Retirement decisions for older European couples[N]

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ABSTRACT

In this paper we use data from the European Community Household Panel (ECHP) to describe and analyse the dynamics of joint labour force behaviour of older couples for 12 European Union (EU12) countries. We focus on testing the relevance of joint retirement across these countries, mainly related to the effects of health variables and on the existence of complementarities in leisure and/or assortative matting. We first find that a working spouse is more likely to retire the more recently the other spouse has retired; this effect is stronger if the wife is the working spouse. Second, there is evidence of assortative mating and/or complementarities in leisure; the effects of all relevant factors on the retirement decision of one spouse depend strongly on whether the other one is working, unemployed, or retired. Third, besides the standard evidence that poor health increases the retirement probability, we find that the husband´s health affects the couple´s retirement decisions much more strongly than the wife´s health does. Additional asymmetric effects are detected with respect to income related variables. We simulate different changes both on the normal and early retirement ages of spouses and on the marginal and average tax rates, following recent reforms happened during the late nineties in some EU countries. While changes on the normal and early ages have important effects on the probabilities of retirement, changes on disposable income has no effects.

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1. Introduction

Although the retirement decisions of older workers (especially men) have been widely studied,[1] much less is known about the joint labour force behaviour of older married couples. However this topic becomes important given the growing proportion of married women that approach old age with substantial work histories. A strong evidence of joint retirement patterns will have important implications for the analysis of the effects of any retirement policy. More specifically, any policy that increases the incentive for one member of a married (cohabiting) couple to exit the labour force will have additional effects on the labour force behaviour of the other spouse. Among the different determinants of retirement such as economic variables or pension provisions, health related factors are bound to play a crucial role in retirement decisions of older couples.[2] In fact, all the pension systems have specific treatment for people retiring because of health or disability reasons. Health status is particularly relevant in explaining joint retirement since sometimes one spouse has to withdraw from the labour market to care for the other one. Although there are a few studies on this issue using US data,[3] and despite its interest, only Blau and Riphahn (1999) present an analysis about joint retirement in Germany. Moreover, we also focus on the effects of changes in the tax system, which can affect individual incomes and can also influence the decisions to exit from the labour market.

Several reasons can justify the existence of joint retirement. First, there could be observable economic factors affecting both members of the couple and causing a positive correlation between retirement dates. Second, poor health or chronic illness may influence not only individual own retirement but may increase the necessity of care giving and, consequently, influence spouses retirement behaviour. Also unobservable factors highly correlated between husbands and wives (*assortative matting*) could originate such a correlation. Finally, strong complementarities between the husband and wife's leisure would explain why couples tend to retire at the same time.

In this paper we examine whether the pattern of joint retirement is a common feature of the European labour market and if so, which are the determinants of such behaviour. The focus of the paper is not to carry out a cross-country comparison but to detect and analyse the common patterns. To understand retirement decisions and, among them, retirement of couples seems especially important when the sustainability of the actual pension systems is becoming a public debate in Europe.[4] Any retirement policy to implement should account for cross-effects among the members of a couple. The sign of these cross-effects will depend on how the labour supply of the spouses interacts. Strong complementarities in leisure will induce one spouse to retire when the other does it while the opposite effect could be found

[1]See, e.g., Gustman and Steinmier (1986) Stock and Wise (1990), Berkovec and Stern (1994), Blau (1994), Rust and Phelan (1997) or Gruber and Wise (1999).
[2]There are a few studies focusing on the effects of health status in an individual context. Some examples are Sickles and Taubman (1986), Bound *et al* (1999) or Dwyer and Mitchell (1999).
[3]Blau (1998), Gustman and Steinmeier (1994) or Hurd (1990) are good examples. All of them in one way or another include health-related variables in their models.
[4]See Boldrin *et al* (1999) or Gruber and Wise (1999) as recent examples.

when leisure for the members of the couple is a substitute. In the latter case if one spouse compulsory retires, the other spouse could increase his/her labour supply to keep the household income at the original level (added worker effect). The European Community Household Panel (ECHP) provides a unique source of comparison across European countries that allow us to exploit individual and country specific differences relating retirement. The ECHP collects information on a wide range of socio-economic characteristics (personal and household demographic characteristics, labour force status, health status, etceteras) as described in the Appendix.

Given the nature of the problem to analyse (uncertainties concerning the magnitude, timing, frequency of job offers and the duration of jobs), labour market histories are best described as realisations of a stochastic process. Within this framework, flow rates between labour market states are the object of study. A household utility function can be derived allowing for dependence of one person's strategy on the employment status of other household members. In such a setting the allocation of time and income is completely determined by the state occupied. A way to take into account the joint labour supply decisions for married couples is to consider the set of possible states the household can be in (for instance: both members working, wife working-husband non working, etceteras). Transitions from and to any of the possible states can be constructed and compared. As an advantage, this approach allows the labour market decisions of both spouses to be endogenous while controlling for observable and unobservable characteristics.

Recent evidence shows that joint retirement is frequent among married couples. In fact, most of the applied papers using either US or European data (see Zweimüller *et al.*, 1996 who use Austrian data, Blau, 1998 using US data or Blau and Riphahn, 1999 using German data) show clear indication of joint retirement due to correlation in unobservable effects or "assortative matting" (for instance, the effect of joint leisure or joint wealth in preferences). European evidence (Zweimüller *et al.*, 1996 or Blau and Riphahn, 1999) shows that higher wages or earnings decrease the incentive to withdraw from the labour force. However, Blau (1998) finds contradictory results using US data. Our interest in this paper consist in testing whether common patterns along european countries can help the authorities to implement common measures for these countries.

Concerning the effect of health variables on retirement, Blau (1998), using two simple indicators of the health status of both members of the couple, shows that poor health has a significant negative (positive) effect on entry (exit) rates, especially for the husband. Cross-spouse health effects are mainly small but there are interesting exceptions. For instance, when the wife is employed and the husband is not, poor health of the husband reduces the wife's exit rate by 16%. This suggests that the health insurance provided by the wife's employer may be specially valuable to a couple when the husband's is covered by the wife's plan and is in poor health. Bound *et al.* (1999) show that poor health lead older workers to withdraw from the labour force, but the earlier a health shock occurs, the less likely is to lead to labour force exit. Finally, Blau and Riphahn (1999) find that a subjective health satisfaction variable and the presence and degree of an officially recognised handicap have no impact on transition rates of

men and women. A chronic disease increases the workers' incentives to leave employment. They also found asymmetric cross effects for this variable. Our aim here

Among our results we find a strong evidence of complementary, but asymmetric, effects between the labour supply decisions of both spouses. It seems that the husband's decision affects more his wife's decision than vice versa, whatever the origin state of the spouse. Furthermore, we do not find evidence supporting the "added worker effect". With regard to health variables, we find, as in most studies, that own poor health provides both members of the couples with incentives to withdraw from the labour force. More importantly, the magnitudes of these health effects depend on the labour force status of the spouse suggesting either complementarities in leisure or correlation in the unobservables of both spouses. Additionally, we find important and asymmetric cross-effects. In that sense, it is striking how crucial is the husband's health status in explaining joint retirement. Concerning demographic variables, self-employed or highly educated individuals have lower probabilities of leaving the labour force. Finally, work income also shows asymmetric effects with a general pattern of negative influence on the probability of leaving the labour force. Since most EU countries have been recently engaged in changing the structure of their tax systems, we simulate the effects on retirement probabilities of changes in marginal and average tax rates. Marginal tax rates are taken from only labour taxes, whose changes are expected to have effects on the labour status or the hours supplied by the individuals. Averages tax rates try to incorporate the recent shift from direct to indirect taxation. We find some asymmetric cross-effects of changes in disposable income. More on simulations

The rest of the paper is organised as follows. Section II describes the characteristics of the ECHP, the pension systems and the behaviour of individuals within the sample. Section III presents the empirical model to be implemented and Section IV analyses the estimation results. The conclusions are elaborated in Section V.

2. Data and stylised facts on labour force behaviour of married couples in Europe

A close observation to the data provides some useful information that should be accounted for when proposing an empirical model to estimate. Evidence on the behaviour of males, females and couples is presented in this section.

In principle, every individual could be in any of three states: working, unemployed or out of the labour force.[5] Figure 1 shows the age profile of labour force transitions between these states for males (Figure 1.a) and females (Figure 1.b) for the joint sample of European countries. As a reference initial point in time is December 1993 and the final point is December 1994. The central line shows the fraction of individuals that actually change labour force status between the two periods. It therefore uses only individuals with valid interviews in both waves. The upper and lower bounds give a range in which the population transition rates necessarily lie. The upper bound shows the transition profile if all individuals

[5] See Gustman *et al* for an overview of retirement measures in the Health and Retirement Study (HRS).

not interviewed in the second wave will have transit. The lower bound shows the transition profile if none of the individuals not interviewed in the second wave will have change the status. Both figures are similar the ones shown in, for instance, Peracchi and Welch (1994), who analyse the case of the US. Transitions from employment and unemployment to out of the labour force show the same age profile. A significant fraction of individuals, especially among males, start leaving the labour force before they are sixty years old. For males and females, exit from the labour force picks at 60 and 65, showing the age of early and normal retirement for most of the European countries considered. Unemployed individuals tend to retire more than employed. It is also clear from these figures that once an older individual leaves the labour force it tends to remain inactive for the rest of her/his life, there is not much re-entry to the labour force.

From the broad picture presented in previous figures, we can concentrate now on the retirement decisions. Figures 1.a and 1.b suggested that with respect to retirement we can analyse transitions from participation to non-participation since the shape of the transitions from unemployment and employment were similar. Furthermore, it also showed that unemployment, despite being a clear pathway into retirement in most of the countries, could not strictly be considered a form of inactivity for older individuals,[6] since it is a much less absorbing state. Therefore in Figures 2.a and 2.b we present the hazard rates to retirement for EU12 males and females, respectively. The origin state is participation and the destination is to be out of the labour force. Again, the similarities across countries are striking apart from some exceptions and in spite of the small sample size for some of the age ranges in particular countries. In general, the conclusions from the aggregate analysis hold for the disaggregated by country analysis: individuals start retiring before they are 60 although there are exit picks when they are 60 and 65 year old. For females this retirement pattern is less clear, but there are also less observations for older women.

