The Decision of Early Retirement in Spain¤

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Abstract

In Spain, as in most OECD countries, population ageing is creating a growing concern with respect to social security arrangements and in particular relative to public pension systems. The most reliable demographic forecasts show that the ageing process will continue at least until 2025. This situation is getting worse in the last decades with the presence of retirement policies that encourage exit out of the labor market before 65 years of age. Policy makers, aware of the consequences of these actions, are stressing the need of establishing measures to provide workers with incentives to extend their working lives and so reverse the dependence rate growth among active and passive people.

The aim of this paper is to analyse the early retirement decision for Spanish older workers, focussing on the characteristics of the early retired and looking at di¤erences among individuals who choose different exits to retirement. This will help us to understand what kind of individuals are more likely to be a¤ected by future laws promoting the delay of retirement, as well as designing suitable policies to ensure a greater labor market attachment for older workers. We work with a sample of individuals older than 49 years that has been taken from the Spanish Household Panel Survey (waves corresponding to 1994 and 1995). The paper focuses on two alternative routes for entering retirement: pure early retirement and disability. The decision of retirement is modelled within a hazard model approach where the decision is treated as a dynamic discrete choice.

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1 Introduction

In Spain, as in most OECD countries, population ageing is creating a growing concern with respect to social security arrangements and in particular relative to pension public systems. The most reliable demographics forecasts show that the ageing process will continue at least until 2025 (…gure 1 shows forecasts for Spain). A negative direct consequence of this process is a growth in the dependence rate among old and young people. The relationship between the number of active and passive individuals is determinant to ensure future viability of pay-as-you-go systems, the current system in Spain. This situation is getting worse in the last decades with the presence of retirement policies that encourage exit out of the labor market before 65 years of age. In …gure 2 it can be seen how the average age of retirement has changed from 68 years of age in 1950 to less than 62 in 1995. Spanish policy makers, aware of this problem, are stressing the need of establishing measures to provide workers with incentives to extend their working lives and so reverse the dependence rate growth among active and passive people. The so-called Pacto de Toledo of 1996, a document agreed upon by social partners (unions, employers and government), envisaged the most important measures to be taken in the near future. It holds, among others, the proposal to provide incentives for delaying the exit from the labour market.

The aim of this paper is the analysis of the decision of early retirement for Spanish older workers focussing on whether the trend towards earlier retirement in Spain re‡ects individual preferences for leisure, or whether it can be ascribed to incentives that attract workers out of the labour force. It will be done looking at the characteristics of the early retired and focussing on the di¤erences among individuals who choose di¤erent exits routes to retirement.

Labor market situation for older workers has been extensively treated for the case of United States. Rhum (1989), Peracchi and Welch (1994) and Blau (1994), among others, have studied changes in patterns of retirement in the last decades. They show how the traditional transition from work to retirement (work continuously in full-time jobs until retirement) have changed over time following more complex

patterns. Furthermore, they …nd an important decrease in the age of retirement over time. Similar analysis for the case of Europe are presented in Meghir and Whitehouse (1997) and Zabalza et al. (1980).

For the Spanish case, Boldrin et al. (1997) describe the historical evolution of the Social Security system and show how the retirement choice is regulated under a system that generates strong incentives to retire early and that Spanish workers tend to do so. Alba (1997) achieves an empirical analysis of the labour force transitions of men aged 50-69 for the period 1987-1996, …nding a higher probability of exit from the labor force at the begining of eligibility for early retirement. Villagarcía (1995) carries out a …rst approximation to the hazard rate from employment to early retirement. However, the data used in this paper have not got information on the exact age of retirement, as well as income variables, family variables or laboral characteristics previous to the date of retirement.

This study can be seen as a complement to the latter ones given that it deepens in the analysis of individual characteristics of early retired individuals focussing on two di¤erent exits routes to early retirement: pure early retirement and disability[1]. The paper is organized as follows: Section 2 presents a summary of early retirement plans provided under each of the di¤erent Spanish public pension systems. The purpose of this section is to give an idea of which are the incentives to leave the job under each scheme, looking at the minimum age allowed in each of them and the relationship between age of retirement and future pension level. Section 3 describes both the theoretical framework and the econometric model applied in the analysis of the decision of early retirement. Section 4 describes the data and presents a descriptive analysis of the sample and section 5 shows the results of estimation. Finally, the last section is devoted to outline the most important conclusions derived from the empirical work, as well as suggest possible indications for economic policy that in view of our results might be implemented.

[1] Although the main objective of disability schemes is not to promote early retirement, there is evidence that they have been used extensively in the last decades as an intermediate state to retirement, especially in declining industries or as substitutes for long-term unemployment subsidies in depressed regions (see Boldrin et al. (1997)).

2 A brief description of early retirement schemes in Spain

Spain has a mandatory pay-as-you-go public pension system. Public pensions for employed people are mainly provided under three schemes: "General Social Security Scheme" (Régimen General de la Seguridad Social, or RGSS), "Special Social Security Schemes" (Regímenes Especiales de la Seguridad Social, or RESS) and government employees scheme (Régimen de Clases Pasivas, or RCP)[2]. The standard age of retirement is 65, although retirement at earlier ages is permitted in some cases. Next we show a brief description of the di¤erent early retirement possibilities provided under each scheme looking specially at the relationship between age of retirement and the penalization over pension bene…ts[3].

Individuals under RGSS can retire at the age of 60 if they had been registered with the Social Security system before January 1, 1967. Claiming bene…ts before 65 years implies a reduction of 8% for each year of early receipt, until a maximum of 40 per cent for those who retire at the age of 60. Retirement at 64 years without any kind of penalization is possible if the …rm hires another worker for a minimum period of one year (substitution contract) to replace the retiree. In this case the retiree is eligible for full bene…ts, according to Social Security rules applicable to retirement at 65. Furthermore, workers can partially retire starting at age 62 with 50 per cent of full bene…ts if the …rm replaces the retiree with another worker (relief contract) to compensate for the reduction in worktime. In addition, Social Security

[2] The relative importance of di¤erent schemes can be seen through the percentage of covered workers in 1994:
-RGSS: 68.08%
-RESS:
Self-employed: 14.97%
Agricultural workers and small farmers: 8.42%
Sailors: 0.78%
Coal miners: 0.23%
Domestic workers: 1.15%
-RCP: 6.32%

[3] Pension bene…ts depend positively on years of contribution (replacement rate) and level of wages at the end of the individual labour history (bene…t base). Apart from that, certain peculiarities are considered under each scheme such as the number of wages considered in the calculation of the pension bene…ts, as well as the maximum and minimum levels of pension allowed in each case.

legislation provides early retirement receiving full bene…ts for workers employed at dangerous or unhealthy jobs or that have been a¤ected by industrial restructuring regulated by special legislation.

