The Homeownership Rate among the Elderly and the Life Cycle Hypothesis: European Evidence Using Individual and Household Data

Joaquín Alegre

Llorenç Pou (*corresponding author*)

Department of Applied Economics-University of the Balearic Islands

Postal address: Edifici Jovellanos-Campus UIB

Ctra. Valldemossa km 7,5 S/N

07122-Palma de Mallorca

Mallorca-Spain

Joaquín Alegre

e-mail: joaquin.alegre@uib.es

Telephone: +34 971 172826

Fax: +34 971 172389

Llorenç Pou

e-mail: llorens.pou@uib.es

Telephone: +34 971 171319

Fax: +34 971 172389

Abstract

One of the central predictions of the Life Cycle Hypothesis is that individuals run down their wealth during retirement. Although housing wealth is the largest component of total household wealth in most countries, empirical evidence supporting the decumulation hypothesis is mixed. In this paper we examine the housing tenure decision by the aged with microdata at both a household and individual level. The results, based on data from the European Community Household Panel for thirteen European countries, show that for nearly all countries (except for Germany and Denmark), the homeownership rate among the elderly does not decline with age, rejecting the Life Cycle Hypothesis. The results are robust to the (household or individual) level at which the data is analysed. The estimates also show a significant cohort effect for most European countries, so that the later the year of birth, the higher the homeownership rate.

Keywords: homeownership rate, the elderly, age-cohort effects, Life Cycle Hypothesis.
(**JEL:** D12, D91, R21)

1. Introduction

The ageing population has aroused renewed interest among academics about the behaviour of the elderly. In terms of their economic status, one central decision area for the elderly relates to housing (Hurd, 1990). At a microeconomic level, given the high cost of housing relative to yearly incomes, housing tenure decisions *(i.e. owning versus renting)* can greatly affect the welfare of the elderly.[1] At an aggregate level, housing decisions by the elderly might have severe consequences on house prices, as analysed by Mankiw and Weil (1989) and subsequent literature. Furthermore, because housing wealth is the largest component of household wealth in most countries (Börsch-Supan, 2003; Mitchell and Piggott, 2004; Bover et al., 2005), the age pattern of housing tenure decisions, obtained at a microeconomic level, could help to explain the relationship between saving and economic growth at a macroeconomic level (Modigliani, 1986; Paxson, 1996).

The standard theoretical model in literature on consumption/saving is the Life Cycle Hypothesis (henceforth, the LCH).[2] This model assumes that individuals smooth their consumption over income variability, so as to save during high-income periods and decumulate wealth at times when income is low. Consequently, one of the main predictions of the LCH is that individuals run down their wealth during retirement. If households consider housing wealth to be a means of financing consumption during retirement, then the Life Cycle Hypothesis predicts a decreasing pattern in housing wealth with age.

[1] See, for instance, literature on reverse mortgages.
[2] See Browning and Lusardi (1996) and Deaton (1997) for a review of literature on the LCH.

The main ways to decumulate housing wealth are twofold: (1) downsizing ownership positions and (2) the tenure transition from ownership to rental (Jones, 1997). Of these two options, the one with the highest impact on housing wealth is own-to-rent transitions.

This paper focuses on the homeownership decisions of the elderly as they age. Previous empirical literature on the housing tenure trajectories of the elderly is mixed (see Section 2). In fact, the results seem to be conditional on the type of microdata that is analysed. Papers that examine cross-sectional data usually support the LCH as they obtain a decreasing homeownership age profile. However, cross-sectional estimates confound age and generational effects (Shorrocks, 1975), so longitudinal data is required to disentangle both effects. In this respect, papers with panel data do not detect a substantial change in the ownership position as the elderly age, while pseudo-panel data provides mixed results.

This paper attempts to contribute to literature on the homeownership rate among the elderly in a number of ways: firstly, previous empirical literature has mostly been based on US and UK data[3]; two countries with high ownership rates. In this paper, we use microdata drawn from the European Community Household Panel (henceforth, the ECHP). This survey permits to analyse a wide sample of European countries (Austria, Belgium, Denmark, Germany, France, Ireland, Italy, Greece, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom) with a standardised questionnaire. In addition to complementing previous empirical literature, the sample

[3] See, among others, Mankiw and Weil (1989), Börsch-Supan (1990), Jones (1995, 1997), Sheiner and Weil (1992), VanderHart (1994), Ermish (1996), Linneman et al. (1997), Megbolugbe et al. (1997), Ermish and Jenkins (1999), and Venti and Wise (2002 2004).

provided by the ECHP is interesting in that the predominant system of housing tenure and, consequently, public policies promoting access to housing differ among European countries (Maclennan et al., 1998; European Central Bank, 2003). Thus our results allow us to examine whether homeownership age profiles for the elderly are dependent upon the predominant system of housing tenure in each country.

The second contribution of this paper is related to the longitudinal nature of our dataset, which was conducted on a yearly basis during eight consecutive years. Unlike single cross-sectional data, thanks to the longitudinal nature of the ECHP, age profiles adjusted by cohort effects can be estimated. Recent literature has emphasized the importance of accounting for cohort effects in analyses of housing careers (Guiso and Jappelli, 1999; Myers, 1999; Chiuri and Jappelli, 2002; Venti and Wise, 2002, 2004; Crossley and Ostrovsky, 2003). In fact, not controlling for cohort effects may bias the test for the homeownership age profile predicted by the LCH. We address this issue by using pseudo-panel techniques, with cohorts defined according to individuals' birth years. Although the main objective of this paper is to estimate age profiles, estimates of cohort profiles across European countries are also interesting in themselves.

Thirdly, the usual approach in literature on housing with microdata is to use information at a household level, where the household reference age is that of the household head. However, some authors (Deaton and Paxson, 2000) have emphasized that summarizing household information through the household head might generate a sample bias, because household heads are not necessarily representative of all individuals of their age in the sample. For instance, elderly people moving in with their children disappear from the sample of household heads. In this paper we examine whether these sample biases might alter the estimated age profiles. For this purpose, we constructed two sets of pseudo-panels that differ in terms of the level at which the data was grouped, either at a household or individual level. Unlike pseudo-panels at a household level, pseudo-panels with information at an individual level take into account all elderly household members whatever their household status.[4]

The main findings of this paper are the following. The results show that homeownership age profiles are very sensitive to the inclusion of cohort variables in the estimated model. In particular, a decreasing homeownership pattern with age, similar to the one detected when the data is treated as pooled cross-sectional data, is obtained when cohort effects are not accounted for. However, including cohort variables in the model leads to a significant change in the age profiles that are obtained, this time showing a homeownership rate that is either flat or increases slightly with age for most countries. Only Germany and Denmark continue to show a decreasing pattern with age. Thus, data from most of the European countries under analysis does not support the own-to-rent transition predicted by the LCH during retirement. As regards the cohort profiles, a significant positive cohort effect is obtained for most European countries. That is, the later a generation is born, the higher the percentage of households (individuals) that own their own dwelling. Finally, it is worth noting that the cohort-adjusted age profiles are robust to the level at which the data is grouped to construct the pseudo-panels, while the cohort effects are stronger with pseudo-panels that take into account information for all elderly individuals in the sample.