All previous evidence suggest that when analysing exit from the labour force behaviour we need to look also to individuals younger than 60. The age of cut that we select is 55 and 50 years for males and females respectively. In our sample an individual is defined as retired when s/he declares her/himself as so,[7] but also when given the age condition s/he is in another type of economic inactivity (e.g., house keeping). Furthermore, retirement is considered as an absorbing state, that is, once the individual enters in it s/he remains there forever afterwards. Thus we analyse transitions from any form of activity (employment or unemployment) to inactivity, defining this one as retirement. As a first approach we consider two moments in time: t_0, December 1993, and t_1, December of 1994. The reason for such simplification is the scarce and concentrated number of transitions that can be found in every quarter. Availability of new data waves will help to overcome this problem allowing a more detailed monthly or

[6]Blau (1998) uses this definition of inactivity for older individuals in the US.

[7]Alternative definitions of retirement combining the self-reported labour force status with the reception of old age or invalidity related benefits yield similar results although originate a substantial drop in the number of observed transitions. Approximately a quarter of the sample in self-reported retirement declares not receiving any old age benefit. Results using these alternative definitions are available from the authors on request.

quarterly transition analysis. Blau (1998) indicates some advantages and disadvantages of using monthly of quarterly *versus* annual data.

Using these criteria we select a sample of couples to analyse joint retirement. As retirement is an absorbing state, for every couple at least one member must be participating in the labour force at t_0. That gives us a sample of 4639 couples with valid values for all variables in the analysis. Figure 3 presents the labour force participation for husbands (top left panel) and wives (top right panel) separately and jointly (bottom panel) for March 1994, a time point in the middle of the observation period, respectively. For husbands there is a gradual declination in employment from the age of 55. This declination is sharper for wives after 55. Trends in joint labour force status shown in Figure 3 indicate that the incidence of the husband working and the wife out of the labour force is roughly constant at about 40 per cent until the husband's age of 60, while the rate of both members working declines gradually during these ages. The incidence of wives working while their husband are out of the labour force remains almost constant at around 8 per cent until the husband is 70 years old. This could be accounted for by wives considerably younger than their husbands, a similar result presented by Blau (1998) for the US. In our sample wives are on average three and a half years younger than their respective husbands are.

It is crucial to answer how often does joint retirement occur. For instance, the probability of retirement is higher for males if their wives are already retired (21.64) than without controlling for the wives' status (18.41). Furthermore, if the wife retires during the period considered (December 1993 to December 1994) the probability of the husband retiring increases up to 27.4 percent. For wives these figures are more striking: if the husband retires during the observation period the probability of retirement for the wife increases more than 16 percentage points (from 19.7 to 36.1 percent). For the US Blau (1998) found that between 30.3 per cent and 40.6 per cent of couples exit the labour force within 1 year of each other. Note that our results suggest that the influence of one spouse's labour force status in the transition from activity to inactivity of his/her couple is not symmetric, being women more sensible to the condition of their husbands.

From previous studies health has revealed as one of the major determinants of labour force behaviour for older men and women.[8] Poor health leads many older workers to withdraw from the labour force. However how to measure health is not a straightforward question. Retirement studies have commonly used global questions as "Does health limit the amount or kind of work you can perform?" or "How would you rate your health? Is it excellent, very good, good, fair or poor?". Bound *et al.* (1999) show for the US that these measures can be endogenous to the labour force status as well as not measuring the actual level of health. Their approach implies the estimation of an unobservable index of health, thorough the observable self-reported health status, using as explanatory variables exogenous factors (as education and age) as well as more detailed health measures available in the HRS, as summarised by Wallace and Herzog (1995). However, Rust (1999) argues, on the contrary, that self-assessed health variables are quite accurate indicators of the individual health status.

[8]See Sickles and Taubman (1986), Blau and Riphan (1999) or Bound *et al* (1999) as examples.

The ECHP does not contain as detailed information as the HRS with respect to functional limitations or specific health conditions. It does however include additional questions to the traditional ones. In particular it records whether the individual has any chronic physical or mental health problem, illness or disability. Individuals are also asked if they have been admitted to a hospital as in-patients[9] and how many times s/he has consulted a doctor a dentist or an optician during the past 12 months, information aggregated for the first wave. Although all of these measures reflect only partially the actual individual health status they are plausible indicators of it. Our reduced form approach here consists on analysing the effect of those indicators on the retirement decisions instead of using them to estimate and predict a health index (see Bound *et al*., 1999). This makes maximal use of the available information on health status.[10] Additionally, to minimise the possible endogeneity of the health variables all of them refer to the previous year, although some alternative is possible, as we will see below (see Anderson and Burkhauser, 1985 for details about measures and problems of health variables). A detailed description of the variables is contained in Appendix B.

Does health influence joint retirement decisions? Table A.2 describes the health status for couples according to the type of transition the couple made between December 93 and December 94. It is noticeable that individuals, especially males, who retire during that period or who are already retired seem to have poorer health than those who remain working. Also poor health condition of the husband is asymmetrically associated with joint retirement when both spouses are initially working. This could suggest that the wives tend to retire to provide care to their husbands. This is confirmed by Table A.3, which presents the probability of retirement given the health condition and labour force status of the spouse. There is an increase in the probability of retirement of 2 percentage points for husbands and wives due to the health condition of the other spouse. This probability increases even more when conditioning on retirement of the spouse during the sample period of time and the effect is especially strong for wives. For males, although there is an increase in the probability of retirement, this is smaller than the increase without conditioning on health status of the wife. Undoubtedly, the fact that the husband is often the main contributor to family earnings helps explain this particular evidence.

When the husband is working while the wife is out of the labour force, the proportion of wives with poor health indicators is higher when the husband retires. In fact this is the women's group with the poorest health indicators, suggesting again some kind of care provision from the husband. The reverse is also true when the wife is the one who is working although the differences on their husbands' health status are not that strong, being the wife own health status much worse in relative terms. In general, the health status of retired husbands with working wives is poorer than for the rest of males. Then it seems that the wife tend to remain in the labour market until she can, given her own health status, suggesting that health insurance provided by the wife's employer may be especially valuable for these couples.

[9]The number of nights spent in a hospital as in-patient are confidential information for Germany and therefore will not be used in this study.

3. Theoretical framework and empirical specification

3.1. A model

Retirement of couples can take several forms depending both on the assumptions of the economic model and on the econometric specification. As the previous evidence suggests retirement of spouses depend upon the work status and probably upon the main earner in the family, so one thing to consider is who is going to retire first. Thus our analysis will consider retirement of the husband conditional on himself and his wife work status as well as retirement of the wife conditional on herself and her husband work status. We can set up our model in the context of a family labour supply. Let us assume the household maximise the following utility function subject to a budget constraint:

$$Max\ U\ (C,\ l_h,\ l_w) \tag{1}$$

$$Subject\ to\ C = w_h A_h + w_m A_m + (L_h - A_h)b_h + (L_w - A_w)b_w + y \tag{2}$$

where C is consumption, l_k is leisure, L_k is length of life, w_k is the annual wage, A_k the number of years working, b_k is the level of benefits when retirement takes place, y is non-labour income of the family (assets) and the sub-index k refers to individual k *(k = husband, wife)*. We avoid setting up our model in an intertemporal context, but equations (1) and (2) refer to lifetime utility and lifetime budget constraint.

The context of a family labour supply is only one of the alternatives to model joint retirement. We can also assume an individual utility-family budget model (see Killingsworth, 1983) in which each partner maximises her own utility subject to a family budget constraint. In the same way as before, joint retirement can be tested for, allowing utility of each partner to depend on leisure of the spouse in a non-linear form. Finally, we can also consider bargaining models either of the Nash type (as in McElroy and Horny, 1981) or collective models (Bourguignon and Chiappori, 1992, Chiappori and Ekeland, 2002 or Michaud and Vermeulen, 2004). Since the information requirements for these last proposals are stronger than those for individual or family labour supply, we only consider the last ones in this paper. In particular, the parameters in a collective are not identified without further assumptions as using goods where consumption can be assumed to be exclusive (Chiappori and Ekeland, 2002) or that, conditional on personal characteristics, singles have the same preferences as individuals in couples who have the same sex (Michaud and Vermeulen, 2004). This second case is not applicable here since we only consider couples in our empirical exercise.

3.2. The empirical specification

[10]See Anderson y Burkhauser (1985) for details about measures and problems of health variables.

Maximisation of problem (1)-(2) above gives the following reduced form specification corresponding to the labour supply (or retirement) decisions:[11]

$$I_h = f(X_h, X_w, Z, \beta_h, \varepsilon_h) \quad (3)$$

$$I_w = f(X_w, X_h, Z, \beta_w, \varepsilon_w) \quad (4)$$

where instead of observing hours of work, we observe the latent indicator I_k $(k = h, w)$. X_k are variables specific to individual k, Z are common variables to both as well as country specific variables. The observabilty rules linking unobserved indicators and observed events are of the form: $I_k = 1$ $(f(.) > 0)$ $(k = h, w)$, whenever utility when retirement takes place is greater than utility when remaining working and zero otherwise. This depends (according to equations (1)-(2) above) on wages, benefits, asset income and also on working ages of spouses because regulation of retirement ages can change the benefits. However, we are not going to focus our analysis on the effects of this kind of legal rules on retirement.