Under RESS it is only possible to retire early for sailors and miners, although self-employed and agricultures are the most numerous groups under these type of schemes[4]. The minimum age of retirement for sailors and miners is 65, however, in both cases, the date of retirement can be anticipated by the amount of time that result from applying reducing coe¢cients over the total working life period. Coal miner coe¢cients are between 0.50 and 0.05, and they are between 0.40 and 0.10 in sailor cases. For the latter one, reduction can not be greater than 10 years, being the bene…t reduced in a 7% for each year of early retirement.

In the case of government employees, individuals with at least 30 years of work can retire with full bene…ts at the age of 60, and so can do military personnel with at least 20 years of service.

An alternative way to exit from the labour market at an early age is through a disability cause. There is evidence that in the last two decades this type of schemes has been massively used especially during depressed periods[5]. We are particulary refering to permanent inability situations. In these cases, individuals can receive a disability pension until the date they are eligible for a retirement pension. There is not a minimum established age to be eligible for a disability pension, although it has a positive relationship with years of contribution and invalidity level. A minimum contributive period is not required to be eligible for a inability pension when invalidity is caused by an accident at work. In other case, the period required depends on the invalidity level. A special subcase is applied to employees older than 55, with a low quali…cation and in particular socio-economic situations. It is expected that for these workers it could be di¢cult to …nd a job in a di¤erent activity than the previous one.

Early retirement is also possible for unemployed people. Unemployed workers

[4] Self-employed and agricultures made up the 93% of individuals under RESS in 1996.

[5] In 1984 invalidity pensions represented more than 50 per cent of retirement pensions. The reform of 1984 introduced a procedure for more accurate assessment of invalidity claims.

aged 52 and older who fulfill some requirements[6], can receive unemployment benefits until they are eligible for early or normal retirement. This subsidy pays up to 75 per cent of the minimum wage and years spent unmeployed count as contributive years towards an old-age pension.

3 The decision of early retirement

3.1 Theoretical framework

The early retirement decision is studied in the context of an option value model. The model focusses on the opportunity cost of retiring or, equivalently, on the value of retaining the option to retire at a later date. It is assumed that individuals choose the labour market participation option that gives them the highest value.

To develop a decision function relative to retirement, suppose that the individual indirectly derives utility $U_w(Y_s)$ from working, and utility $U_r(B_s(r))$ from retiring. Both of them are defined over rents (in monetary and leisure terms) of each state, conditioned over current and past labour supply decisions. Suppose that (i) when deciding whether or not to retire the individual discounts future utility by the discount factor β, and (ii) individual will die by year S with probability one. If he retires at age r, the weighted, or discounted, value received over the remainder of his life is

$$V_t(r) = \sum_{s=t}^{r-1} \beta^{s-t} U_w(Y_s) + \sum_{t=r}^{S} \beta^{s-t} U_r(B_s(r))$$

Thus, the value function $V_t(r)$ depends on future earnings and retirement benefits, which in turn depend on the age r at which he retires. The individual must choose either to work during year t, so that $r > t$, or to retire, so that $r = t$. Assume that he makes the decision by comparing the expected value he would receive

[6] These requirements are: (1) the workers must be registered at the public employment office, (2) his income should be lower than the minimum wage, (3) he needs to have made Social Security contributions for at least of six years, and (4) the person must meet all requirements for retirement except that of age.

if he retires now, at r = t, with the greatest of the expected values from possible retirement dates r > t in the future. The expected gain, at time t, from postponing retirement to age r is then given by

$$G_t(r) = E_t V_t(r) - E_t V_t(t)$$

where $E_t(:)$ denotes individual's expectation about future circumstances, based on information available to him at the begining of year t. So, the individual retires if there is no expected gain from continued work, that is, if

$$G_t(r^*) = E_t V_t(r^*) - E_t V_t(t) < 0$$

where r^* represents the retirement age with the highest expected value. Following with this notation the probability of retirement at age θ can be expressed as,

$$Pr[R = \theta] = Pr[G_t(r^*) > 0; :::; G_{\theta-1}(r^*) > 0; G_\theta(r^*) < 0]$$

that is, an individual in the sample at age $\theta - 1$ retires at age θ if there is no earlier age when he considers it optimal to retire, and if it is optimal to retire at θ based on the decision function expressed by $G_t(r^*)$.

Traditionally, the structural analysis of these models has been done using optimal control theory. However, as Stock and Wise (1988a) demonstrate, there exist a quite direct relationship between the option value model and the more familiar proportional hazard model. Therefore, we can express the probability that a person retires before age θ as

$$H(\theta) = Pr[R \cdot \theta] = 1 - \exp\left[-\int_{u=t}^{\theta} \mu(u)\,du\right] = Pr\left[e^{-\int_{u=t}^{\theta} \mu(u)\,du}\right]$$

assuming that $\int_{u=t}^{R} \mu(u)\,du$ is the utility gain from retirement at age ¿ and so, $\mu(¿)$ is the derivative of the utility of retirement at time ¿. Following H (¿), the retirement will occur when the value of $\int_{u=t}^{R} \mu(u)\,du$ exceeds e, the random term in the proportional hazard model, which is an individual-speci…c term that remains constant over time and can be thought of as an individual-speci…c threshold. In the proportional hazard model $\mu(t)$ is typically expressed as

$$\mu(t) = \lambda(t) \exp\left[x(t)'\beta\right]$$

where $\lambda(t)$ is a function of age and $x(t)$ is a vector of variables that remain or not constant over time. The latter case could in principle include a variable like $G_t(r^{\alpha})$.

We estimate this model in reduced form looking at the e¤ect of age on $\lambda(t)$ and taking into account which factors a¤ect not only the utility to continue in the active labour market and the utility to retire, but also individual preferences. With respect to variables a¤ecting utilities associated with the two di¤erent alternatives, to continue working or to retire, we must include variables that aproximate the level of earnings in each case. With respect to the speci…c utility threshold of each individual we include variables that approximate the possibilities of early retirement of each one given his labour market trajectory as well as variables that re‡ect individual preferences on leisure and work.

3.2 Econometric model

In this paper the age of retirement is modelled following a hazard model approach, where the retirement decision is treated as a dynamic discrete choice. Given that individuals may consider two di¤erent retirement routes, it could be expected that the e¤ects of the factors determining the retirement decision vary according to the exit chosen. Therefore, a competing risk model is implemented.