The remainder of this paper is organised as follows. Section 2 reviews literature on the homeownership rate among the elderly. Section 3 describes the dataset and discusses

[4] The methodological procedure used to impute household information to individuals is discussed in Section 3.

the estimation strategy. The main results are outlined in Section 4, while Section 5 closes with the concluding remarks.

2. Review of Literature

Given the inherent characteristics of housing, when individuals make housing arrangements, they incorporate an element of saving in decision-making as well as consumption (Henderson and Ionnides, 1983). The standard theoretical model in literature on consumption/saving is the Life Cycle Hypothesis. In this model, individuals plan consumption for each period based on the present value of their lifetime income (i.e. permanent income) in such a way that their intertemporal marginal utility remains constant. In the “stripped-down” life cycle model, it is assumed that a household (individual) *i* belonging to generation *b* earns a constant income Y_b until retirement age *R*, so that lifetime resources are $H_b=Y_b \cdot R$, the household (individual) lives *T* years, there is no uncertainty and financial markets are perfect, the interest rate and the rate of time preference are zero, and optimal consumption is constant at $C=H_b/T$. Then the total wealth of this household (individual) aged *a* increases up to retirement with the expression:

$$W_{a,b} = \frac{a}{R}\left(1 - \frac{R}{T}\right)H_b \text{ for a=0,…, R-1.} \quad [1]$$

and declines afterwards,

$$W_{a,b} = \left(1 - \frac{R+a}{T}\right)H_b \text{ for a=0,…, (T-R).} \quad [2]$$

Note then that the age-wealth profile of this household (individual) is hump-shaped and independent from lifetime resources, so that the wealth equation can be summarised as:

$$W_{a,b} = f(a)H_b \qquad [3]$$

where function *f(a)* determines how fixed lifetime resources, H_b, are accumulated/dissaved over the lifecycle.[5]

If housing can be considered to be an asset that can finance consumption during retirement (Venti and Wise, 2002), then from equations [1] and [2] one would expect households to decumulate housing wealth during the retirement period as its members age (Jones, 1997).

As commented above, tenure transitions are one of the main ways to affect housing wealth. Thus, following expression [3], housing tenure choices can also be presented as a decision affected by the stage in the family lifecycle (age) and generational (cohorts) effects:

$$T_i = f(\text{age}, \text{generation}) \qquad [4]$$

where T_t *i*s the housing tenure (ownership *vs* rental) variable of household (individual) *i*.

[5] Although the replacement of some of the simplifying assumptions stated above for more "realistic" ones may change the age-wealth profile, depending on whether the interest rate exceeds or falls short of the individual's rate of time preference, it does not change the basic result of wealth decumulation during retirement.

Empirical literature on the homeownership age pattern among the elderly is mixed. Papers that rely on cross-sectional data usually obtain a decreasing homeownership rate with age, supporting the LCH (Mankiw and Weil, 1989; Vanderhart, 1994; Jones, 1995, 1997; Ermish, 1996; Linneman et al., 1997). As commented above, however, cross-sectional estimates confound age and generational effects. The individuals interviewed in any cross-section belong to generations that differ in mortality rates, preferences and lifetime resources (Jappelli, 1999). Thus a decreasing homeownership rate with age might simply be the result of comparing individuals from different generations, where those that were born earlier have a lower permanent income. In order to estimate cohort-adjusted age profiles, longitudinal data is required so that these fixed time effects can be controlled for.[6]

With regard to results based on longitudinal data, papers that use panel data do not find substantial own-to-rent transitions (Feinstein and McFadden, 1989; Börsch-Supan, 1990; Sheiner and Weil, 1992; Megbolugbe et al., 1997; Ermish and Jenkins, 1999; Walker, 2004; Tatsiramos, 2006). Indeed, when detected they correspond to individuals of a very advanced age and are associated with precipitating shocks in the household status, like the death of a spouse or significant money disbursements due to entry into a nursing home. On the other hand, papers that apply pseudo-panel techniques are not highly supportive of the LCH: Venti and Vise (2002, 2004) obtain a flat age profile with US data, while Crossley and Ostrovsky (2003) obtain a decreasing but not steep homeownership rate with age with Canadian data.

[6] See Börsch-Supan (1990) for a demonstration of how different the age patterns for housing can be depending on whether panel data from the American PSID is analysed as either pooled cross-sectional or longitudinal data.

As shown above, the life-cycle model also contemplates the existence of differences in the accumulation of wealth among households due to a generational effect. Modigliani (1986) assumes that if productivity increases over time, then generations hold higher lifecycle resources the later they are born.[7] In this context, holding everything else constant, a positive relationship might be expected between individuals' year of birth and their housing demand. In fact, empirical literature supports the existence of cohort effects for the homeownership rate (Guiso and Jappelli, 1999; Venti and Wise, 2002, 2004; Crossley and Ostrovsky, 2003).

3. Data and Estimation Strategy

3.1. The dataset

This paper draws on data from the European Community Household Panel. The ECHP is a standardized multi-purpose annual longitudinal survey providing comparable microdata about living conditions in European Union Member States (Eurostat, 1996). The survey is annually representative of households and individuals in each country, with over 60,000 households and 130,000 adults across the European Union being interviewed during each wave. The topics covered in the survey include income, demography, labour, health, education and training, housing and social relations. The survey began in 1994 in twelve countries (Belgium, Denmark, Germany, France, Ireland, Italy, Greece, Luxembourg, Portugal, Spain, the Netherlands, and the United Kingdom), with three additional countries joining the survey in succeeding years (Austria in 1995, and Finland and Sweden in 1997). The last survey was conducted in

[7] In the basic LCH it is assumed that productivity growth is generation specific. This implies that any productivity shock would induce a parallel shift of the age-wealth profile without affecting its shape over the lifecycle.

2001, so for most countries the ECHP covers the period 1994 to 2001. In this paper all these countries were analysed, except for Finland and Sweden due to longitudinal data requirements.

One of the attractive features of the ECHP for the purpose of this paper is that it provides information about housing tenure together with demographic data for all adult household members. As regards tenure, the ECHP collects information on whether the household owns or rents its dwelling. Those households for whom this information was either missing or not applicable were excluded. We focused on households with a reference person aged 50 or older. In the ECHP, age information is top coded for those individuals born before the year 1910. Consequently, households with a head born before that year were also excluded, so our household sample is restricted to households with a reference person aged between 50 and 91 (henceforth, the elderly household sample). Notice that the availability of housing tenure information up to the age of 91 is interesting because, as commented in the review of literature, some authors only detect transitions out of ownership at very advanced ages.