When analysing joint retirement, it is necessary to establish a proper definition. If we use a flexible parameterisation of utility (of the translog form, for instance) allowing for interaction terms among leisure of both partners affecting the utility level, we can derive an empirical specification in which it is possible to test for joint retirement decisions, in a way such that leisure of partner k depends not only on his own variables but it also depends on variables of the other member of the couple. But, this is not the unique form of defining joint retirement. Let us assume that we base our tests for joint retirement of the on the following definition:

$$Pr(I_h = 1/ X_h, X_w, Z) \neq Pr(I_h = 1/ X_h, Z) \quad (5)$$

$$Pr(I_w = 1/ X_w, X_h, Z) \neq Pr(I_h = 1/ X_w, Z) \quad (6)$$

In the empirical specification (3)-(4), we can simply test (5)-(6) by including linearly variables of spouse k on the probability index of the other spouse and then conducting t, χ^2 or likelihood ratio tests. We can also think that variables of the spouse do not only affect retirement of the partner but they have also some effect on the margin, i.e. there are not only conditional but marginal effects. This is going to happen if:

$$dPr(I_h = 1)/(dX_h/ X_w) \neq dPr/dX_h$$

$$dPr(I_w = 1)/(dX_w/ X_h) \neq dPr/dX_w$$

[11]In fact, we can also write the first order conditions of the model for the duration of the working times of individual k, A_k and we can then write the reduced form according to these decision variables (see Zweimüller et al., 1996).

then, we can allow for interactions with quadratic terms in leisure within the utility representation in a way such that variables of both partners appear interacted in the first order conditions from where we derive the empirical specification. Since we are going to estimate models conditioning on work status of the couple, the first definition of joint retirement seems more appropriate to use, although we can empirically check the second one. Again, *t*, χ^2 or likelihood ratio tests are valid for the null of absence of joint decisions.

No controls for personal or household characteristics have been considered in the evidence presented in the previous section. To do so, an empirical fully parametric specification is proposed in this one. We assume that preferences are given by a household utility function. Savings behaviour is exogenous in this context given the difficulty of empirically modelling savings and labour supply jointly.[12] In such setting the allocation of time and income is completely determined by the state occupied, as Burdett and Mortensen (1978) showed. Each member of the couple can be participating (A) or not participating (I) in the labour market. Participating must be understood as being working or unemployed but looking for job and not participating collects people in any other situation. The following matrix describes all possible combinations between states in the previous year (t-1) and the current period (t). However, in the light of Figure 1 and Table 1, transitions implying a re-entry in the labour force from non-participation are not considered here since we assume retirement (non-participation) is an absorbing state. We recognise, however, that the dynamics out of retirement are more common in recent years (see Blau, 1997 or Michaud, 2003).

Table 1. Labour force transitions

t-1	→		*A*			*I*			*T*
↓	*t*	→	*A*	*I*	*Mg*	*A*	*I*	*Mg*	
	↓								
	A		$_{AA}\pi_{AA}$	$_{AA}\pi_{AI}$	$_{AA}\pi_{A\cdot}$	*nc*	*nc*	$_{AI}\pi_{A\cdot}$	$_{A\cdot}\pi_{A\cdot}$
A	*I*		$_{AA}\pi_{IA}$	$_{AA}\pi_{II}$	$_{AA}\pi_{I\cdot}$	*nc*	*nc*	$_{AI}\pi_{I\cdot}$	$_{A\cdot}\pi_{I\cdot}$
	Mg		$_{AA}\pi_{\cdot A}$	$_{AA}\pi_{\cdot I}$	$_{AA}\pi_{\cdot\cdot}=1$	*nc*	*nc*	$_{AI}\pi_{\cdot\cdot}$	$_{A}\pi_{\cdot\cdot}=1$
	A		*nc*	*nc*	*nc*	*nc*	*nc*	*nc*	*nc*
I	*I*		*nc*	*nc*	*nc*	*nc*	*nc*	*nc*	*nc*
	Mg		$_{IA}\pi_{\cdot A}$	$_{IA}\pi_{\cdot I}$	$_{IA}\pi_{\cdot\cdot}=1$	*nc*	*nc*	*nc*	*nc*
T			$_{\cdot A}\pi_{\cdot A}$	$_{\cdot A}\pi_{\cdot I}$	$_{\cdot A}\pi_{\cdot\cdot}=1$	*nc*	*nc*	*nc*	$_{\cdot\cdot}\pi_{\cdot\cdot}=1$

[12]See Blau (1998) or Martínez-Granado (1998), among others, for similar specifications when dealing with the labour supply of couples. On the other hand, Diamond and Hausman (1984) present an analysis about the relationship between retirement and savings.

Notes.

1. *A* means participating, *I* means non-participating, Mg means marginal and T means total.
2. *nc* means not considered.

Each element of the matrix, ${}_{kl}\Pi_{ij}$, represents the probability of making a transition from state $\{k,l\}$ in $t-1$ to state $\{i,j\}$ at time t, where k and i refer to the husband and l and j to the wife. In a reduced form, these probabilities depend on the demographic and economic characteristics, X (age, education, income, country specific legislation, ...) that shape the latent comparison of utilities that originates a change of status and on a vector, β, which parameterises them. This specification allows for state dependence, that is, the effect of the variables varies with the origin and destination states. In principle, quarterly or monthly transitions could be considered and duration in every state used as an explanatory variable (duration dependence). However, we use a simpler approximation by ignoring the transition time and concentrating only on the destination to which exit took place. In our analysis we considered the following cases:

i) Conditional on participation of both members of the couple in the previous period $(A,A)_{\text{in } t-1}$, the couple as a whole can be in one of the following four states:

1: Both spouses participating $(A,A)_{\text{in } t}$

2: Husband participating, wife non participating $(A,I)_{\text{in } t}$

3: Husband non participating, wife participating $(I,A)_{\text{in } t}$

4: Both non participating $(I,I)_{\text{in } t}$

ii) Husband (wife) participation model conditional to his (her) own participation and non-participation of his (her) spouse in the previous period.

However, marginal conditional probabilities still are informative in the following cases:

iii) Marginal husband or wife participation models conditional to both members of the couple participating in the previous period.

iv) Marginal husband (wife) participation model conditional to his (her) own participation in the previous period. Note that iii) is just the combination of i) and ii).

To finish this section, we briefly describe the procedure that we conduct to test the relevance of the joint retirement decision, in addition to those presented above. We first check for potential correlation among the participation decision of both spouses, which implies to test for a significant correlation coefficient in bivariate (conditional) probit models. Second, we also test for Independence of Irrelevant Alternatives on multinomial logit and other pooling alternatives. Finally, we compare the coefficients between marginal distributions in models where both spouses are participating $(A,A)_{\text{in } t}$, the husband is

participating, and the wife does not participate $(A,I)_{\text{in } t}$ and the husband is non participating while the wife participates $(I,A)_{\text{in } t}$.

4. Results

4.1. Joint estimation results

Although we estimate individual logit models for males and females, we only report joint results.[13] Concerning the results for couples, we estimate individual retirement models for males and females. The Data Appendix gives a detailed discussion and definition of the variables used in the analysis. We present these set of results, although alternative specifications allowing for the effect of some variables (as age) to be different across countries were tried. We find differential effects for some countries, but none of the main conclusions changed. The remaining coefficient estimates were unaltered and there was a minor improvement on the explanatory power. We claim for a reduced form model, but we are aware that most of the variables are possibly endogenous and therefore correlated with the error term. There are alternatives to overcome these problems as the instrumental variable treatment of the endogeneity on self-reported health variables employed by Bound *et al.* (1998) or the approach used by Blau (1998) for dealing with the endogeneity of income variables. Instead, we use variables dated at period t_0, although one can argue that alternatives as impatient hospitalisations or physician visits are expected to be exogenous to retirement decisions. We hope that variables dated at t_0, are at least predetermined given the initial labour force status and, under the null of absence of correlation in the errors.

Concerning the joint estimation proposed in section 3, we deal here with a discrete-choice model and therefore the parameter estimates are not directly informative. They appear in Jiménez-Martín, Labeaga and Martínez-Granado (1999) and we concentrate here on the discussion of Tables 2, 3 and 4 that present simulations of the transition probabilities, based on the estimated parameters. The effects of a given variable on the transition probabilities from a particular state were simulated by computing the probabilities for a reference couple and allowing changes on the variable whose effects we want to assess.[14] Table 2 show the simulation from the estimates of a logit conditional on the case in which the husband is participating and the wife is out of the labour force at period t_0. Table 3 contains the simulations for the logit conditional on the case in which the husband is out of the labour force and the wife is participating at period t_0. And finally, Table 4 present the simulations obtained from the multinomial logit conditional on the case in which both spouses were participating at period t_0. In all

[13] The complete set of results can be consulted in Jiménez-Martín, Labeaga and Martínez-Granado (1999). Also a separate estimation for every country was implemented but most of the variables could not be identified because of the small sample size for many countries. For a comparison grouping the countries by north - south see Jiménez-Martín (1999).

[14] The reference couple has the following characteristics: husband 55 years old and wife 52, none of them with higher education, none unemployed in the initial period, both starting their working lifes at 18, with no part-time job, none working in the public sector, none self-employed, living independently and without any other family member. The shares of the household income for the reference couple are: 25 per cent wife income, 50 per cent husband income and no capital income.

these estimations we have used country dummies. In general results are coherent with the separate individual estimations, although some new facts reveal from the joint estimation.

Let us start with the retirement decisions of one member of the couple when the other is already retired (Tables 2 and 3). The more relevant effects are found through age, health status, job status in the origin period and the living arrangements of the couple. Age has, as expected, a strong positive effect, especially for women. The probability of the husband retiring increases from 7.2 per cent to 23.3 per cent as he ages from 55 to 60 years and to 55.4 per cent when he reach the 65 years of age. For wives the probability of retiring increases from 2.3 per cent to 28.1 per cent and to 43.4 per cent when she passes from 52 to 60 and 65 years of age respectively. Cross-age effects although positive are relatively small, especially for males.

Poor health influences strong and positively the exit rate from the labour market. For males a chronic health condition, to visit often the doctor and especially to be admitted as in-patient at a hospital are good proxies for poor health. For women, the visits to the doctor do no reflect a poor health condition, probably because most of them are regular visits. Cross-spouse health effects are mainly insignificant with an interesting exception: when the wife is employed and the husband is not, poor health (a chronic condition) of the husband reduces the wife's exit rate by 24 per cent compared to good health. Blau (1998) and Blau and Riphahn (1999) find similar cross-spouses effects for the US and Germany respectively. A close inspection of the data reveals that when the husband is out of the labour force because of health reasons (with a low level of benefits), the wife's work income becomes fundamental for sustaining the household. The positive effect of the dummy reflecting whether the husband receives any type of invalidity income reinforces that hypothesis.