The dependent variable in the model is the duration of employment that …nished in early retirement through either of the two possible exits to retirement we are

considering. We assume the existence of two independent[7] random variables, T_1 and T_2, each of them refering to one of the di¤erent exit states. We consider that the real state at which the individual is going to is given by the minimum of $fT_j g\,;\ j = 1;2$, that is, the duration we really observe. The hazard function is the conditional probability of entering retirement at age t, given that the individual has not retired at an earlier age. For individual i it takes the form

$$\mu_i(t) = \lim_{h \,!\, 0^+} \frac{Pr[t + h > T_i \geq t \,j\, T_i > t; X(t)]}{h} \tag{1}$$

Assuming a proportional[8] hazard parameterization $\mu_i(t)$ can be expressed as

$$\mu_i(t) = \lambda_0(t) \exp[x_i(t)'\beta] \tag{2}$$

where $\lambda_0(t)$ is the base-line hazard at time t, which is exclusively a function of age, $x_i(t)$ is the vector of explanatory variables for individual i, any of them could change with time, and β is a vector of unknown parameters.

Given the discrete nature of our data we express equation (2) as

$$h_i(t) = 1 - \exp[-\exp fx_i(t)'\beta + \gamma(t)g] \tag{3}$$

where $h_i(t)$ is the discrete counterpart of $\mu_i(t)$ and $\gamma(t) = \left(\int_t^{t+1} \lambda_0(s)ds\right)$ captures duration dependence non-parametrically. The existence of two alternative routes for

[7] In general independence among risks is assumed in order not to impose a priori restricted parametric functional forms. This assumption can be tested against an alternative hypothesis of independence, although these tests are highly sensitive to the speci…ed functional form.

[8] The propotional hazard is a very common parametrization due to its advantages. On the one hand, it does not impose any restriction on β whereas it guarantees the non-negativity of the hazard rate. On the other hand, the estimation and inference of these models is rather direct (see Kiefer (1988)).

access to retirement allows us to de…ne one hazard function related to each type of risk. Thus,

$$h_{ij}(t) = 1 - \exp\left\{-\exp\left\{x_i(t)\beta_j + \gamma_j(t)\right\}\right\} \tag{4}$$

where $h_{ij}(t)$ is the hazard rate to state j for the individual i. Furthermore, given that an individual can leave his job only through one of the speci…c exits considered, the next relation is satis…ed

$$h_i(t) = h_{1i}(t) + h_{2i}(t) \tag{5}$$

So, we can express the likelihood function as the product of the likelihood functions associated to each type of risk (L_j; $j = 1; 2$), being L_j equal to the product of the individual likelihood functions related to j risk. Given the assumption of independence among risks, the parameter vectors associated to each of them can be estimated separately treating in each case the durations that end up in the alternative risk as censored at the exit moment (see Narendranathan and Stewart (1993)). So the likelihood functions to maximize take the form

$$L_j = \prod_{i=1} \left\{ \prod_{t=1}^{d_i - 1} f[1 - h_{ij}(t)]\, h_{ij}(t) \right\}^{c_{ij}} \prod_{t=1} [1 - h_{ij}(t)]^{(1 - c_{ij})} \tag{6}$$

where d_i is the observed duration for the individual (complete or censored)[9] and c_{ij} is a dummy variable that takes the value 1 if individual i exits to state j ($j = 1; 2$) and zero otherwise. The contribution to the likelihood function for an individual that exits to state j is given by the density function related to exit j and the survival function corresponding to the alternative risk, since we know that, at

[9] Complete durations correspond to the early retired individuals, while the employees between 50 and 64 give rise to censored observations.

least at moment d_i, the individual had not gone out to the other state. In censored cases individual contributions will be done by two survival functions, each of them associated to a di¤erent type of risk.

However, it is possible to de…ne this likelihood function in an alternative way that makes computations much easier. Following Jenkins (1995), we de…ne y_{ij} which takes the value 0 for all ages except the age of retirement, in which case y_{ij} takes the value of one. Using this indicator variable, the likelihood function of each individual i can be written as

$$L_j = \prod_{i=1} \left(\frac{h_{ij}(d_i)}{1 - h_{ij}(d_i)} \right)^{y_{ij}} \prod_{t=1} [1 - h_{ij}(d_i)] \tag{7}$$

It has the same form that a standard likelihood function in regression analysis with a binary dependent variable (y_{ij}) and it is equivalent to equation (6). So, we estimate the model maximizing expression (7). It implies that the model is treated as a sequence of binary choice equations de…ned on the surviving population at each duration.

In addition to this, the model will be estimated adding a term to correct for the presence of unobserved heterogeneity. Not introducing this term would imply not correcting for unobserved individual di¤erences, which might lead to bias, not only on the baseline hazard but also on the parameters associated to the explanatory variables. We include this term, as it is standard, in a multiplicative way. Denoting by ε_{ij} the heterogeneity term and assuming it follows a normalized gamma distribution[10], the hazard rates can be expressed as

$$h_{ij}(t) = 1 - \exp\left\{ -\exp\left(x_i(t)\beta_j + \gamma_j(t) + \log(\varepsilon_{ij}) \right) \right\} \tag{8}$$

[10] Ridder and Verbakel (1983) show that this speci…cation is less restrictive the more ‡exible the duration dependence is. They also show that the other standard de…nition of unobserved heterogeneity (discrete non parametric estimation), although it gives better results in terms of goodness of …t, its e¤ect over …nal results is very small. Given the computation complexity of such assumption, we have assumed the gamma-distribution.

where ε_{ij}, $j = 1;2$, that is, we consider an heterogeneity term associated to each type of risk being both of them independent[11]. In this case, a similar likelihood to the function presented in equation (7) is estimated, where the hazard rate depends now on the additional term, ε_{ij}.

4 Data and empirical analysis

The empirical analysis of the decision of early retirement is based on data taken from the Spanish Household Panel Survey, a longitudinal panel that includes, at present, two waves corresponding to 1994 and 1995. Each wave contains detailed information on the current demographic and labour situations as well as income variables; in addition to this, retrospective information on individual labour market histories is available.

The study is restricted to men because of the low participation rates of older females. The weakness of the results derived from the small number of observations makes especially difficult the analysis of early retirement decision for females.