Table 1 presents the homeownership rate for the above European countries in 1994 and 2001. For the sake of comparability, this table provides information for the elderly household sample but also for all households with heads aged twenty and older. Three main conclusions can be drawn from Table 1. First, the homeownership rate presents wide differences across European countries, whatever the age sample. In 1994 these differences ranged from 39.2% for Germany to 85.1% for Ireland for the elderly household sample. Second, the figures are higher for the elderly sample than for the whole sample in nearly all countries.[8] Finally, a comparison of the years 1994 and 2001 shows a significant increase in the homeownership rate for both age samples in most European countries. Particularly noteworthy are the cases of the Netherlands, the United Kingdom and Greece, with increases of eight percentage points or higher.[9]

As regards the importance of demographic information for all household members, analyses based on the age of the household head assume that the latter's housing tenure decisions are representative of all individuals of the same age. As surveys usually identify the household head as the main family earner, it is obvious that there might be a selectivity issue. Indeed, individuals do not always remain household heads during their whole lifecycle: divorces and widowhood often involve changes in the household reference person. Furthermore, some elderly people move in with their children, so they lose their status as household heads and disappear from the sample of household heads. All these sample selection issues might generate misleading homeownership age profiles among the elderly. In order to overcome all these selection issues, we generated a new sample that included all household members over the age of 49 born later than 1909, whatever their household status (hereafter the elderly individual sample). In contrast with information gathered at the household level, where for each wave we had one observation per household, at the individual level we had as many observations as the number of elderly household members in each wave. A final issue in the construction of the sample at the individual level was the imputation procedure of the household tenure status to family members. In this paper we followed the work by Deaton and Paxson (2000), where total household expenditure is imputed to the household members. We assumed that homeownership is a public good for spouses, so

[8] This evidence is also obtained in Mitchell and Piggot (2004) with data for Japan, the US and Australia.
[9] Engelhardt (2007) also obtains a significant increase in the homeownership rate for elderly American households over the period 1977-2000.

when a household owns (rents) its dwelling, both partners are considered to be the owners (renters). For the rest of the household's elderly members, homeownership was assumed to be a private good, so they were always computed as renters.

[INSERT TABLE 1 ABOUT HERE]

Figure 1 focuses on the elderly samples, showing the homeownership rate by age groups, pooling all the waves available in the ECHP. Panels 1a and 1c plot the ownership rates for the elderly household sample. Broadly speaking, in these two panels own-to-rent transitions increase with age in all countries, especially for those households aged 70 and above. The sharp fall in the ownership rate of British and Dutch households is particularly worthy of note. Panels 1b and 1d display the homeownership rates for the elderly individual sample. Compared to panels 1a and 1c, transitions out of ownership are higher with data at an individual level. This is especially true for those countries plotted in panel 1b, which are those with a high percentage of elderly people living with their children (see Table 1).

[INSERT FIGURE 1 ABOUT HERE]

At first sight, the declining homeownership rate with age displayed in Figure 1 might seem to contradict the general upward trend for the elderly shown in Table 1 for the period 1994-2001. What reconciles both facts is the potential existence of cohort effects in the data. In particular, if at a given age each generation has a different homeownership rate, with this rate increasing the later the generation was born, then the decreasing homeownership rate with age drawn with pooled data could be the result of generational differences. Furthermore, despite differences in the homeownership rate by cohorts, they might all follow the same trend over time, explaining the evidence in Table 1.

3.2. Estimation strategy

To test for the housing wealth decumulation hypothesis predicted by the LCH, the age and cohort effects must be disentangled while controlling for common time effects. Unlike cross-sectional data, longitudinal data allows these three effects to be disentangled. In particular, bearing in mind expression [4], now the housing tenure status can be expressed as:

$$T_{it} = f(\text{age, generation, time}) \qquad [5]$$

where T_{it} *i*s the housing tenure variable of household (individual) *i* at time *t*, which takes a value of 1 if the household (individual) owns its dwelling, and 0 if it is rented. *Age* refers to how homeownership decisions evolve over the lifecycle, while *generation* corresponds to the cohort-specific effect. *Time* variables refer to the year when the data was collected and they are intended to control for macroeconomic shocks common to all households (individuals) in the sample.

Although a true panel approach is possible with the ECHP, it raises several issues. First, the survey suffers from a severe attrition problem (Peracchi, 2002).[10] Second, because

[10] The percentage of households from the initial sample that completed all the waves amounted to 54.4% in Spain, 48.9% in Denmark, 55.8% in the Netherlands, 55.6% in Belgium, 58.4% in France, 37.7% in Ireland, 61.8% in Italy, 60.6% in Greece, 73% in the UK, 70% in Germany, 75.9% in Portugal, and 48.2 in Austria. As regards the average annual attrition rate, it was 8.29% in Spain, 9.66% in Denmark, 7.95% in the Netherlands, 8.02% in Belgium, 7.36% in

the ECHP is intended to reflect changes in the population over time, the survey follows the evolution of the initial sample, with the formation of new households as existing ones split up. Again, in many cases, the longitudinal dimension of these new households is short. Third, the percentage of households that show housing tenure transitions during the available period are minor in most countries (Tatsiramos, 2006). Thus most of the sample variability is not longitudinal, but cross-sectional.

In order to deal with the above factors and take advantage of the whole elderly sample available in the ECHP, we applied pseudo-panel techniques. Pseudo-panels are generated by grouping households (individuals) on the basis of an invariable time characteristic: usually, the year of birth of the household head (individual). Taking the year of birth as the reference variable, information from each wave can be tracked, so as to follow the average behaviour of each cohort over time. In this respect, each cohort can be construed as a synthetic household (individual) with as many time observations as available waves (Deaton, 1997). When applying pseudo-panel techniques, expression [5] can be presented as:

$$\overline{T_{ct}} = f(\text{age, generation, time}) \qquad [6]$$

where $\overline{T_{ct}}$ corresponds to the homeownership rate of all households (individuals) belonging to cohort *c* interviewed in year *t*. If the age, cohort and year variables are specified as a set of dummy variables, then equation [6] can be estimated as:

$$\overline{T} = D^a\alpha + D^c\gamma + D^t\delta + u_{ct} \qquad [7]$$

France, 12.91% in Ireland, 6.60% in Italy, 6.85% in Greece, 3.95 in the UK, 4.1 in Germany, 3.85% in Portugal, and 18.5 % in Austria.

where $\overline{T}$ is a stacked vector of the homeownership rate with elements corresponding to each cohort in each year. D^a, D^c and D^t are matrices of age, cohort (year of birth) and year dummies respectively. α, γ and δ correspond to the coefficients on the age, cohort and year effects respectively, and u_{ct} is the error term.

We constructed two pseudo-panels for each country that differ in the (household/individual) level at which the data was grouped. Each cohort was constructed by grouping households (individuals) into five-year birth intervals, where the age assigned to each cohort was its mid-age. For instance, cohort 1 was defined for those household heads (individuals) born between 1910 and 1914. Thus the age interval for this cohort in 1994 was 80-84, and its assigned age was 82. In 1995, the age interval was 81-85, and so the assigned age was 83. Notice that because the cohorts are defined as a five-year band and the ECHP is available for eight consecutive years, the cohorts overlap for three years, so our pseudo-panels have common information for the same age but different cohorts. Each country's pseudo-panel sample had 64 observations (except for Austria with 56 observations), corresponding to eight cohorts over a period of eight years. The year-of-birth intervals, the range over which the median age of each cohort is observed in 1994, 1997 and 2001, and the average cell size for each cohort are reported in Table 2.