Although to be unemployed during the first period has in principle a negative and small effect, it turns to be positive when the individual is 60 or older. This reflects the prevalence of special early retirement schemes for unemployed individuals from the age of 60. Finally living arrangements influence clearly the probability of retirement for both, males and females. When the couple depends on other family members the probability of retirement increases drastically, especially for husbands. Also, when they cohabit with some family member depending on them there is a reduction in the probability of withdrawing from the labour market.

With respect to the rest of the variables, self-employment, high education and individual work income relative to household work income are disincentives to retirement. A part time job during the first period or a high percentage of the household income coming from non-work sources accelerates the exit from the labour market. The evidence relating income variables is similar to that presented by Zweimüller *et al.* (1996) or Blau and Riphahn (1999) with Austrian and German data, respectively. However, Blau (1998) finds contradictory results using US data.

We turn now to the simulation for the probability of retiring when both spouses were working in the initial period (Table 4). There is a strong positive effect of age. Age not only affects own retirement but also the older the husband relatively to the wife the more likely that she retires and vice versa. In

particular if the husband is 65 and the wife is 60 the probability of both retiring increases from one per thousand to almost 50 per cent. It seems therefore that financial incentives generated by the Social Security system influences the joint retirement decisions: the members of the couple tend to postpone retirement until they are eligible for a pension. In a model of Social Security acceptance for working couples using US data, Hidedmann (1998) obtains similar results.

Health status is other major determinant of retirement for working couples. However here we find an asymmetric effect between husbands and wives. While poor health of any member of the couple increases their own probability of retirement, especially for husbands, poor health of the husband increases also the probability of both retiring. For example if the husband has really poor health (he has a chronic condition, was admitted as in-patient in a hospital during the previous year and visits often the doctor) the probability of both members of the couple retiring increases from 1 per thousand to 5.5 per cent. However, the wife's health status effect on the probability of joint retirement is almost negligible. Therefore when the husband leaves the labour market due to health problems, the wife (because of care-giving reasons) is more likely to leave also the labour market. Finally, the probability of both retiring also increases when both members of the couple enjoy poor health, with a very strong positive effect of the health condition of the husband.

Some other variables as the job status at the initial period or the relative work income present interesting asymmetric effects. When one member of the couple is unemployed at the initial period he or she is more likely to retire. However when the husband is the unemployed one, also the wife tends to retire: there is a mild increase on the probability that she retires and a more important increase on the probability of both retiring. This is coherent with the absence of an added worker effect found for several European countries. Several theories try to explain this fact: complementarities in leisure, assortative matting, a stigma effect for husbands depending on their wives and so on (see Martínez-Granado, 1998 for an application using UK data). The income effects go in the same direction. The higher the percentage of the household income any member of the couple earns, the less likely s/he is to retire. However, the husband income has a positive effect on the probability of retirement of his wife while the wife income has a negative effect on the probability of retirement of the husband. In any case, work income as well as non-work income act as a disincentive to joint retirement. The effects of the education variables also confirm this pattern. The negative sign of the non-work income variable may reflect stronger labour market attachment.

The living arrangements of the couple show a clear example of co-ordinated behaviour: to depend on other family members increases the probability of observing both members of the couple out from the labour market. Self-employment of any of the spouses reduces the probability of observing any of them retiring, in line with the results obtained when performing independent estimations for males and females (see Jiménez-Martín, Labeaga and Martínez-Granado, 1999). Family size slightly reduces the probability of retiring both members of the couple.

Potential experience of the husband increases his exit from the labour market and the probability of both of them retiring, while the wife's potential experience increases only the probability of both of them retiring. This effect reflects again the economic incentives of the pension system: when both of them are more likely to be eligible for a pension the chances of joint retirement are higher.

With respect to the country specific effects, we must mention that an intercept modifier (country dummy) collects the only difference in the results we present, although it is also possible to find differences in some of the slopes, since country specific variables do not encompass well all the differences between countries. Bearing this shortcoming in mind, Italy, France and Spain are the countries in which joint retirement is more likely to occur, but further research should be done in this aspect when additional waves of the survey become available.

A final exercise we do consists of simulating the effects on retirement when disposable income changes. We conduct two exercises: the first one consist in changing the marginal tax rates applicable to earned income according to a common average on 7 per cent decrease, which is the mean value observed during the nineties in the EU12. In the second exercise we modify total (earned and unearned income) according to the actual different changes in tax pressure corresponding to the 12 countries during the period 1990-98. While direct taxes have been reduced in most countries, there has been a shift towards indirect taxation by both, harmonization of the Value Added Tax (VAT) and also by increasing the stadard and reduced rates of the VAT. The results of the first exercise show a mean negative effect of income on the transitions to retirement probabilities. A 7 per cent increase in earned income reduces the probability of retirement by 0.12 per cent. On the other hand, we find heterogenous effects in the second exercise because of two reasons. One is that the changes in total disposable income is different among countries and, the other one, because the response in probability is also heterogeneous among countries, but the average effect on the probability of retirement is similar to the previously found. However, the main conclusion is that income has a negative influence on retirment for both spouses.

Before concluding it is worth to mention that the effect of most variables on the transition probabilities of any spouse depends on the job status of the other member of the couple. For example, a woman with strong health problems has a probability of retiring of 6 per cent when her husband is employed while it increases to 9.6 per cent when the husband is already retired. In the same way, the probability of a male retiring when his wife is working and he has strong health problems is lower than 1 per cent but when his wife is already retired this probability increases to 28.2 per cent. Therefore there is evidence of a propensity among couples to spend leisure time together. Whether this effect is due to some unobservable characteristics affecting both members of the couple or to complementarities in leisure is a question that cannot be disentangled with the simple model estimated in the previous section.

4.2. Some policy reforms

The results we get can have very important policy implications. At the light of several recent proposals in the media about possible changes in the retirement probabilities, we conduct several hypothetical reforms

in order to evaluate these changes for both men and women. The four policies we implement are the following: we change the normal and early retirement ages of the husband, the wife and both members of the couple and we reduce the tax rate in 10 percent in all income sources. The first three reforms try to shed light into the importance of complementarity in leisure of the spouses while the last one intends to capture whether economic incentives also matter both at the individual level and as a source of coordination in participation decisions.

5. Conclusions

In this paper we examine individual and couples retirement patterns within the EU12 using information from the first two waves (1994 and 1995) of the European Community Household Panel, a newly released Eurostat longitudinal survey. In our analysis we pool the data from the different countries and control the differences between their labour markets and pension systems. In more detail, we control these differences by introducing either a set of country specific effects or a set of variables that capture the differences in the regulation and/or the characteristics of the population. Our approach, despite some evident limitations, has important advantages: it permits, specially when more waves become available, to capture the effect of the regulation and to analyse the effect of changes in the regulations for some countries.

Before describing the detailed results we want to stress that there is strong evidence of joint retirement behaviour for the EU12 countries, confirming the evidence also found with US data. In particular, we find that a working spouse is more likely to retire the more recently the other spouse has retired. This effect is even stronger if the wife is the working spouse.

At the individual level our results are in line with most of the recent literature in retirement behaviour. In particular, we find some behavioural differences (income and health effects) between males and females; the more the household depends on the male for survival, the smaller his probability of retirement is; self-employed people have lower probabilities of leaving the labour force; highly educated individuals stay in the labour market for longer periods; the probability of retirement is important at early ages and determining retirement behaviour, especially for males.

With respect to couples exiting from the labour force, the following features should be stressed. First, concerning the joint retirement decisions given that both members of the couple are participants at the beginning of the period, we have found, first, strong cross age effects, especially when both spouses reach the entitlement age. Second, as found in other studies, there is strong evidence against the added worker effect at older ages. Third, male health status has strong influence in his own decision and, more importantly, in joint retirement decisions. However, the reverse is not true, since female health status has little influence in all the cases. This issue deserves further investigation since we believe that it may undercover an important income effect. Fourth, as previously commented, the self-employment status discourages retirement in all cases. Finally, we find important asymmetric effects of the relative work income variables.

As expected, there are strong differences between countries, which are well accounted for by the differences in regulation, specially in the cases of males. For females, the important behavioural differences across countries (essentially the difference North vs. South) are not well captured, because of our data limitations.

To finalise, we want to emphasise that the magnitude of the effect of some key variables (health, income or living arrangements) depends on the labour force of both members of the couples suggesting either complementarities in leisure or correlation in the unobservables of both spouses.

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Table 2. Marginal effect in husband retiring when the wife is already out of the labour force

	Probability	Effect (%)
Reference	0.072	
Husband Age = 60	0.233	222
Husband Age = 65	0.554	664
Wife Age =60	0.079	10
Wife Age =65	0.080	10
Husband Chronic Condition	0.099	37
Husband in-patient at hospital	0.160	121
Husband visiting doctor >=5	0.084	16
Previous Three	0.282	289
Wife Chronic Condition	0.082	13
Wife in-patient at hospital	0.102	41
Husband work history started at 28	0.072	-1
Husband Unemployed at t_0	0.056	-23
H. Unemployed and Age 62	0.345	376
Husband Higher Education	0.072	-1
Wife Higher Education	0.036	-51
Husband Part Time	0.127	75
Husband Public Sector	0.092	27
Husband Self-employed	0.048	-33
Household size = 4	0.045	-37
Not independent	0.346	378
Husband relative income = 75%	0.059	-18
Husband relative income = 25%	0.088	22
Husband relative income = 0%	0.108	48
Couple relative non-work income = 10%	0.108	48
Wife receiving invalidity income	0.063	-13
Denmark	0.033	-54
Belgium	0.047	-35
France	0.141	95
UK	0.046	-37
Ireland	0.034	-53
Italy	0.103	42
Greece	0.080	10
Spain	0.052	-28
Portugal	0.046	-37

Note.
The reference couple has the following characteristics: husband 55 years old and wife 52, none of them with higher education, none unemployed in the initial period, both starting their working lifes at 18, with no part-time job, none working in the public sector, none self-employed, living independently and without any other family member. The shares of the household income for the reference couple are: 25% wife income, 50% husband income and no capital income.