The objective of the paper is to analyse transitions from employment to early retirement, so we work with individuals who access to retirement before 65. The minimum age we consider is 50 given that, as Alba (1997) shows, the labour force participation of men starts to decline from this age on. Retrospective information available in the survey allows us to construct part of the work history for these individuals. It is possible to know when early retired individuals left their last job and we assume that it is exactly the moment of entering to early retirement. It is possible that in some cases there might exist an intermediate transition between employment and early retirement but available data make impossible to capture this type of transition[12]. An additional assumption we make is that the exit to official retirement from an early retirement situation is direct.

We focus on two different exit routes to retirement: pure early retirement and disability. Pure early retirement is the situation of those individuals for whom the

[11] It is directly derived from the previous assumption of independence among risks.

[12] We are mainly refering to an unemployment period. These intermediate transitions could be captured when future waves are available.

following conditions are given: i) they de…ne their situation as retired and have not left the job by an inability cause[13] and ii) the early retirement age is not younger than 50 and not older than 64. In a disability situation there are individuals that satisfy the following conditions: i) they are disabled[14] or they de…ne themselves as retired but left the job for an inability cause[15] and ii) the age of the transition from employment to this state is not younger than 50 and not older than 64. Henceforth, individuals who access to retirement by a pure early retirement route will be called retired, and those for whom disability was the exit state will be called disabled. The study will be done taken as reference group employed[16] men between 50 and 64 years of age. This will allow us to identify what are the main di¤erences among individuals that are employed at older ages and those who retire early. Table 1 shows the distribution of individuals by current age at the time of the interview for employed people and by age of retirement for the cases of retired and disabled people. It must be noted that given that in the latter cases the time of retirement has been constructed using retrospective information, in most cases this age does not coincide with the current one. That is, 50 per cent of disabled and retired individuals are more than 64 and 66 years old, respectively.

Figures 3 and 4 show the pattern of exits to early retirement by age. The estimated empirical hazard functions[17] show how the rate of exit to retirement at each age (50 to 64 years) is lower through the disability route than through the

[13] Under this situation, we have three types of individuals:
-individuals retired in both periods, 1994 and 1995
-individuals retired in 1994 and missing in 1995
-individuals not retired in 1994 but retired in 1995.

[14] We are interested in individuals a¤ected by a permanent disability, so that, non-permanent cases have been taken o¤ the sample. However, the data only provides information about permanent disability for individuals observed in the second wave (1995). We assume that all of the individuals that are only observed at …rst wave (1994) su¤er a permanent disability. So, if we consider that among the latter ones the same proportion of individuals as in the case of those observed at second wave do not su¤er a permanent disability, we are making an identi…cation error of 1.32 per cent of disabled individuals.

[15] As in the case of retired people, it is possible to observe the same three types of individuals.

[16] Individuals who are working at least 15 hours a week.

[17] The hazard rates from employment to retirement and disability are de…ned in each case as the probability of exit to retirement at an age t given that the individual has remained employed until that moment. Vertical lines represent a 95% con…dence interval for the hazard estimated at each age.

alternative one, although for disabled individuals the transition occurs with a higher probability at relative younger ages. In both cases the hazards are increasing with age, …nding a pike at 60 years. As we said in section 2 this is the age at which, under the main schemes of retirement, individuals are eligible for accessing to retirement with pension bene…ts.

The di¤erence between current age and age of retirement allows us to analyse the pattern of retirement for early retired men with time. So, we distinguish two cohorts: (i) early retired individuals born after 1930 (therefore aged 64 or less at the time of the interview) and (ii) early retired men born before 1931 (therefore older than 64 at date of the interview). Figures 5 and 6 show the distribution of ages of retirement by exit route and cohort. In both of them it can be seen how for the youngest group the moment of retirement is concentrated at lower ages than for the older group. So, this fact con…rms that recent early retirement policies are being implemented in relatively younger workers.

A general description of individuals in the sample is presented in table 2. It includes personal and household characteristics as well as variables relative to their work experience[18]. Some important di¤erences between retired and disabled individuals are captured in table 2: (i) although in general early retired individuals have a low education, we can see that the skill level of disabled workers is lower than that of retirees, given that both the educational level and job quali…cation are lower for the former; (ii) if we look at both individual earnings and family income distributions, the economic situation seems to be relatively worse for disabled individuals than for retirees; and (iii) the retirees, relatively to disabled individuals, were in a higher proportion public employees, had been working in manufacturing and in larger …rms, while disabled individuals are characterized for having worked in a relatively high percentage as self-employed, in …rms with less than 20 employees and in agriculture and construction. With respect to employed individuals, these are characterized for: (i) having university studies in a higher proportion than secondary ones[19], although the main category is also represented by primary education; (ii) being concentrated

[18] See the data appendix for a full description of all variables.

[19] Given the design of the survey, this category includes university and vocational II studies.

on medium and high levels of family and individual income distributions; and (iii) work in a relatively high percentage as self-employed, in …rms with less than 20 employees and which belong mainly to the services sector.

It must be noted that a comparative analysis of the characteristics of early retired individuals (retired or disabled) and employees from table 2 could be a¤ected by a cohort e¤ect because of the possible correlation between some variables and current age. So, in order to avoid this type of e¤ect and to get a better characterization of the early retired individuals a multinomial logit model is estimated. The multinomial logit estimation shows the relative probability of each respondent to be observed in any of the exit states considered, relative to the probability of being working. As independent variables we have included personal characteristics as health status, level of current individual earnings and skill level; measures of family situation, such as whether the individual is head of household or not, and others related to family income (marital status and laboral situation of spouse at moment of respondent retirement, current family size, current family income); previous job characteristics (type of job, hours of work, …rm size) and industry, so as to capture demand e¤ects. Finally, current age has been introduced to correct for possible cohort e¤ects. Results are presented in table 3.

We …nd, especially for disabled individuals, as expected, that the probability of accessing to early retirement is positively related to a bad health status. High levels of individual earnings make less likely the access to early retirement, maybe because access to retirement always implies an income reduction.

The education e¤ect is better captured by the type of occupation instead of the level of studies, probably because general education was adquired a lot time ago and the type of occupation describes better the actual level of quali…cation. In both cases, retired and disabled individuals, working in a non-skilled manual occupation in relation to work in a skilled manual make less likely to retire early. The same e¤ect is obtained for individuals working in a professional occupation only if the access to early retirement is through a disability route.

For retired individuals family size has a negative impact on the probability of going out of the labour market before 65, which suggests that individuals with more

family responsabilities try to remain in the labour market.