[INSERT TABLE 2 ABOUT HERE]

Finally, there is known to be a direct linear relationship among age, generation and year. If we take year of birth *b* and sample year *t*, then age *a* can automatically be inferred given the identity $a=t-b$. Any of these three effects can thus be explained as a combination of the other two, and so strong assumptions must be imposed on the parameters to identify age, cohort and year effects. Ways of solving the identification problem typically rely on the separability assumption between the age and cohort effects, plus restrictions on time effects or the specification of a model for at least one of the three effects (Brugiavini and Weber, 2003). In this paper, the habitual identification strategy used in literature, proposed by Deaton and Paxson (1994), was adopted. These authors impose the assumption that year dummies sum to zero and are orthogonal to the time trend composed by the age and cohort effects (see conditions [8] and [9]). In other words, these restrictions assume that all trends in the data can be interpreted as a combination of age and cohort effects and are therefore, by definition, predictable (Jappelli, 1999). Thus year dummies can be interpreted as deviations around that time trend.

$$\sum_{a+b=t}^{T} D^t = 0 \qquad [8]$$

$$\sum_{a+b=t}^{T} (a+b) D^t = 0 \qquad [9]$$

where D^t is a set of year dummies, and a and b the age and cohort effects.

4. Results

In this section the estimation results are discussed. As commented in the previous section, the estimated model includes age, cohort and yearly dummy variables, with the latter having been transformed to impose restrictions [8] and [9].[11] The dependent variable, that is the homeownership rate for cohort c at year t, T_{ct}, is expressed in *log*-

[11] We followed previous housing literature (see, for instance, Ermish (1996)) and did not include other socio-demographic information in the model because we were interested in unconditional age profiles. In this respect, the results were robust to its inclusion in the estimates.

odds form: $\ln[T_{ct}/(1-T_{ct})]$.[12] Equation [7] was estimated using Weighted Least Squares, with the cohort size (i.e. the number of households or individuals grouped for each cohort) at time *t* used as the weights.

Tables 3 and 4 present the results for the pseudo-panels with information grouped from the elderly household and individual samples, respectively. Both tables report the F-statistics (and their p-values) of joint significance for the whole model and χ^2-statistics for the age, cohorts and year dummy variables. The results shown in Table 3 for the elderly household sample show that both the age dummies and the cohort dummies are jointly significant at the 5% level for all countries, with the exception of the age dummies for Austria which are significant at the 7% level. As for the year variables, in most cases they are not significant. With regard to the explanatory power of each set of variables, the Wald tests reported in Table 3 show that, compared with age and time effects, the cohort variables are by far the ones with the highest explanatory power. These same comments are applicable to the pseudo-panels created with information grouped from the elderly individual sample (see Table 4). It is worth commenting, however, that the explanatory power of the cohort variables is even higher in Table 4.

[INSERT TABLE 3 ABOUT HERE]

[INSERT TABLE 4 ABOUT HERE]

Figure 2 plots the estimated age profiles for each country. To assess the relevance of controlling for both cohort effects and potential sample selection biases when data is

[12] This functional form ensures that the predicted values will always lie between 0 and 1, which would not be the case with a standard linear specification. See Beaudry and Lemiaux (1999) for a log-odds application to labour market participation.

used at the household level, in Figure 2 we present three different estimated homeownership age profiles. The first two profiles, obtained from pseudo-panels based on information grouped at a household level, differ in the inclusion/exclusion of the cohort variables, while the third profile is obtained from estimates of pseudo-panels based on information grouped at an individual level when cohort variables are included in the regressions.

[INSERT FIGURE 2 ABOUT HERE]

The (non cohort-adjusted) age profiles with information at a household level, shown in Figure 2, display a general decreasing homeownership pattern with age, as also obtained in empirical literature with cross-sectional data. In some countries (Germany, Denmark, the Netherlands, Belgium, Austria and the UK), this pattern is observed at all ages, while in other countries (France, Italy and Greece) it is only obtained at older ages, since the profiles describe an inverted U-shape. The remaining countries (Luxembourg, Spain and Portugal) show a flat homeownership rate with age. However, the age profiles change dramatically when cohort variables are included in the regressions. In fact, now the declining ownership rates with age highlighted above only remain for Germany and Denmark. In the case of the Netherlands, the decreasing pattern becomes flat. For the remaining countries (i.e. Belgium, Luxembourg, France, the United Kingdom, Italy, Spain, Portugal and Austria), the homeownership profile increases with age. That is, once common time effects and generational differences have been accounted for, in most countries the homeownership rates do not decline with age. Thus the estimates do not support the Life Cycle Hypothesis.

Interestingly enough, the cohort-adjusted age profiles obtained from pseudo-panels based on information at an individual level show similar patterns to those obtained with information at a household level (see Figure 2). That is, the absence of a declining homeownership rate with age among the elderly is robust to the level at which the information is grouped.[13] Notwithstanding this, it is worth noting that in several countries (Germany, Denmark, Luxembourg, Italy, Spain, Portugal and Austria) the estimated homeownership rate is lower at the individual level than at the household level, especially at a more advanced age.

[INSERT FIGURE 3 ABOUT HERE]

With regard to the cohort effects, Figure 3 plots the estimated homeownership rates by cohorts. Following Figure 2, two cohort profiles, one for either type of pseudo-panel, are presented for each country. The results highlight what is virtually a general generational pattern across European countries, regardless of the level at which the information is grouped. In particular, the results show that the later the year of birth, the higher the homeownership rate.[14] The only exceptions to this pattern are Germany and Denmark. Interestingly, these were the two countries with a decreasing homeownership pattern with age. Finally, a comparison of the estimated cohort profiles obtained from both types of pseudo-panels shows substantial differences in some countries. More specifically, as expected, the estimated cohort profiles for the homeownership rate are lower but rise steeply with pseudo-panels based on individual data for those countries

[13] Wald tests were applied to test for the equality of the age dummy coefficients. For this purpose, the age dummies were grouped into four groups: 50 to 59 year olds, 60 to 69 year olds, 70 to 79 year olds and, finally, 80 year olds and above. In most cases, the null hypothesis of equality between the coefficients of consecutive groups could not be rejected at the usual statistical level for either type of pseudo-panel. For the sake of brevity these results are not reported, but are available from the authors upon request.

[14] We also ran Wald tests for the equality of the coefficients on adjacent cohorts with either type of pseudo-panel. The results rejected the equality restriction in nearly all cases, showing that the positive cohort effect is statistically significant. These tests are available from the authors upon request.

with a higher percentage of households where elderly individuals live with their children. This finding illustrates the extent to which working with information from all household members can help to obtain more accurate estimates. This issue may be important, for instance, in papers aimed at projecting future housing demands.