Table . Marginal effect in wife retiring when the husband is already out of the labour force

	Probability	Effect (%)
Reference	0.023	
Husband Age = 60	0.034	49
Husband Age = 65	0.043	90
Wife Age =60	0.281	1138
Wife Age =65	0.434	1812
Husband Chronic Condition	0.017	-24
Husband in-patient at hospital	0.040	78
Wife Chronic Condition	0.044	95
Wife in-patient at hospital	0.092	307
Wife visiting doctor >=5	0.018	-21
Previous Three	0.096	324
Wife work history started at 28	0.019	-17
Wife Unemployed at t_0	0.017	-25
Wife Unemployed and aged 62	0.076	235
Husband Higher Education	0.028	24
Wife Higher Education	0.020	-13
Wife Part Time	0.032	39
Wife Public Sector	0.016	-28
Wife Self-employed	0.015	-33
Household size = 4	0.019	-18
Not independent	0.083	268
Wife relative income = 75%	0.013	-43
Wife relative income = 50%	0.040	74
Wife relative income = 0%	0.068	200
Couple relative non-work income = 10%	0.025	8
Husband receiving invalidity income	0.037	62
Denmark	0.011	-53
Belgium	0.011	-51
France	0.034	48
UK	0.040	77
Ireland	0.006	-73
Italy	0.038	68
Greece	0.034	52
Spain	0.024	4
Portugal	0.011	-50

Note.
The reference couple has the following characteristics: husband 55 years old and wife 52, none of them with higher education, none unemployed in the initial period, both starting their working lifes at 18, with no part-time job, none working in the public sector, none self-employed, living independently and without any other family member. The shares of the household income for the reference couple are: 25% wife income, 50% husband income and no capital income.

Table 4. Marginal effect for transitions from both working

	Wife retiring		Husband retiring		Both retiring		Both working	
	Prob.	Effect (%)	Prob.	Effect (%)	Prob.	Effect (%)	Prob.	Effect (%)
Reference	0.0377		0.0087		0.0014		0.9522	
Husband Age = 60	0.0478	26.7	0.0381	340.2	0.0042	197.4	0.9099	-4.4
Husband Age = 65	0.0457	21.1	0.1880	2070.1	0.0157	1020.6	0.7506	-21.2
Wife Age =60	0.2430	544.3	0.0097	12.3	0.0425	2929.3	0.7048	-26.0
Wife Age =65	0.2478	557.2	0.0155	78.6	0.0126	800.6	0.7241	-24.0
Husband 65 and Wife 60	0.2942	680.2	0.2112	2337.9	0.4765	33847.1	0.0181	-98.1
Husband Chronic Condition	0.0422	11.9	0.0324	273.6	0.0065	362.3	0.9189	-3.5
Husband in-patient at hospital	0.0477	26.5	0.0193	123.0	0.0087	517.7	0.9243	-2.9
Husband visiting doctor >=5	0.0289	-23.3	0.0285	229.0	0.0042	200.0	0.9384	-1.5
Previous Three	0.0483	28.0	0.1278	1375.0	0.0549	3813.8	0.7690	-19.2
Wife Chronic Condition	0.0781	107.2	0.0164	88.7	0.0015	8.0	0.9040	-5.1
Wife in-patient at hospital	0.0236	-37.4	0.0055	-37.1	0.0036	159.7	0.9673	1.6
Wife visiting doctor >=5	0.0352	-6.7	0.0032	-62.5	0.0004	-71.6	0.9612	0.9
Previous Three	0.0598	58.6	0.0081	-6.1	0.0008	-45.9	0.9313	-2.2
Both Chronic condition	0.0375	-0.4	0.0171	96.8	0.0069	388.6	0.9385	-1.4
Husb. work history started at 28	0.0361	-4.3	0.0123	42.5	0.0070	401.1	0.9445	-0.8
Wife work history started at 28	0.0398	5.7	0.0165	90.4	0.0052	269.2	0.9385	-1.4
Husband Unemployed at t_0	0.0485	28.6	0.0154	77.7	0.0039	179.8	0.9322	-2.1
Wife Unemployed at t_0	0.1045	177.1	0.0084	-3.1	0.0015	9.3	0.8856	-7.0
Both Unemployed	0.1343	256.2	0.0149	72.1	0.0043	205.8	0.8465	-11.1
Husband Higher Education	0.0444	17.7	0.0050	-42.3	0.0009	-38.1	0.9497	-0.3
Wife Higher Education	0.0259	-31.3	0.0066	-24.4	0.0022	57.4	0.9653	1.4
Both Higher Education	0.0305	-19.2	0.0038	-56.4	0.0014	-2.5	0.9644	1.3
Husband Part Time	0.0238	-36.8	0.0135	56.3	0.0013	-9.7	0.9614	1.0
Wife Part Time	0.0884	134.4	0.0114	31.5	0.0023	61.7	0.8979	-5.7
Both Part Time	0.0558	48.1	0.0178	105.6	0.0020	46.0	0.9243	-2.9
Husband Public Sector	0.0227	-39.7	0.0168	93.7	0.0017	22.3	0.9588	0.7
Wife Public Sector	0.0324	-14.0	0.0126	45.9	0.0015	7.8	0.9534	0.1
Any Self-employed	0.0252	-33.2	0.0071	-18.5	0.0005	-66.5	0.9673	1.6
Household Size = 4	0.0370	-2.0	0.0076	-12.5	0.0004	-72.5	0.9551	0.3
Not Independent	0.0441	17.1	0.0146	68.2	0.0699	4882.9	0.8713	-8.5
H. relative income = 75%	0.0453	20.1	0.0076	-12.4	0.0005	-66.4	0.9467	-0.6
H. relative income = 25%	0.0314	-16.7	0.0099	14.1	0.0042	198.0	0.9545	0.2
H. relative income = 0%	0.0261	-30.7	0.0113	30.2	0.0125	787.8	0.9501	-0.2
W. relative income = 75%	0.0067	-82.2	0.0051	-41.5	0.0002	-85.2	0.9880	3.8
W. relative income = 50%	0.0159	-57.9	0.0066	-23.5	0.0005	-61.5	0.9769	2.6
W. relative income = 0%	0.0895	137.3	0.0113	30.7	0.0036	159.7	0.8956	-6.0
Relative non-work income = 10%	0.0353	-6.4	0.0074	-14.2	0.0010	-31.6	0.9563	0.4
Denmark	0.0162	-57.1	0.0095	9.2	0.0014	-1.2	0.9730	2.2
Belgium	0.0301	-20.2	0.0200	130.5	0.0009	-39.4	0.9491	-0.3
France	0.0090	-76.2	0.0506	483.4	0.0155	1002.2	0.9250	-2.9
UK	0.0427	13.2	0.0123	41.4	0.0038	173.8	0.9412	-1.2
Ireland	0.1297	244.1	0.0063	-27.1	0.0056	301.7	0.8583	-9.9
Italy	0.1364	261.9	0.0364	320.3	0.0130	823.0	0.8142	-14.5
Greece	0.0848	124.8	0.0158	81.9	0.0053	274.6	0.8942	-6.1
Spain	0.0737	95.4	0.0053	-39.0	0.0072	411.8	0.9138	-4.0
Portugal	0.0299	-20.6	0.0091	4.6	0.0010	-25.6	0.9599	0.8

Note.
The reference couple has the following characteristics: husband 55 years old and wife 52, none of them with higher education, none unemployed in the initial period, both starting their working lifes at 18, with no part-time job, none working in the public sector, none self-employed, living independently and without any other family member. The shares of the household income for the reference couple are: 25% wife income, 50% husband income and no capital income.

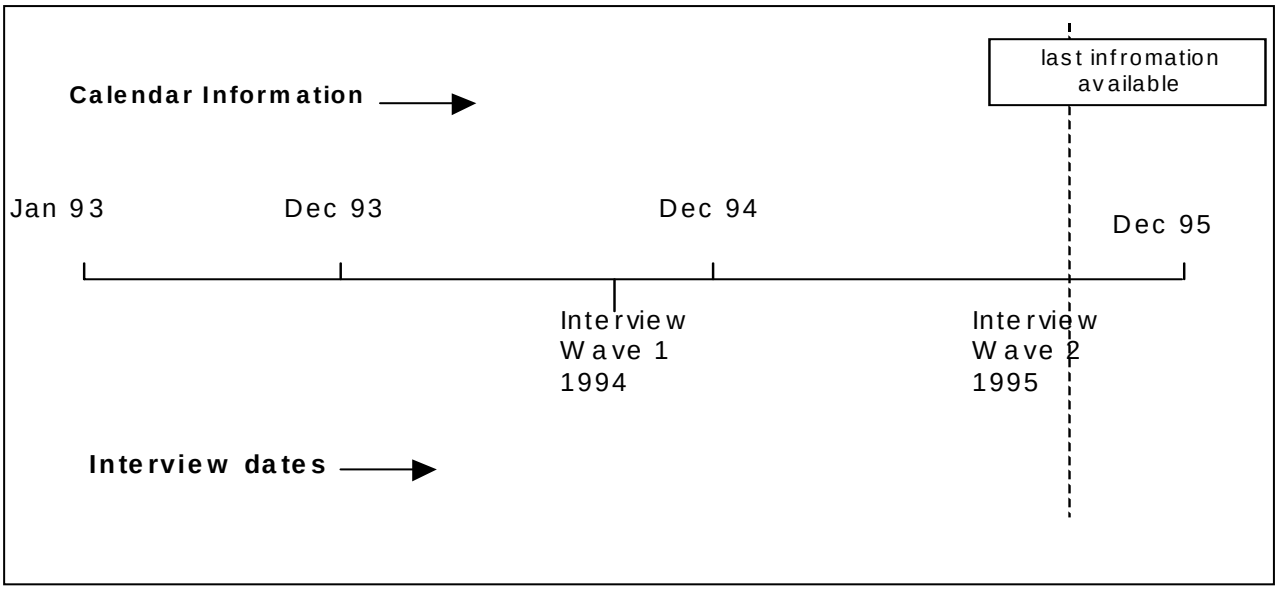
Appendices

A. A description of the European Community Household Panel

The data analysed in this paper comes from the ECHP and contains information for 12 European countries. The focus of the ECHP is on household income and living conditions across EU12 countries. Eurostat achieves comparability across countries through a standardised design of the survey and common technical and implementation procedures, with centralised support and coordination of the national surveys. Time comparability is achieved by keeping the time between successive waves for a given country close to a calendar year and by keeping the questionnaire similar from one wave to another as much as possible [see Peracchi (2000) for a description of the ECHP].