It is important to highlight the e¤ects that type-of-job variables exert on the probability of early retirement. The probability of being retired with respect to be employed (between 50 and 64 years) is a¤ected by whether individuals have the option of going out the labour market before 65 or not. As it was said in section 2, self-employed individuals can not retire early and this can be observed from the negative e¤ect that to be self-employed has on the probability of early retirement. In the same way, working in manufacturing makes more likely to retire early, which is not surprising given that this sector was the most a¤ected one by measures of early retirement during the industrial restructuring process (early 80s). Furthermore, being in the public sector has a positive e¤ect on the probability of early retirement. This result is likely to be related to the fact that individuals working in the public sector can retire early without any kind of monetary penalization if they have been working the required number of years (20 or 30 years depending on if they were or not military personal, respectively).

The same e¤ects of the type-of-job variables are obtained for disabled individuals which somehow con…rms the view that disability schemes are in most cases being used as a mechanism to promote early retirement.

5 Results of the competing risk model

This section presents the results of the competing risk model estimation for exits from employment to early retirement and disability. The model has been estimated including the variables that, according to section 3.1, must be taken into account.

As we said when describing the theoretical framework to be used in the empirical analysis of duration of employment that ends up in early retirement, we must consider not only variables related to the utilities associated with work and retirement (variables associated with the level of income in each case), but also variables related to individual-speci…c threshold as well. Due to the lack of retrospective information on the level of wages at the date of retirement other variables are included as proxies for it. Marital status and if the spouse was or not working at the date of husband

retirement are included to approximate the level of family income in that particular moment. Given the positive relationship existing between wages at the date of retirement and pension bene…ts, current individual earnings are also included. Finally, current family income has been considered to capture the relationship between the present economic family situation and the retirement decision. With respect to the speci…c utility threshold of each individual we consider personal characteristics such as health status[20] and occupation in the last job, the last one as a proxy of individual quali…cation level. Job situation and activity capture the possibilities of early retirement for each individual given his labour market trajectory, that is, incentives to retirement provided under each type of job.

The duration dependence of the hazard rate with respect to age of retirement is captured in two di¤erent ways. On the one hand, pure duration dependence is de…ned, as it was said in section 3.2, non-parametrically using separate indicator variables for each age of retirement. On the second hand, interactions of certain independent variables with the logarithm of the duration are included to see if variables' e¤ects change with age of retirement. We have …rst tried other estimations including interactions of all variables with the logarithm of duration and then the non-signi…cative ones have been removed.

Table 4a shows estimations of the competing risk model. We present the results of estimations both when unobserved heterogeneity is not taken into account (columns I and III) and when it is taken into consideration (columns II and IV). Our comments will refer to the results of columns II and III given the signi…cance and non-signi…cance of unobserverd heterogeneity[21] in the cases of early retired and disabled individuals, respectively. Estimated values of the pure duration dependence are presented in table 4.b.

[20] We only know the current health status of individuals. However, it would be better to have a time dimension health status variable given that the labour force decision seems to be more sensitive to changes in health than to the overall health status (see Bound et al. (1997)).

[21] At the end of table 5.a we have included the signi…cance of the heterogeneity variance for those models where heterogeneity is controlled for, as well as the statistic which corresponds to the test of the likelihood ratio of both models (including the term of heterogeneity against not including it). This value must be compared to a $\hat{A}^2_{(1)}$ (3.84 at 5%). This test is often used in this context (see Lancaster (1990)), although the second model is not, strictily speaking, nested in the …rst one.

The analysis of the hazard rates to early retirement is based on the results showed in tables 4.a and 4.b, and in …gures 7 to 8.4. These …gures stress some of the results, as they indicate the cuantitative importance of the main variables' e¤ects in terms of the hazard rate. In these …gures di¤erent estimated hazard rates are compared: (i) the estimated hazard rate for the reference individual case[22], and (ii) the e¤ect of speci…c variables on the estimated hazard rate, keeping up the rest of variables in their previous categories.

As it can be seen in …gures 7 and 8 the hazard rates turns out to be very similar to the empirical hazards shown in …gures 3 and 4, even though in the former multivariate controls have been included.

With respect to retired individuals it must be noted that having a good level of health status has a negative impact on the decision of early retirement, as it can be seen in table 4.a. It is a surprising e¤ect and contrary to the result found in the multinomial logit. In principle, we would expect that unhealthy individuals would be more likely to retire early, either through pure retirement or disability routes, given that to remain employed should be more expensive for them than for healthier individuals[23].

As it was said earlier, the importance of quali…cation on the exit rate to early retirement is likely to be better captured through the e¤ect of occupation in the last job rather than through the educational level. Taking as the reference group individuals with a skilled manual quali…cation, we …nd that having worked in a service occupation has a positive impact on the hazard rate to retirement between 50 and 64 years, although this e¤ect changes as age of retirement increases. As it can be seen in …gure 7.1, the …nal e¤ect de…nes a pattern of retirement with age quite similar to that followed by skilled manual individuals, the reference group. However, having worked in a non-skilled occupation has a clear negative impact on

[22] The reference case is represented by an individual with a good health status, married at date of retirement and with a non-working spouse, with low individual earnings and low family income, whose last job was in the private sector, in a skilled manual occupation and that was employed in a service activity.

[23] Two aspects must be taking into consideration. In the …rst place, the clasi…cation of individuals into the di¤erent categories of the health status variable is made through their own self-reported health status. And, in the second place, the retired individuals with a bad health of status are not sick enough to go out of labour market by an inability cause.

the hazard rate to early retirement. This may indicate that replacing old workers by younger ones is more di¢cult in jobs where no quali…cation is required, given that in these cases experience has normally a higher value than the educational level. Similar e¤ects have been obtained in previous studies, such as Villagarcía (1995) who propose as an alternative explanation that low wages, which are usually associated with a low level of quali…cation, make these individuals to try to delay the age of retirement as much as possible, given the low level of pension bene…ts they will receive.

With respect to the level of income, having a medium or high level of individual earnings, relatively to receiving low earnings, reduces the hazard rate to retirement at each age. This is consistent with the idea expressed in Boldrin et al. (1997) about the bias of the Spanish social security system toward "forcing-out" low-wage earners[24]. However, it must be noted that in the case of medium-earnings earners the e¤ect changes as age increases (see …gure 7.2). So, while the hazard rate to retirement increases for medium-level earners as they are getting close to 65 years, individuals with the highest level of earnings refuse to accede to early retirement independently of age. In the same vein, table 4.a shows that high levels of family income reduce the hazard rate to retirement relative to those households with the lowest levels of income. The negative relationship between level of income and exit to retirement is a common …nding in other studies such as Meghir and Whitehouse (1997).