5. Conclusions

The aim of this paper was to analyse homeownership decisions among the European elderly. Housing literature on the degree to which homeownership decreases with age among the elderly is mixed. Previous literature suffers from several drawbacks: (1) papers that rely on cross-sectional data cannot disentangle age and cohort effects, (2) some papers do not follow households up to very advanced ages, and (3) most papers with microdata use information at a household level, so several sample selection issues are veiled. This paper has attempted to contribute to existing literature in several ways. First, the longitudinal data required to estimate cohort-adjusted age profiles was achieved by applying pseudo-panels techniques to the ECHP survey. Second, the information for thirteen European countries available in this dataset allowed us to complement previous literature, mostly based on US and UK data. Furthermore, the ECHP provides information up to the age of 91, so it was possible to examine housing tenure decisions among elderly people of an advanced age. Finally, we examined whether the age and cohort profiles were robust to the (household/individual) level at which the data was analysed.

The regression results show that that homeownership age profiles are very sensitive to the inclusion of cohort variables in the estimates. In fact, when cohort effects are not accounted for, the results show a decreasing pattern with age similar to the one obtained when the data is treated as pooled cross-sectional data. Interestingly, this pattern is more pronounced for pseudo-panels constructed from data at an individual level that take into account information from all elderly household members. However, including cohort variables in the estimates leads to a significant change in the age profiles. In accordance with most previous evidence based on longitudinal data, our results do not show a substantial change in the housing tenure status among elderly European people. More specifically, now they show either a slowly rising or flat homeownership rate with age for most European countries. Only in the cases of Germany and Denmark do we obtain a decreasing homeownership rate with age. The cohort-adjusted age profiles that were obtained have proved to be robust to the (household/individual) level at which information was used and to the inclusion in the pseudo-panels of elderly people of an advanced age. Furthermore, the obtained age profiles do not seem to be sensitive to the dominant housing tenure situation in each country.

From a theoretical perspective, with the exceptions of Germany and Denmark, the results drawn from our European data do not support the housing wealth decumulation hypothesis predicted by the Life Cycle Hypothesis during retirement. By extension, our estimates suggest that European households (individuals) do not consider housing wealth to be a means of financing consumption during retirement. In this respect, our results corroborate most empirical literature on saving, where it is observed that households do not consume all their disposable income during retirement (Poterba, 1994; Börsch-Supan, 2003). As regards the policy implications of our results, the general flat ownership rates obtained with age point to the fact that the rising elderly population in European societies should not necessarily imply a massive increase in the number of houses on sale and, consequently, that housing prices need not be severely affected by ageing. On the other hand, one remaining future research task is to analyse the causes of the absence of substantial transitions out of homeownership in our data. Among the possible causes, two issues are worth mentioning: the desire to bequest property and the lack of sufficiently attractive reverse mortgage schemes.

This paper has also shown the existence of strong cohort effects for European households (individuals). In fact, compared with the age and year variables, the cohort variables are, by far, the ones with the highest explanatory power in the estimates. Again with the exception of Germany and Denmark, the remaining European countries present a positive cohort effect. That is, holding age constant, the later the year of birth, the higher the homeownership rate. This result is particularly interesting as it shows an increasing preference across generations for households/individuals to own their dwelling, and so it leads to an increasing trend in the overall homeownership rate.

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Table 1. Home-ownership rate across European countries in 1994 and 2001, and percentage of households with elderly living with their children (whole period)

	Home-ownership rate				% of households where the elderly are living with their children**
	1994		2001		
	Households aged 20+ (a)	Households aged 50+ (b)	Households aged 20+ (c)	Households aged 50+ (d)	(e)
Belgium	67.6	72.7	73.2	77.6	1.03
Denmark	61.6	64.9	66.5	68.8	0.08
Germany	39.2	47.4	41.4	46.7	1.45
France	56.4	67.5	61.2	73.0	1.78
Ireland	85.1	90.7	87.1	91.4	2.90
Italy	72.5	77.5	77.3	82.4	4.12
Greece	73.6	85.5	83.4	89.0	11.41
Luxembourg	70.8	81.4	70.1	82.3	6.25
Netherlands	50.3	44.9	59.6	53.0	0.18
Portugal	67.8	71.7	73.4	76.5	6.36
Spain	79.4	84.1	84.7	89.3	8.92
United Kingdom	66.5	66.3	74.9	76.2	1.57
Austria	59.0*	64.9*	61.4	62.6	3.26

Note: (*) this figure corresponds to the year 1995. (**) Values are based on those households with heads born between 1930 and 1950

Table 2. Year-of-birth intervals, age bands and average cell size by cohorts

	Cohorts by year of birth							
	1910-14	**1915-19**	**1920-24**	**1925-29**	**1930-34**	**1935-39**	**1940-44**	**1945-49**
Age interval in 1994	80-84	75-79	70-74	65-69	60-64	55-59	50-54	45-49
Age interval in 1997	83-87	78-82	73-77	68-72	63-67	58-62	53-57	48-52
Age interval in 2001	87-91	82-86	77-81	72-76	67-71	62-66	57-61	52-56
Average cell size by cohorts								
Belgium	74.5 (89.3)	109.7 (135.3)	207.2 (273.2)	209.1 (310.5)	229.3 (359.2)	185.0 (305.8)	185.8 (315.0)	301.7 (497.0)
Denmark	72.0 (80.1)	109.6 (132.3)	133.6 (183.2)	147.1 (210.0)	157.2 (240.2)	179.1 (272.8)	216.8 (351.3)	273.1 (431.3)
Germany	83.7 (114.1)	120.2 (144.5)	437.3 (617.5)	402.8 (630.0)	474.7 (770.0)	664.5 (1101.0)	627.6 (1108.6)	569.0 (977.5)
France	152.6 (193.6)	168.7 (218.7)	384.5 (527.6)	429.6 (673.1)	466.8 (755.2)	445.5 (757.0)	424.8 (717.6)	603.0 (1079.0)
Ireland	57.7 (81.6)	125.7 (163.5)	189.3 (265.8)	206.3 (316.5)	251.2 (379.8)	238.8 (437.7)	275.5 (480.1)	294.7 (553.0)
Italy	182.0 (255.0)	194.2 (278.7)	411.6 (600.6)	545.5 (816.3)	600.6 (968.3)	637.5 (1136.0)	654.6 (1199.6)	717.8 (1428.3)
Greece	110.3 (203.6)	178.0 (298.0)	266.7 (486.2)	415.8 (760.0)	460.1 (879.0)	401.3 (779.2)	399.8 (733.2)	490.7 (869.8)
Luxembourg	33.7 (62.3)	51.5 (84.6)	99.7 (170.8)	149.3 (245.1)	160.1 (288.5)	189.8 (334.5)	197.0 (363.1)	200.2 (405.5)
Netherlands	83.3 (95.1)	153.7 (204.6)	256.5 (338.5)	314.0 (473.7)	309.0 (493.6)	311.6 (500.6)	370.7 (610.1)	490.2 (827.2)
Portugal	125.7 (194.5)	205.2 (304.5)	401.5 (626.5)	486.5 (787.3)	497.5 (852.3)	456.0 (825.5)	439.8 (824.5)	416.7 (833.3)
Spain	149.6 (266.6)	252.0 (405.6)	442.5 (693.2)	536.3 (843.2)	591.8 (1010.3)	488.5 (906.0)	510.5 (946.3)	509.6 (988.1)
United Kingdom	138.3 (159.1)	213.0 (266.0)	356.2 (473.7)	364.1 (523.1)	337.1 (536.1)	355.5 (557.0)	415.2 (692.3)	497.3 (861.5)
Austria	62.8 (86.4)	62.5 (85.0)	187.0 (269.0)	204.4 (320.7)	212.4 (337.8)	249.7 (430.1)	268.7 (478.0)	224.0 (435.5)

Note: between parentheses the average cell size for the elderly individual sample.