The structure of the data is described in Figure A1. The interviews are collected at some point during the year (1994, for wave 1, and 1995, for wave 2) and the questionnaire concentrates in the current individual and household information as well as on detailed information about previous calendar year. As the interviews were made almost at any month during the year depending on the country and the wave, one way of homogenising the information is to use the retrospective information to analyse the labour market transitions. In this way, transitions from one labour status to another will refer to the same span of time for every country instead of referring to the interview date that vary across countries and waves. In addition, income variables refer also to the previous calendar year, and therefore concentrating on transitions of this type seems more appropriate.

Figure A.1. Data Structure



The paper concentrates on information from waves 1 and 2, the ones available at the moment, and excludes from the analysis two countries: Austria, for which the panel contains only one wave of information, and the Netherlands, which does not contain any retrospective question in its questionnaire. That gives us two complete years of information about job status transitions, income and individual and household characteristics including health related variables.

B. Variables

The variables included in the analysis can be grouped in four categories:

1) *personal and household characteristics*:

- marital status: two dummies, one taking value 1 if the individual is married, and the other equalling 1 if the individual is separated/divorced/widowed
- a dummy for the individual being head of the household, dated in t_0.
- a dummy reflecting whether the couple lives as dependent in other households or any of the members is the head of the household and therefore they live independently, dated in t_0.
- age, its square, and two dummies, one for age being 60 and another for age being 65 to pick the exit spikes at those ages
- education: a dummy for the individual having a third level of education recognised
- foreigner: a dummy for individuals not being nationals of the country where they are, dated in t_0.
- household size, dated in t_0.
- number of children in the household younger than 15, dated in t_0.

2) health variables

- a dummy if the individual reports himself as having good health, dated in t_0.
- a dummy for individuals having a chronic physical or mental health problem, dated in t_1 (this information is not available for t_0).
- a dummy for individual was admitted as in-patient in a hospital during the previous year
- two dummy variables for visiting the doctor between 1 and 5 times and more than five times in the year, dated in t_0.

3) labour force status characteristics, all dated in t_0.

- potential experience: Age-Age at which the person started her/his working life.
- dummies controlling for self-employment, unemployment, part-time job and, working in the public sector.
- occupational dummies: professionals, clerks, services workers
- dummy for the size of the job unit greater than 500
- work income relative to household income (it includes employment and self-employment earnings as well as unemployment benefits).
- non-work income relative to household income (includes capital and property rental income as well as private transfers)
- invalidity income: dummy that equals 1 if the individual receives income from sickness pensions. Since this type of income is not directly observable for every country it also includes some other public pensions: educational, family related benefits and other personal benefits.

4) country specific characteristics

- 11 national dummies
- sex specific variables collecting different regulations and characteristics across countries
    i) life expectancy at 65: number of expected years to live over 65
    ii) early retirement age and Normal retirement age
    iii) social Protection Expenditure (in Euro per capita)
    iv) pension eligibility criteria
    v) minimum pension relative to work income

In Table B.1 below present the mean and the standard deviation for all relevant variables in the individual and joint samples.

Table B.1. Descriptive statistics between states: joint transitions between t-1 and t for EU13 couples

lfs1	1 in t-1, 1 in t	1 in t-1, 4 in t	1 in t-1	4 in t-1, 1 in t	4 in t-1, 4 in t	4 in t-1	All cases
1 in t-1, 1 in t	2737(72.4)	528 (14.0)	3265 (86.4)	*314 (6.0)*	3787 (72.8)	4101 (78.8)	7366 (82.0)
1 in t-1, 4 in t	315 (8.3)	200 (5.3)	515 (13.6)	*39 (0.8)*	1060 (20.4)	1099 (22.2)	1614 (18.0)
1 in t-1	3052 (80.7)	728 (19.3)	3780 (100)	353 (6.8)	4847 (93.2)	5200 (100)	8980 (1.0)
4 in t-1, 1 in t	113 (6.2)	*31(1.7)*	*144 (7.9)*	*75 (0.5)*	*324 (2.0)*	*399 (2.5)*	*543 (3.1)*
4 in t-1, 4 in t	1277 (70.3)	395(21.8)	1672 (92.1)	196 (1.2)	15228(96.3)	15424(97.5)	17096(96.9)
4 in t-1	1390 (76.5)	426(25.5)	1816 (100)	271 (1.7)	15552(98.3)	15823 (100)	17639 (100)
All cases	4442 (79.4)	1154 (20.6)	5596	624 (3.0)	20399(97.0)	21023 (100)	26619 (100)

Notes.

1. In white: Joint distribution analysis conditional to participation of both members of the couple.
2. Marginal distribution analysis: In blue conditional to {1,1}; in green conditional to {1,4} or {4,1} and in red conditional to {1,.} or {.,1}
3. In yellow: transitions back to activity.

Table B.2. Descriptive statistics

	Males in Couples sample 4639 obs.		Females in Couples sample 4639 Obs	
	Mean	St-dev.	Mean	St-dev.
Transition to retirement	0.183[(1)]	0.387	0.197[(2)]	0.398
Age	60.99	5.000	57.61	5.181
Unemployment	0.073	0.260	0.038	0.192
College education	0.147	0.354	0.073	0.260
Good Health	0.555	0.497	0.509	0.500
Chronic physical/mental health problems	0.287	0.452	0.279	0.449
In-patient in a hospital	0.104	0.305	0.091	0.288
Number of visits to the doctor 1-5	0.545	0.498	0.530	0.499
Number of visits to the doctor >=6	0.265	0.441	0.340	0.474
Potential experience	43.57	9.126	31.82	17.73
Self employment status	0.330	0.470	0.111	0.314
Part time	0.067	0.250	0.185	0.389
Public employment	0.219	0.413	0.162	0.368
Working in a 500+ firm	0.106	0.308	0.047	0.212
Professional	0.257	0.435	0.139	0.346
Clerks	0.056	0.230	0.076	0.266
Services workers	0.052	0.223	0.103	0.304
Non national	0.011	0.103	0.011	0.103
Married	----	----	----	----
Sep-divorced-Widowing	----	----	----	----
Household size	3.091	1.351	3.091	1.351
Living independently	0.936	0.245	0.936	0.245
Number of children 0-15	0.080	0.371	0.080	0.371
Head	----	----	----	----
Work income relative to H'hold income	0.473	0.356	0.136	0.219
Non-work income rel. To H'hold income	0.036	0.105	0.036	0.105
Min benefits relative to work income	0.527	0.373	0.837	0.291

Notes.
1. 3881 observations.
2. 2207 observations.

Table B.3. Health status by type of transition

Origin state	Both employed				Husband employed / Wife OLF		Wife employed / Husband OLF	
Destination State	Both employed	Wife retires	Husband retires	Both retire	Remain	Husband retires	Remain	Wife retires
Husband Age	59.66	60.77	61.56	64.20	60.18	63.42	62.76	66.36
In good health	61.45	64.57	43.59	45.45	61.58	49.41	38.96	36.07
Chronic condition	22.80	19.43	40.17	43.94	22.07	35.24	48.88	44.81
Hampered in daily activities	21.45	18.29	31.62	36.36	20.13	34.45	45.57	46.45
Admitted as in-patient	6.86	8.00	14.53	25.76	7.88	18.90	14.09	16.39
Visits to doctor 1-5 times	59.23	62.86	59.83	53.03	55.56	53.35	43.65	44.26
Visits to doctor >5	20.87	14.86	29.91	34.85	21.26	31.10	45.74	47.54
Wife Age	55.50	57.68	57.15	61.09	57.61	60.60	57.2	61.63
In good health	58.74	56.57	60.68	53.03	49.22	36.61	54.09	45.90
Chronic condition	22.80	29.71	28.20	21.21	30.38	35.04	23.48	29.51
Hampered in daily activities	22.03	26.86	23.93	24.24	31.73	39.17	24.00	30.05
Admitted as in-patient	7.73	7.43	6.84	10.61	10.36	11.81	5.04	10.38
Visits to doctor 1-5 times	57.29	53.14	61.54	51.52	51.32	50.00	52.70	48.63
Visits to doctor >5	29.95	31.43	23.93	28.79	35.02	39.76	35.45	37.16
Both chronic condition	9.37	8.00	11.97	13.64	10.90	17.72	15.83	16.39
N. OBSERVATIONS	1035	175	117	66	1853	508	575	183

Table B.4. Probability of retirement between December 1993 and December 1994: conditional to spouse retirement and health status

	Wife poor health Retired between Dec 93-Dec 94	Wife poor health	Husband poor health Retired between Dec 93-Dec 94	Husband poor health	Unconditional
Husband	24.36	20.97	--	27.95	18.41
Wife	--	22.53	41.30	21.76	19.71

Notes.

1. Poor health is defined as and individual suffering from a chronic condition or being admitted as in-patient in a hospital.

Table B.4. Analysis of joint transitions within the couples

From \ To	Both in	Husband in / Wife out	Husb. Out / wife in	Both out
Both in	1035	175	117	66
	(74.3)	(12.6)	(8.4)	(4.74)
Husband In / wife out	n.c.	1861	nc	514
		(78.4)		(21.64)
Husband Out / wife in	n.c.	n.c.	575	183
			(75.9)	(24.1)
Both out	n.c.	n.c.	n.c.	n.c

Notes.
1. (nc): not considered.
2. Sample: husband aged 55 and more and wife 50 and more.
3. Retirement is assumed to be an absorbing state.]