Concerning job characteristics we can see that the e¤ects con…rm the direction of the incentives provided under each type of job. With respect to the job situation, being self-employed has a negative impact on the hazard rate to retirement. Although this e¤ect changes with age, the exit rate of self-employed individuals to retirement is the lowest one at each age. As it was said in section 2, this is due to the fact that this type of workers do not have the legal opportunity to retire early. Public employees, however, exit from employment to early retirement at a higher rate than private employees regardless of the age of retirement. This is an impor-

[24] They think that while the Spanish system does not pay a particularly generous average pension relative to GDP per-capita, its generosity concentrates on providing lage minimum pensions to individuals with below average working histories and/or low wages.

tant …nding, as it indicates that early retirement seems to be more favoured from public jobs. In relation to activity, having been working in manufacturing relative to services increases the hazard at each age, whereas the opposite e¤ect is found for trade. As it was said before, the former case represents the e¤ect of the measures that took place during the early 80s which promoted the exit from the labour market of individuals which belonged to a sector under an industrial restructuring process. The latter case could be related to self-employed individuals given the nature of the activities included in the trade category.

As far as disabled individuals is concerned, we can distinguish three types of e¤ects. In the …rst place, there is an important positive impact on the estimated hazard rate of having an acceptable or bad health of status relative to be healthy (see …gure 8.1), which is an expected e¤ect given the nature of the disability schemes.

In the second place, variables associated with a high level of income such as having worked in a professional occupation or having a medium or high level of earnings, have a negative impact on the hazard rate to retirement (see …gures 8.2 and 8.3). Furthermore, comparing …gures 7.2 and 8.3 we can observe that the income e¤ect is stronger for the disabled individuals than for the retired ones given that, while in the latter case the negative e¤ect of medium individual earnings is decreasing with age, for disabled individuals the e¤ect of both medium and high levels of earnings remains negative and constant with age regardless the proximity of 65.

Finally, in relation to job characteristics, we can see how the exit from the labour market through the disability route is again favoured from the public sector (see …gure 8.4). Furthermore, working as self-employed makes less likely the access to early retirement by a disability cause at young ages, whereas the e¤ect increases with age so that by 64 years the hazard rate of self-employed individuals is the highest. This fact encourage the idea already suggested in Boldrin et al. (1997) about disability insurance system is being used "strategically" by individuals who cannot legally anticipate retirement to actually achieve early retirement, such as self-employed individuals.

6 Conclusions

The aim of this paper has been to analyze individual and job characteristics of early retired individuals in Spain, looking at di¤erences among those who access to retirement through pure early retirement routes and those who make it through an inability cause. The analysis is limited to male individuals between 50 and 64 years of age given that (i) it is known that male job participation starts to decline from 50 years on, and (ii) we are interested in transitions to early retirement, that is, previous to 65 years. The data is taken from the two available waves corresponding to the longitudinal sample of the Spanish Household Panel Survey, that is, the waves of 1994 and 1995.

The results show that the decision of early retirement of both retired and disabled individuals is related to the incentives provided under each type of job. We have seen that the hazard rates to early retirement of retired individuals are higher from types of jobs where incentives to early retirement are provided, such as manufacturing or the public sector, and lower from self-employed individuals who do not have from the legal prospective the opportunity to retire early. In the case of disabled individuals the exit to early retirement is also particularly favoured from the public sector; in addition to this, we have found evidence that suggests that the disability insurance system is being used by self-employed individuals to anticipate the retirement.

With respect to personal characteristics we have seen that individuals with high levels of income or with a high quali…cation try to delay the date of retirement, being these e¤ects stronger for disabled individuals. So, this shows that at least part of the older men refuse to early retirement policies trying to remain in the labour market.

Finally, in the case of retired individuals the results suggest that the non-skilled manual individuals exit to early retirement at a lower rate than the skilled manual ones. We think that this is related to the fact that replacing old workers by younger ones is more di¢cult in jobs where no quali…cation is required, given that in these cases experience has normally a higher value than the educational level.

The …rst implication for policy that these results suggest is that, given that individuals react positively to the early retirement incentives provided by the legal

framework, general measures to desincentive early retirement should be introduced if the objective is to diminish early retirement. In addition to this, our results indicate that it is important that from the public sector the exits to early retirement are reconsidered; …nally, it is important to take control of the strategical use of disability insurance system by individuals who cannot legally anticipate retirement to actually achieve early retirement.

These types of measures imply, however, that suitable jobs are available for older workers which require a continuous job-training for workers to avoid that older workers are replaced by younger ones, with a higher educational level and probably lower cost.

Finally, the analysis by cohorts suggests that the appropiate measures to desincentive early retirement have not been implemented in the near past (up to 1995), given that the age of retirement is lower for the relatively younger early retired individuals than for the oldest ones. Therefore, measures such as the ones proposed in this study should be carry out immediately if we want to avoid more serious problems in the near future related to social security arrangements and in particular to the public pension system.

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Data appendix

De…nition of variables used in the empirical analysis:

Age: Current age, that is, individual age at the date of the interview.

Health status: This variable is de…ned through the self-assessed indication of each individual about his health status. Three categories: (1) Good: if the individual considers that he has a good or very good health status, (2) Acceptable: if the individual considers that he has an acceptable health status and (3) Bad: if the individual considers that he has a bad or very bad health status.

Individual earnings: Net total individual earnings in the previous year at the time of the interview. Three categories: (1) Low level of earnings: individual earnings under the level corresponding to 25th percentile, (2) Medium level of earnings: individual earnings between the values corresponding to 25th and 75th percentiles and (3) High level of earnings: individual earnings over the level corresponding to 75th percentile.

Education: Three categories: (1) Primary: less than secondary studies, (2) Secondary: secondary education or vocational I and (3) University: university studies or vocational II.

Job quali…cation: Six categories : (1) Professional: bachelors, ingeneers or architects and …rm managers at private or public sector, (2) Clerical: personal of administrative servicies, (3) Personal servicies: individuals that work in domestic, personal and security servicies as well as hotel trade personal, (4) Agricultures: that individuals work in agricultural, cattle raising, forestry or …shing activities, (5) Skilled manual: foremen, warrant o¢cers and supervisors and (6) Non-skilled manual: personal work in product manufacture, assembly and handling of maquinery and installations, construction and transport.

Head: 1 if the respondent is the person in charge of the household.

Married: 1 if the respondent was married at the time of his retirement.

Working spouse: 1 if the spouse was working at the time of respondent's retirement. If the spouse was dead at the time of the interview no information is available

on her labour history. In these cases we have missing values for this variable. This happens for 38 individuals in the sample (1.96%).

Family size: Current family size.