Table 3. Estimation results of the home-ownership rate by country with pseudo-panels constructed with information at the household level

Country	F-test *(whole model)*	$\bar{R}^2$	Age dummies	Cohort dummies	Year dummies
Germany	11.68 (0.0001)	0.898	2.65 (0.050)	8.30 (0.0017)	3.03 (0.093)
Denmark	140.89 (0.000)	0.991	10.96 (0.000)	64.17 (0.000)	8.58 (0.004)
Netherlands	492.79 (0.000)	0.997	7.95 (0.0002)	110.89 (0.000)	1.52 (0.258)
Belgium	22.03 (0.000)	0.943	3.00 (0.022)	16.59 (0.000)	1.61 (0.240)
Luxembourg	5.42 (0.001)	0.955	3.77 (0.008)	5.36 (0.005)	1.17 (0.344)
France	59.62 (0.000)	0.979	8.80 (0.0001)	54.80 (0.000)	0.91 (0.429)
United Kingdom	74.55 (0.000)	0.983	3.81 (0.008)	48.18 (0.000)	0.15 (0.864)
Ireland	13.20 (0.000)	0.907	5.02 (0.002)	34.39 (0.000)	2.12 (0.162)
Italy	27.93 (0.000)	0.955	5.47 (0.001)	37.41 (0.000)	3.14 (0.079)
Greece	29.91 (0.000)	0.958	11.02 (0.000)	35.28 (0.000)	17.31 (0.0003)
Spain	25.67 (0.000)	0.951	12.40 (0.000)	47.98 (0.000)	5.64 (0.018)
Portugal	8.61 (0.001)	0.858	4.65 (0.003)	34.83 (0.000)	0.02 (0.975)
Austria	18.53 (0.0007)	0.939	3.28 (0.069)	15.43 (0.0019)	52.90 (0.002)

Note: The table reports F-statistics and associated p-values (in parentheses) for the whole model, and χ^2 -statistics (and p-values) for the age, cohort, and year dummy variables.

Table 4. Estimation results of the home-ownership rate by country with pseudo-panels constructed with information at the individual level

Country	F-test *(whole model)*	$\bar{R}^2$	Age dummies	Cohort dummies	Year dummies
Germany	15.91 (0.0000)	0.925	2.14 (0.099)	10.13 (0.0008)	2.12 (0.171)
Denmark	102.23 (0.000)	0.987	7.32 (0.0003)	30.56 (0.000)	9.19 (0.0038)
Netherlands	544.43 (0.000)	0.997	15.12 (0.0000)	113.65 (0.000)	4.02 (0.046)
Belgium	76.02 (0.000)	0.983	7.15 (0.0004)	70.00 (0.000)	4.26 (0.040)
Luxembourg	7.02 (0.0004)	0.828	2.44 (0.067)	3.21 (0.036)	8.46 (0.0051)
France	63.65 (0.000)	0.9804	6.43 (0.0007)	33.41 (0.0000)	0.18 (0.8335)
United Kingdom	143.43 (0.000)	0.9913	5.52 (0.0014)	80.58 (0.000)	0.26 (0.7771)
Ireland	24.30 (0.000)	0.949	3.77 (0.0084)	29.59 (0.000)	1.12 (0.357)
Italy	239.55 (0.000)	0.994	8.08 (0.0002)	103.90 (0.000)	8.01 (0.006)
Greece	262.35 (0.000)	0.995	22.21 (0.000)	141.67 (0.000)	16.16 (0.0004)
Spain	330.11 (0.0000)	0.996	7.71 (0.0003)	141.13 (0.000)	4.76 (0.030)
Portugal	122.70 (0.0000)	0.989	8.99 (0.0001)	148.41 (0.000)	2.03 (0.174)
Austria	11.05 (0.003)	0.899	1.35 (0.381)	8.38 (0.0009)	14.97 (0.004)

Note: The table reports F-statistics and associated p-values (in parentheses) for the whole model, and χ^2 -statistics (and p-values) for the age, cohort, and year dummy variables.

Figure 1. Home-ownership rates across European countries by age groups (pooled data).

