proportion of single households**)**

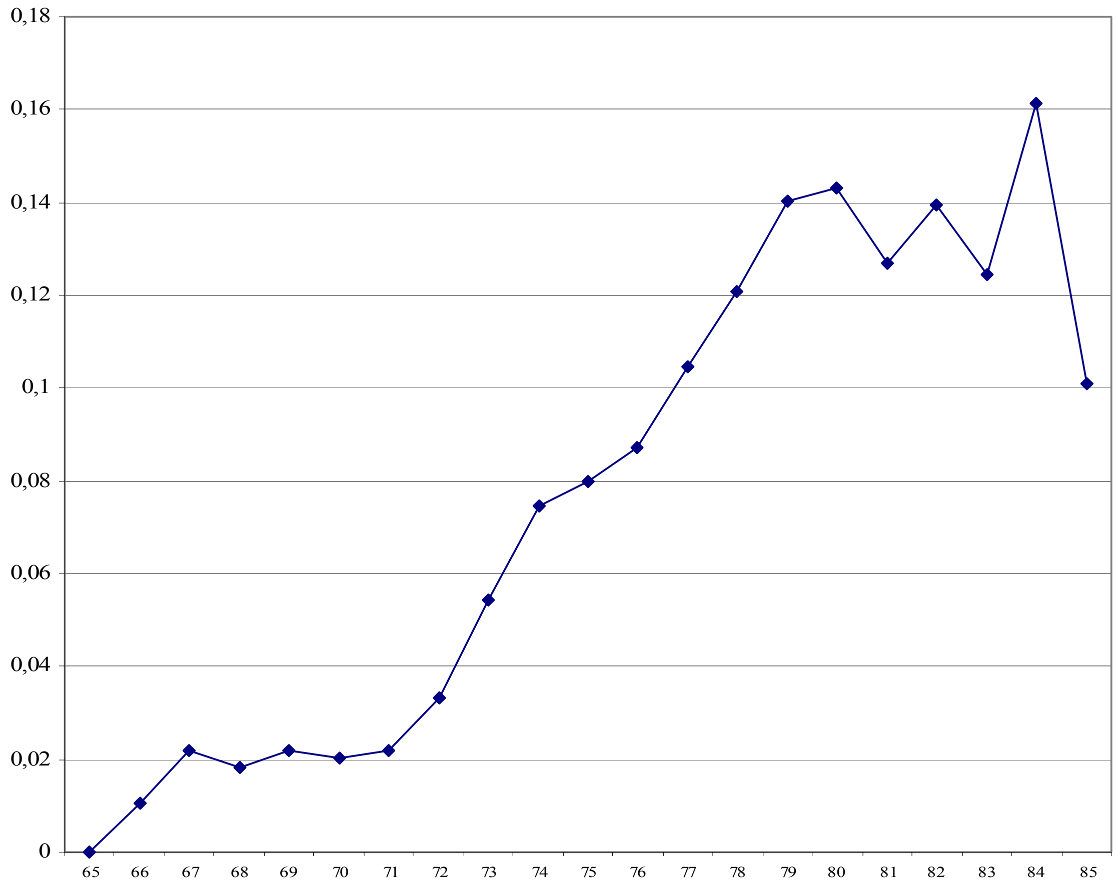

Chart 7
Effective and projected proportions of nuclear households

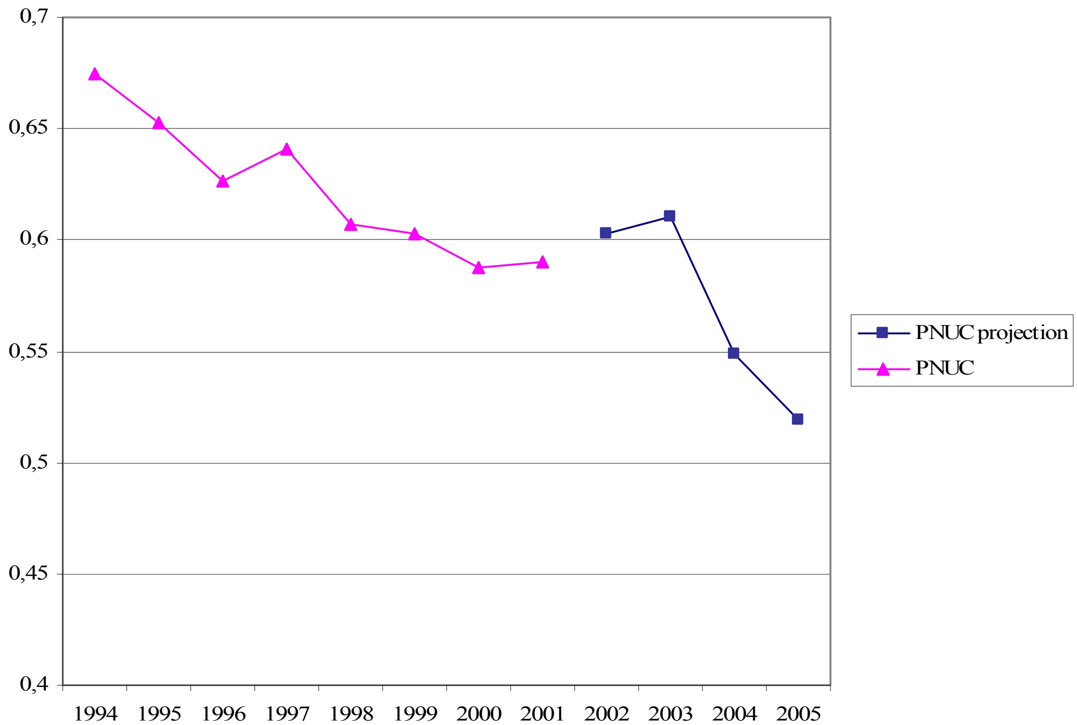

Chart 8
Effective and projected proportions of single households