C. The pension system and its generosity

There are two key types of pension systems: unfounded Pay As You Go (PAYG) and funded systems. All the EU12 are characterised by a first PAYG pillar, which differs across countries in their coverage and generosity. Simultaneously, on the top of this public first pillar, many EU countries have also a second pension pillar (voluntary or compulsory), with defined benefits (DB) or defined contributions (DC). On the top of these two pillars, there is a third private pensions pillar (which is still of limited importance in a vast majority of the countries considered). See, for instance, Boldrin *et al*. (1999) for a comprehensive description of the EU15 situation.

In Table C.1 a set of variables that identify some of the differences in terms of the parameters that characterise public pensions and life expectancy (which determines the length of the period in which people receives benefits) in EU12 countries.[15] There are not much differences in retirement ages (being Italy an important exception) or life expectancy (either at birth or at 65). However, there are important differences among countries in contributory rates, eligibility criteria and generosity. It is worth mentioning the differences in generosity of the "guaranteed" benefits. Belgium and Luxembourg provide the elderly with the highest level of guaranteed benefits and Greece, Portugal and Germany with the lowest. A clear relationship between the levels of guaranteed benefits and GDP per capita is found (Germany and Spain are notable exceptions). See Boldrin *et al*. (1999) or Blondal and Scarpetta (1998) for further comments of public pension replacement rates or generosity.

[15]The key parameters that characterise public pension systems are the contribution rates, the eligibility criteria, the early (if any) and normal retirement ages, the replacement rate, the indexation rules (to real wages or to nominal inflation), and the amount of survivors and orphans benefits.

Table C.1. Tax, social protection and life expectancy data

Country	Tax	SPE Euro pc.	Male Life exp.	Female Life exp.	Male life exp at 65	Fem. Life exp at 65
Germany	42.6	5514	73	80	14.7	18.4
Denmark	51.3	6374	73	78	14.3	17.7
Netherlands	45.4	5536	75	80	14.8	19.1
Belgium	46.8	5052	74	81	14.8	19.1
Luxembourg	43.3	6674	74	81	14.6	18.7
France	44.6	5500	74	82	16.2	20.6
UK	34.9	4649	74	79	14.7	18.3
Ireland	36.3	2873	73	79	13.9	17.4
Italy	40.7	4312	75	81	15.5	19.4
Greece	32.8	1645	75	80	16.1	18.4
Spain	34.8	3020	73	81	15.7	19.5
Portugal	36.1	2162	71	79	14.4	17.9

Notes.

1. Tax: Income and social contributions taxation.
2. SPE: Social protection expenditure (in Euro per capita).
3. Minimum benefits are given in 1995 PPS units.

Table C.2. Pension system data

Country	Male			Female			Eligi-bility	Replacement rate		Minimum Benefits
	Lowest age	Early	Normal	Lowest age	Early	Normal		At age 55	At age Full Ben.	
Germany	60	63	65	60	60	65	5			2768
Denmark	60	60	67	60	60	67	3			3472
Netherlands	58	60	65	58	60	65	0			3473
Belgium	58	60	60	58	60	60	0			7638
Luxembourg	57	60	65	57	60	65	10			10440
France	57	60	69	57	60	60	0			5048
UK	60	65	65	60	60	60	4			4103
Ireland	55	65	65	55	60	65	3			3357
Italy	56	56	61	51	51	56	16			4759
Greece	62	62	65	57	57	60	15			354
Spain	60	60	65	60	60	65	10			5087
Portugal	60	65	65	60	62	62	15			1345

Notes.

1. Lowest age: lowest age a person can, under special programs, claim for old-age benefits.
2. Minimum benefits are given in 1995 PPS units.
3. Source: MISSOC (1994) Gruber and Wise (1999) and Blöndal and Scarpetta (1998).

Table C.3. Changes in taxes in EU12

Country	1	2	3
Germany	0.0	25.8	13.5
Denmark	-13.2	43.2	5.70
Netherlands	0.00	-8.30	-4.20
Belgium	0.00	0.00	6.50
Luxembourg	-15.8	0.00	2.00
France	-5.30	90.0	5.10
UK	0.00	-60.0	3.30
Ireland	-13.2	-20.0	-4.20
Italy	-8.00	90.0	9.80
Greece	-10.0	-72.2	14.6
Spain	-14.3	-28.0	3.60
Portugal	0.00	0.00	15.5

Notes.

1: Percent change in maximum marginal rates corresponding to the period 1990-99.

2: Percent change in minimum marginal rates corresponding to the period 1990-99.

3. Percent change in tax pressure during the period 1990-98. For Greece the figure corresponds to 1990-97.

4. Source: Alvarez, Alonso, Gago and González (2001).

Figure 1.a. Male labour force transitions in a three state model in EU12 by age.

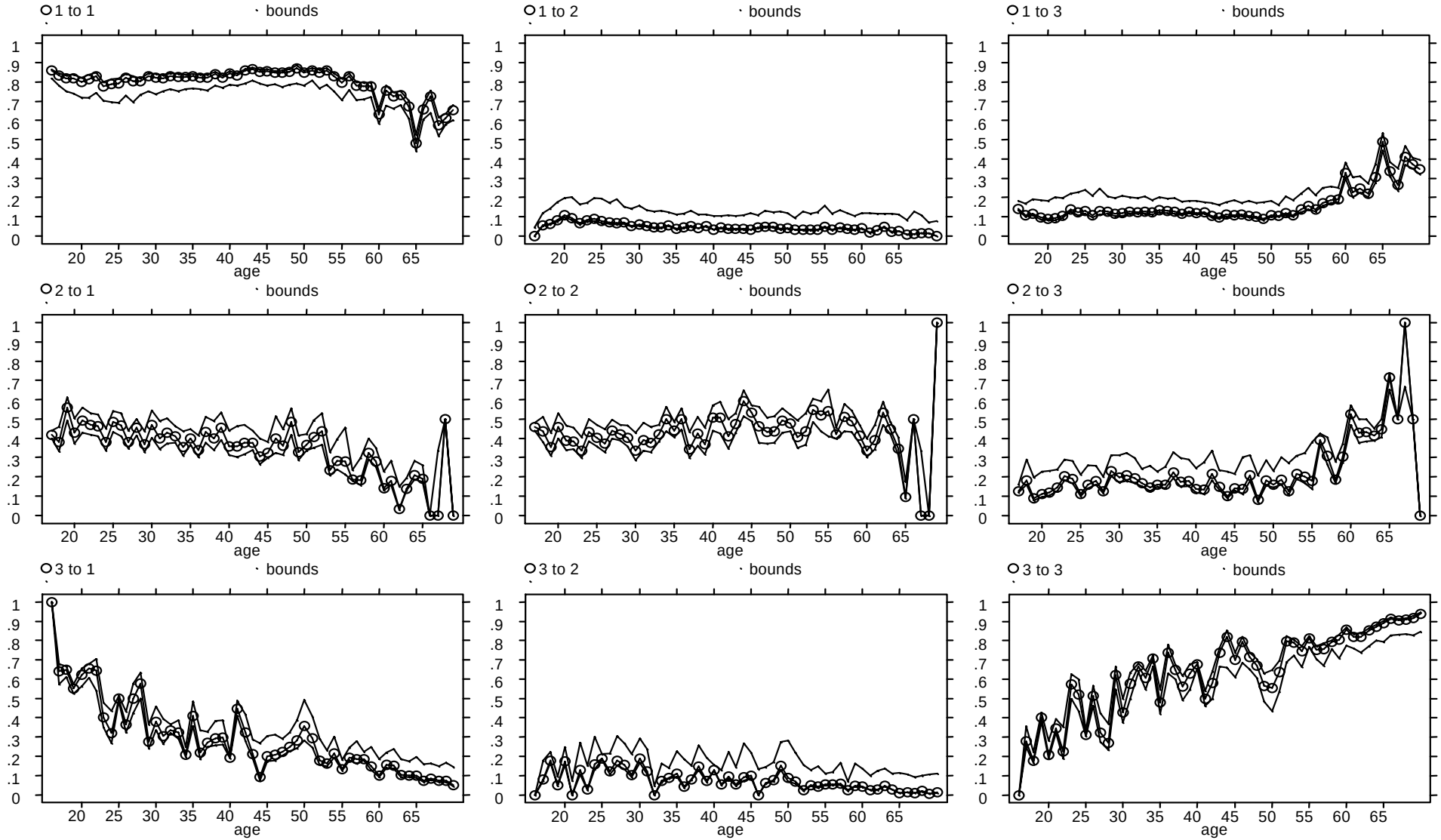


Figure 1.b. Female labour force transitions in a three state model in EU12 by age.