Family income: Net total family income in the previous year. Three categories: (1) Low level of income: family incomes under the level corresponding to 25th percentile, (2) Medium level of income: family incomes between the values corresponding to 25th and 75th percentiles and (3) High level of income: family incomes over the level corresponding 75th to percentile.

Job situation: Three categories: (1) Private employee: employee at the private sector, (2) Public employee: employee at the public sector and (3) Self-employed: employer, independent worker or family help.

Firm size: Four categories: (1) Less than 20 employees, (2) 20 to 49 employees, (3) 50 to 99 employees and (4) more than 99 employees.

Activity: Five categories: (1) Agriculture: agriculture, cattle raising, hunting, forestry and …shing, (2) Manufacturing: extraction and transformation of minerals; manufacturing industries; production and distributrion of electric energy, gas and water, (3) Construction: construction, (4) Trade: wholesale, retail and intermediary trade and (5) Other servicies: hotel trade, transport and communications; …nancial institutions, insurance …rms, servicies done to other …rms, hiring and other public servicies.

Hours of work: Two categories: (1) Full-time job: 30 or more hours a week and (2) Part-time job: between 15 and 30 hours a week.

Table 1. Distribution of sample cases by age

Age	Employees		Retired		Disabled	
	Number	%	Number	%	Number	%
50	94	8.70	7	1.35	5	1.63
51	107	9.91	4	0.77	15	4.89
52	96	8.84	9	1.55	22	7.17
53	84	7.78	10	1.93	14	4.56
54	86	7.96	10	1.93	21	6.84
55	120	11.11	16	3.09	18	5.86
56	55	5.09	21	4.06	25	8.14
57	64	5.93	19	3.68	27	8.79
58	71	6.57	37	7.16	33	10.75
59	70	6.48	42	7.93	33	10.75
60	52	4.81	106	20.31	38	12.38
61	60	5.56	52	10.06	17	5.54
62	51	4.72	48	9.09	18	5.86
63	35	3.24	47	8.90	16	5.21
64	35	3.24	95	18.18	5	1.63
Total	1080	100.0	523	100.0	307	100.0

Table 2. Main characteristics of the sample

Variables	Employees	Retired	Disabled
# observations	1080 (56.55%)	523 (27.38%)	307 (16.07%)
Indiv. characteristics			
Age	54.9759	66.3288	63.7719
	(4.1019)	(4.7273)	(5.2586)
Health status			
Good	64.07	46.92	7.84
Acceptable	27.96	36.54	35.62
Bad	7.96	16.54	56.54
Individual earnings			
Low	17.87	30.98	42.67
Medium	47.59	53.92	49.19
High	34.54	15.11	8.14
Skill level			
Education			
Primary	76.94	85.66	91.21
Secondary	7.87	8.03	4.89
University	15.19	6.31	3.91
Job quali...cation			
Professional	26.37	13.97	6.38
Clerical	5.00	4.59	3.36
Sevices	7.60	7.19	7.38
Agricultures	12.13	9.18	16.44
Skilled manual	37.93	47.90	45.64
Non-skilled manual	10.97	17.17	19.80
Household situation			
Head	91.99	90.85	88.43
Marital status			
Married	92.22	89.67	89.25
Not married	7.78	10.33	10.75
Working spouse	20.46	8.80	14.33
Family size	4.0333	2.9139	3.1302
	(1.5224)	(1.3653)	(1.4981)
Family income			
Low	13.20	32.31	40.72
Medium	49.54	51.82	46.58
High	34.26	15.87	12.70

(continuation table 2)

	Employees	Retired	Disabled
Labour situation			
Job situation			
Private employee	47.49	59.92	63.84
Public employee	18.34	25.41	10.70
Self-employed	34.17	14.67	25.46
Firm size			
Less than 20 employees	64.13	43.09	57.32
20 to 49 employees	9.80	12.71	13.39
50 to 99 employees	5.42	5.80	7.11
More than 99 employees	20.65	38.40	22.18
Activity			
Agriculture	15.24	13.35	24.23
Manufacturing	22.25	40.25	30.77
Construction	12.15	12.71	20.38
Trade	14.42	6.57	8.46
Other services	35.94	27.12	16.15
Hours			
Full-time	97.01	98.35	97.79
Part-time	2.99	1.65	2.21

Note: Values in relative percentages except for family size and age where medium values are presented (standard deviation in brackets).

Table 3. Multinomial logit estimation

Variables	E - R¤[1] Coef.	est.-t[2]	E - D¤¤[1] Coef.	est.-t[2]
Indiv. characteristics				
Age	0.54	(18.73)	0.40	(14.35)
Health status (Ref. Good)				
Acceptable	0.26	(1.17)	2.09	(7.43)
Bad	0.68	(2.35)	3.67	(11.64)
Individual earnings (Ref. Low)				
Medium	-1.45	(5.36)	-1.30	(4.65)
High	-1.60	(4.29)	-1.54	(3.71)
Skill level				
Education (Ref. Primary)				
Secondary	-0.08	(0.21)	-0.11	(0.25)
University	-0.30	(0.73)	0.35	(0.68)
Job quali...cation (Ref. Skilled manual)				
Professional	-0.50	(1.50)	-1.45	(3.52)
Clerical	-0.56	(1.10)	-0.82	(1.43)
Services	0.27	(0.66)	0.10	(0.24)
Agriculture	-0.44	(0.75)	-0.38	(0.65)
Non-skilled manual	-0.62	(2.03)	-0.68	(2.12)
Household situation				
No head (Ref. Head)	-0.36	(1.56)	-0.34	(1.41)
Marital status (Ref. Married)				
Not married	-0.48	(1.36)	-0.37	(1.00)
Spouse working (Ref. No work)	-0.17	(0.58)	0.03	(0.09)
Family size	-0.16	(2.12)	-0.12	(1.49)
Family income (Ref. Low)				
Medium	0.20	(0.74)	0.07	(0.26)
High	0.14	(0.37)	-0.03	(0.08)

(continuation table 3)

	E - R¤[1]		E - D¤¤[1]	
	Coef.	est.-t[2]	Coef.	est.-t[2]
Labour situation				
Job situation				
(Ref. Private employee)				
Public employee	0.77	(3.31)	1.54	(5.96)
Self-employed	-1.70	(5.34)	-0.69	(2.05)
Firm size				
(Ref. Less than 20 emp.)				
20 to 49 employees	-0.34	(0.87)	-0.24	(0.58)
50 to 99 employees	-0.73	(1.42)	-0.40	(0.78)
More than 99 employees	-0.03	(0.09)	-0.39	(1.24)
Activity				
(Ref. Other services)				
Agriculture	-0.32	(0.61)	-0.23	(0.42)
Manufacturing	0.79	(3.00)	0.54	(1.87)
Construction	-0.32	(0.87)	-0.17	(0.47)
Trade	-0.50	(1.27)	-0.27	(0.63)
Hours				
(Ref. Full-time)				
Part-time	-0.91	(1.41)	-0.60	(0.91)
Constant[3]	-31.31	(17.45)	-25.42	(14.35)
# observations	1910			

¤ Employment-retirement

¤¤ Employment-disability

[1] Reference case: individuals employed between 50 and 64 years of age.