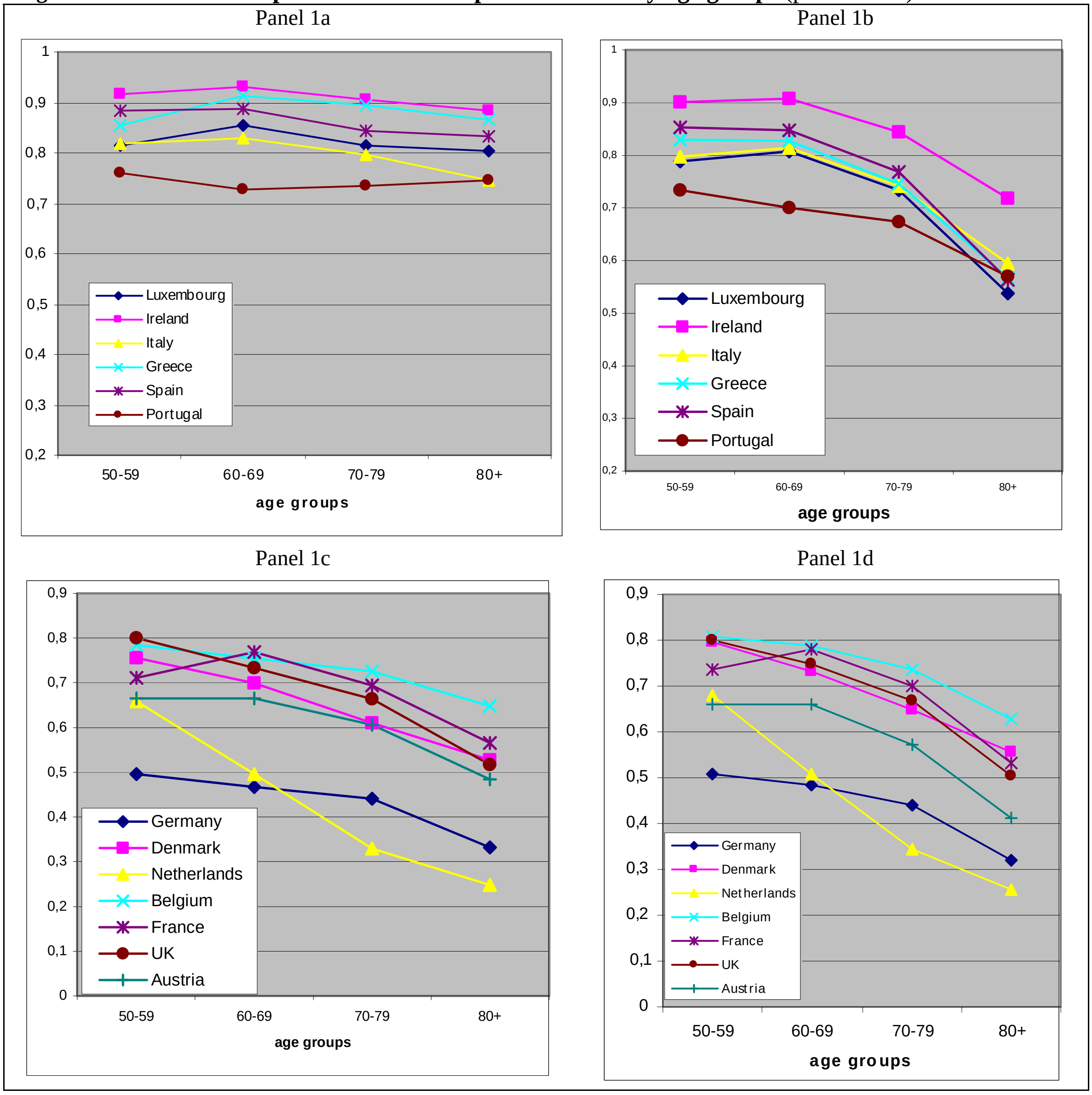

Figure 2. Estimated age-homeownership rate profiles including/excluding cohort variables at a household level, and with cohorts at an individual level

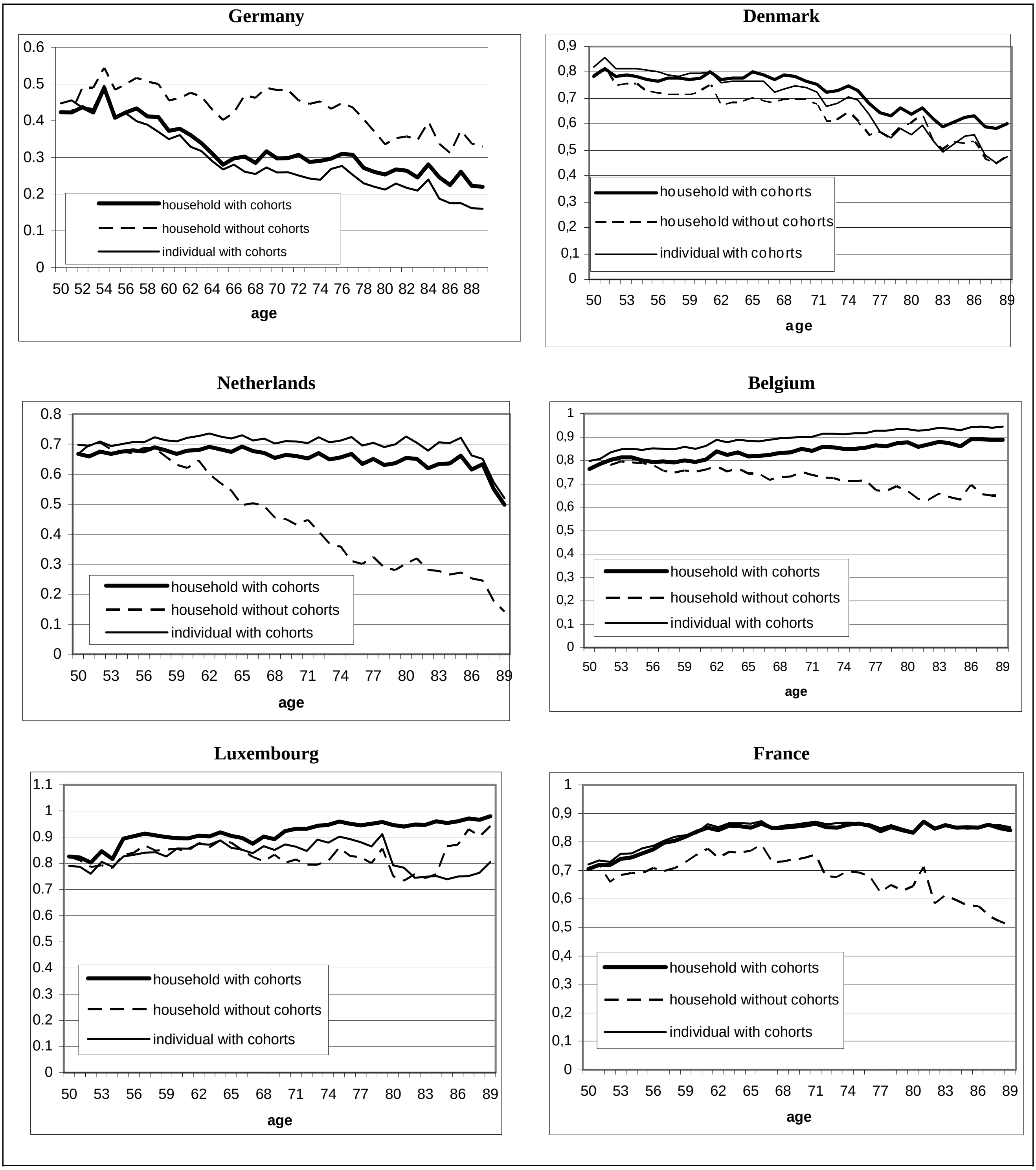

Figure 2. Estimated age-homeownership rate profiles including/excluding cohort variables at a household level, and with cohorts at an individual level (continued)