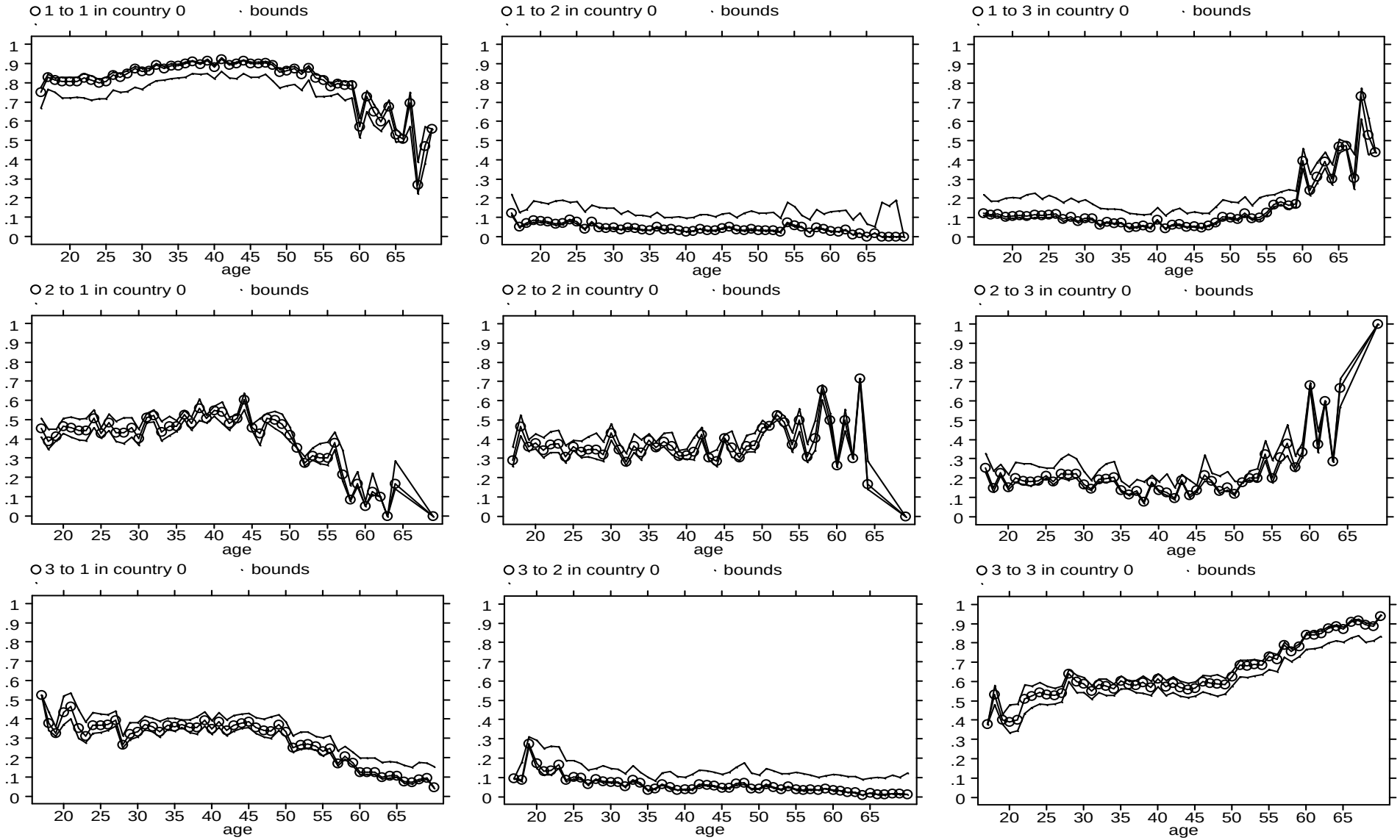
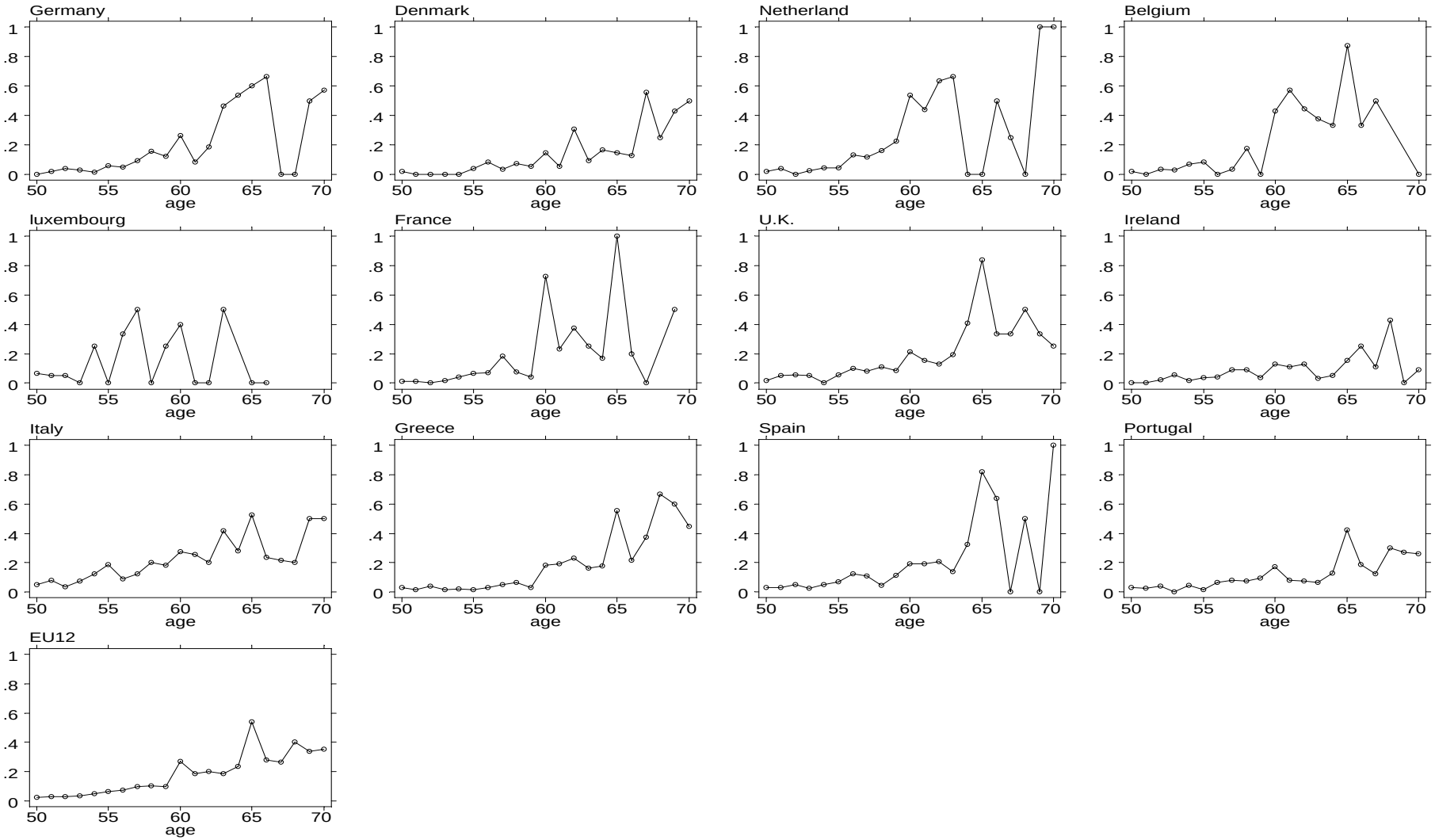
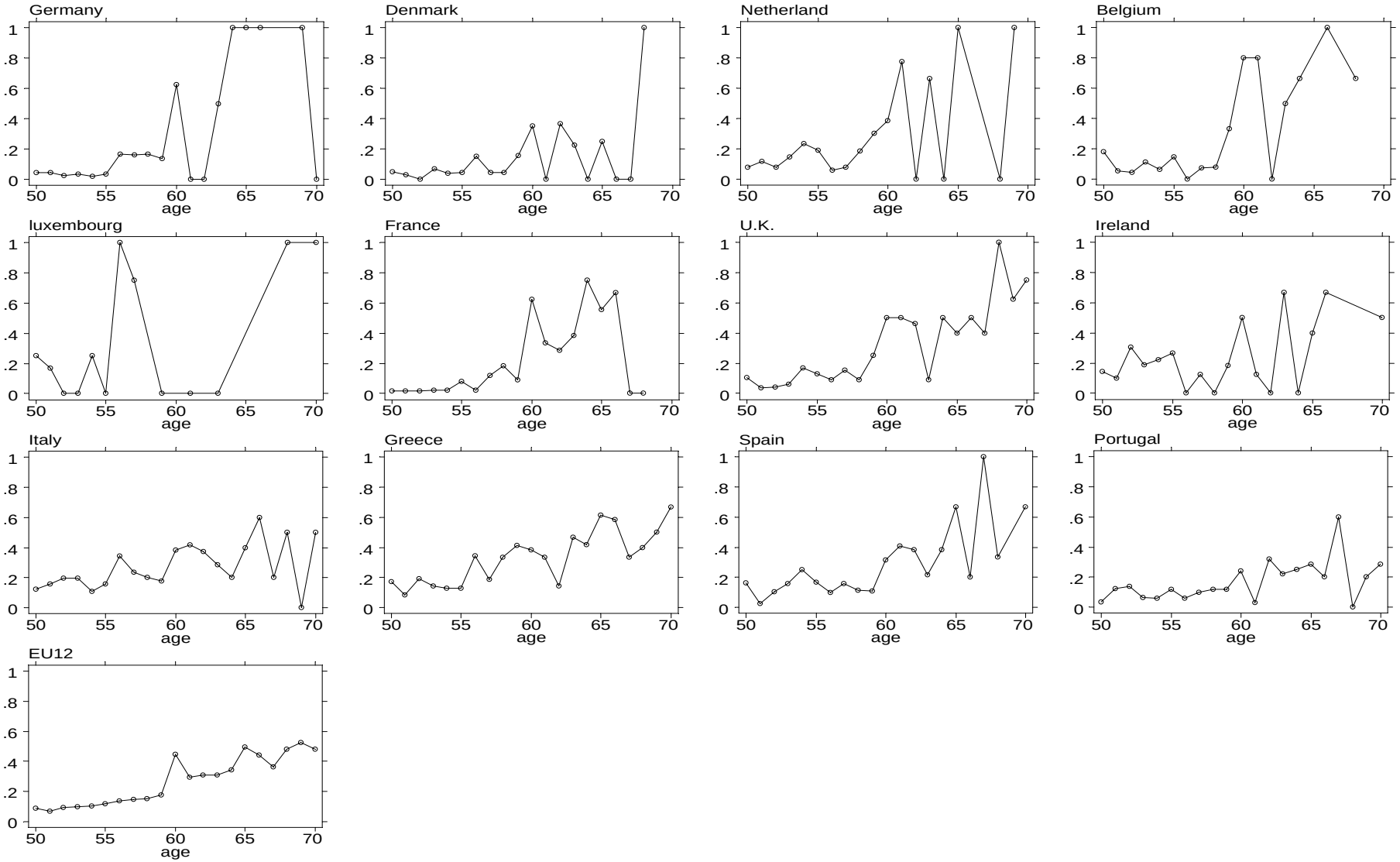


Figure 2.a. Male hazard out of the labour force by country and age.



notes : longitudinal hazard out of the labor force based on retrospective response (current status in the Netherlands).

Figure 2.b. Female hazard out of the labour force by country and age.



notes : longitudinal hazard out of the labor force based on retrospective response (current status in the Netherlands).

Figure 3. Male, Female and joint distribution of activities by age in EU12 in March 1994.