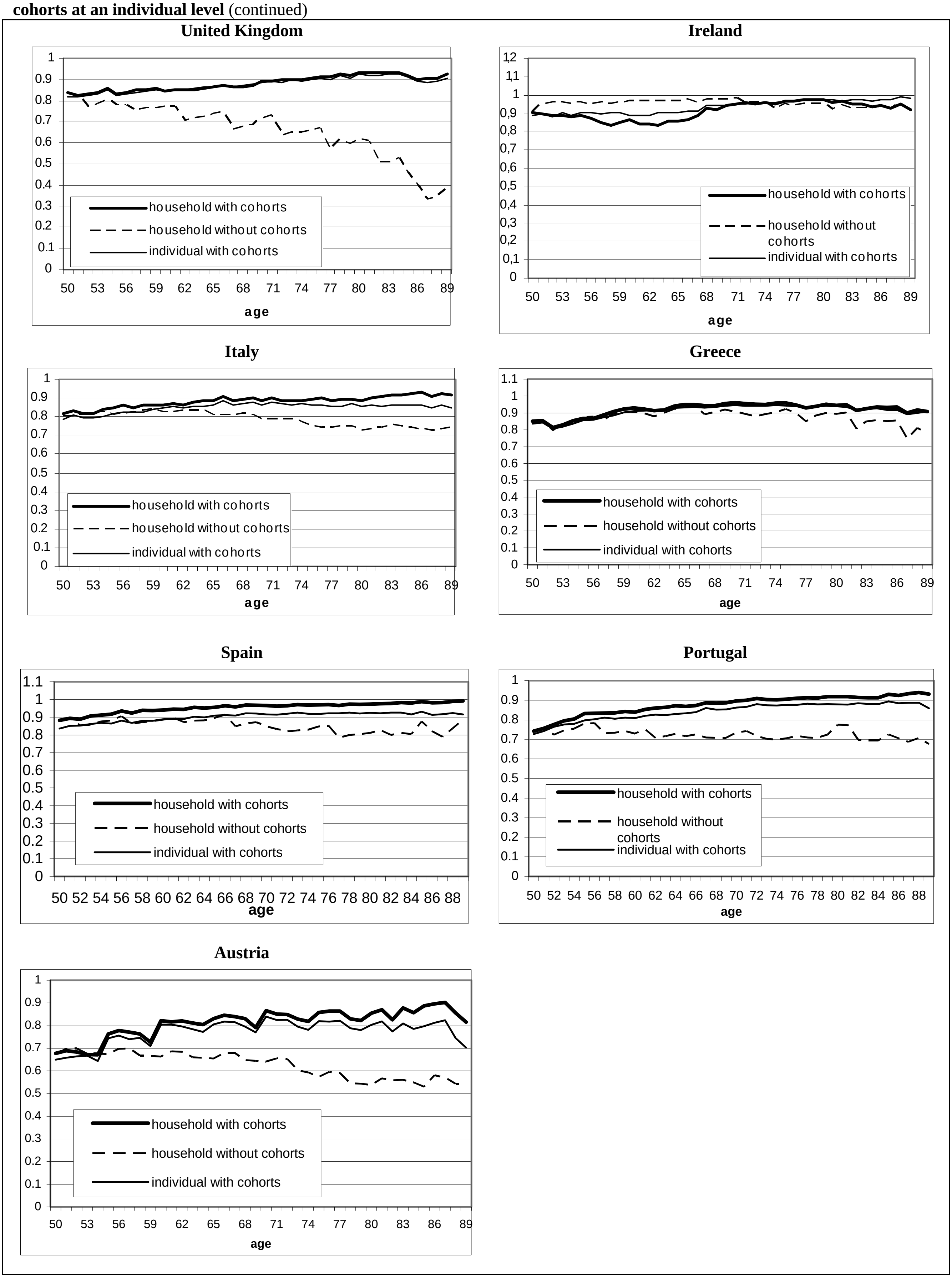

Figure 3. Estimated homeownership-cohort profiles at a household and at an individual level

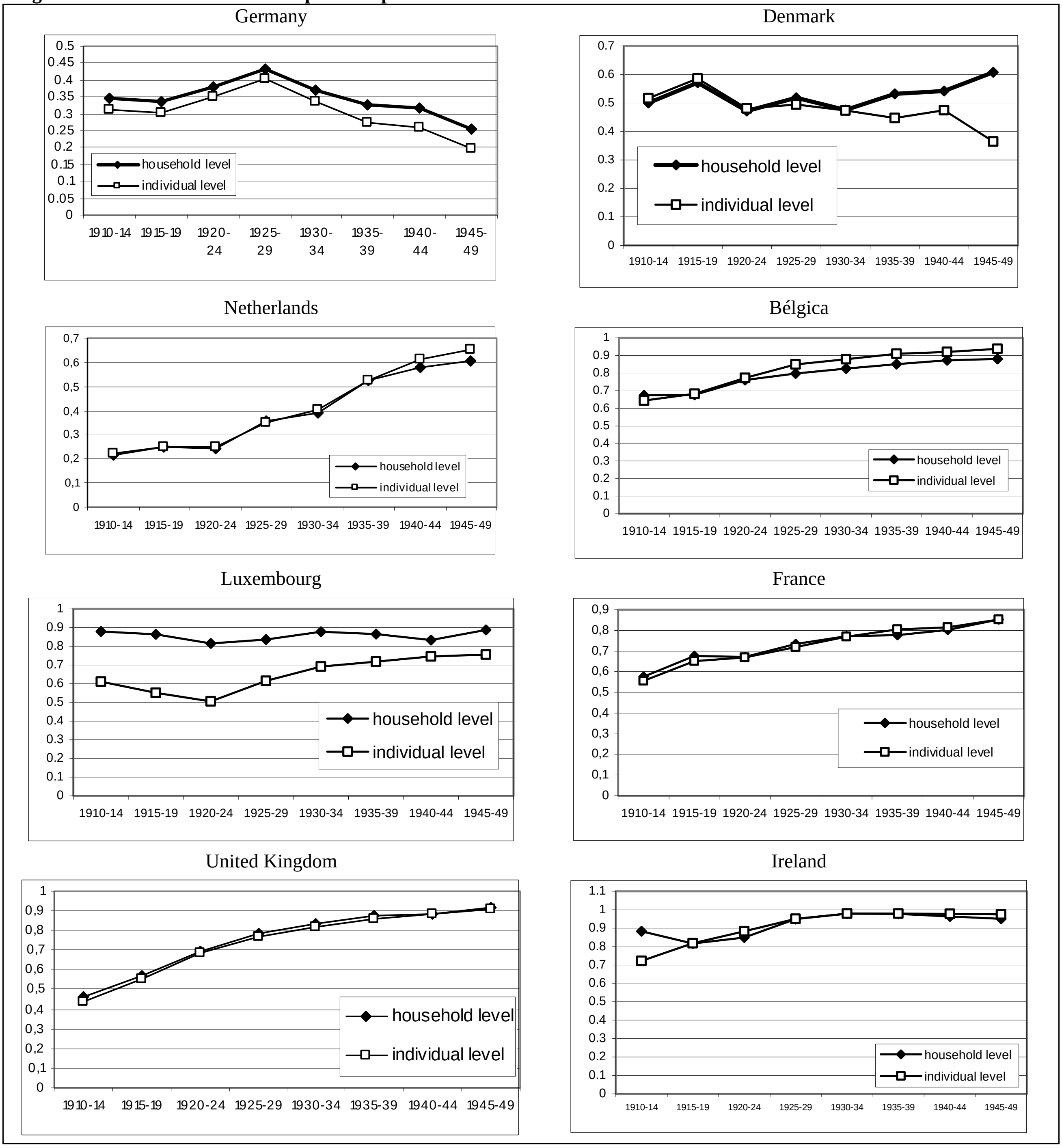

Figure 3. Estimated homeownership-cohort profiles at a household and at an individual level (continued)