[2] Absolute t-value in brackets.

[3] The constant term represents the reference individual, that is, a male with a good level of health status, with primary studies, married, head of household, with a non-working spouse, with low levels of family income and individual earnings, who is working in the private sector, in a full-time job, with a skilled manual occupation and in a …rm with less than 20 employees belongs to service activity.

Table 4.a. Competing risk model estimation

Variables	Retired		Disabled	
	No U.H.	With U.H.	No U.H.	With U.H.
Health status				
(Ref. Good)				
Acceptable	-0.04 (0.42)	-0.07 (0.50)	1.73 (7.72)	1.76 (7.42)
Bad	-0.23 (1.72)	-0.34 (1.93)	2.68 (12.27)	2.77 (9.87)
Skill level				
(Ref. Skilled manual)				
Professional	-0.16 (0.99)	-0.12 (0.59)	-0.72 (2.70)	-0.75 (2.66)
Clerical	0.10 (0.41)	0.27 (0.90)	-0.29 (0.88)	-0.32 (0.90)
Services	1.87 (2.66)	2.20 (2.97)	-0.01 (0.03)	-0.01 (0.02)
Services*log(dur)	-0.79 (2.60)	-0.92 (2.76)	-	-
Agriculture	-0.10 (0.39)	-0.18 (0.54)	-0.03 (0.09)	-0.05 (0.15)
Non-skilled manual	-1.59 (1.89)	-1.51 (1.67)	-0.21 (1.25)	-0.26 (1.29)
Non-skilled m.*log(dur)	0.59 (1.68)	0.53 (1.37)	-	-
Marital status				
Not married	-0.15 (0.99)	-0.11 (0.56)	-0.02 (0.10)	-0.02 (0.07)
(Ref. Married)				
Spouse working	-0.09 (0.56)	-0.05 (0.23)	0.24 (139)	0.25 (1.35)
(Ref. not working)				
Individual earnings				
(Ref. Low)				
Medium	-2.00 (3.87)	-2.24 (4.00)	-0.32 (2.30)	-0.37 (2.15)
Medium*log(dur)	0.69 (3.20)	0.71 (3.00)	-	-
High	-0.56 (3.07)	-0.75 (3.20)	-0.48 (1.82)	-0.51 (1.82)
Family income				
(Ref. Low)				
Medium	-0.14 (1.29)	-0.15 (1.04)	-0.05 (0.36)	-0.05 (0.34)
High	-0.30 (1.82)	-0.38 (1.78)	-0.06 (0.27)	-0.08 (0.35)
Job situation				
(Ref. private employee)				
Public employee	-0.87 (1.77)	-0.99 (1.87)	0.52 (3.30)	0.54 (3.16)
Public empl.*log(dur)	0.47 (2.23)	0.52 (2.19)	-	-
Self-employed	-5.44 (3.98)	-4.40 (3.18)	-1.33 (2.06)	-1.33 (2.04)
Self-empl.*log(dur)	1.96 (3.53)	1.41 (2.39)	0.70 (2.39)	0.69 (2.33)

(continuation table 4.a)

Variables	Retired		Disabled	
	No U.H.	With U.H.	No U.H.	With U.H.
Activity (Ref. Other services)				
Agriculture	-0.24 (1.06)	-0.37 (1.21)	-0.25 (1.03)	-0.25 (0.92)
Manufacturing	0.54 (4.74)	0.80 (4.45)	0.14 (0.83)	0.13 (0.75)
Construction	-1.64 (1.54)	-1.38 (1.22)	0.14 (0.73)	0.17 (0.82)
Construction*log(dur)	0.76 (1.71)	0.64 (1.32)	-	-
Trade	-3.40 (1.96)	-3.08 (1.71)	-0.12 (0.45)	-0.08 (0.30)
Trade*log(dur)	1.29 (1.85)	1.13 (1.52)	-	-
Heterog. variance	-	0.75 (1.88)	-	0.25 (0.54)
L-ratio estatist.	-	5.4882	-	0.3062
# observations	15608			

Table 4.b. Estimated duration dependence[1]

Duration	Retired		Disabled	
	No U.H.	With U.H.	No U.H.	With U.H.
d50	-3.85 (8.34)	-3.81 (7.86)	-7.29 (13.94)	-7.34 (13.67)
d51	-4.25 (8.21)	-4.46 (7.85)	-6.19 (16.49)	-6.24 (15.90)
d52	-3.80 (9.59)	-3.73 (8.91)	-5.77 (16.64)	-5.81 (16.08)
d53	-3.77 (10.10)	-3.69 (9.29)	-6.20 (16.22)	-6.22 (15.82)
d54	-3.48 (9.48)	-3.75 (9.56)	-5.75 (16.42)	-5.77 (16.01)
d55	-3.42 (11.55)	-3.31 (9.83)	-5.86 (16.20)	-5.87 (15.84)
d56	-3.14 (11.34)	-3.01 (9.59)	-5.43 (15.98)	-5.44 (15.59)
d57	-3.27 (11.59)	-3.11 (9.65)	-5.27 (15.73)	-5.26 (15.25)
d58	-2.60 (11.29)	-2.40 (8.38)	-4.97 (15.25)	-4.94 (14.58)
d59	-2.42 (10.87)	-2.16 (7.33)	-4.80 (14.76)	-4.75 (13.75)
d60	-1.33 (7.08)	-0.93 (3.01)	-4.46 (14.04)	-4.38 (12.37)
d61	-1.80 (8.35)	-1.26 (3.32)	-4.95 (13.55)	-4.85 (11.70)
d62	-1.65 (7.33)	-0.97 (2.24)	-4.56 (12.59)	-4.44 (10.41)
d63	-1.29 (5.55)	-0.45 (0.89)	-4.27 (11.42)	-4.13 (8.94)
d64	0.40 (1.82)	1.82 (2.30)	-4.84 (9.20)	-4.69 (7.78)

[1] Abosulute t-value in brackets.

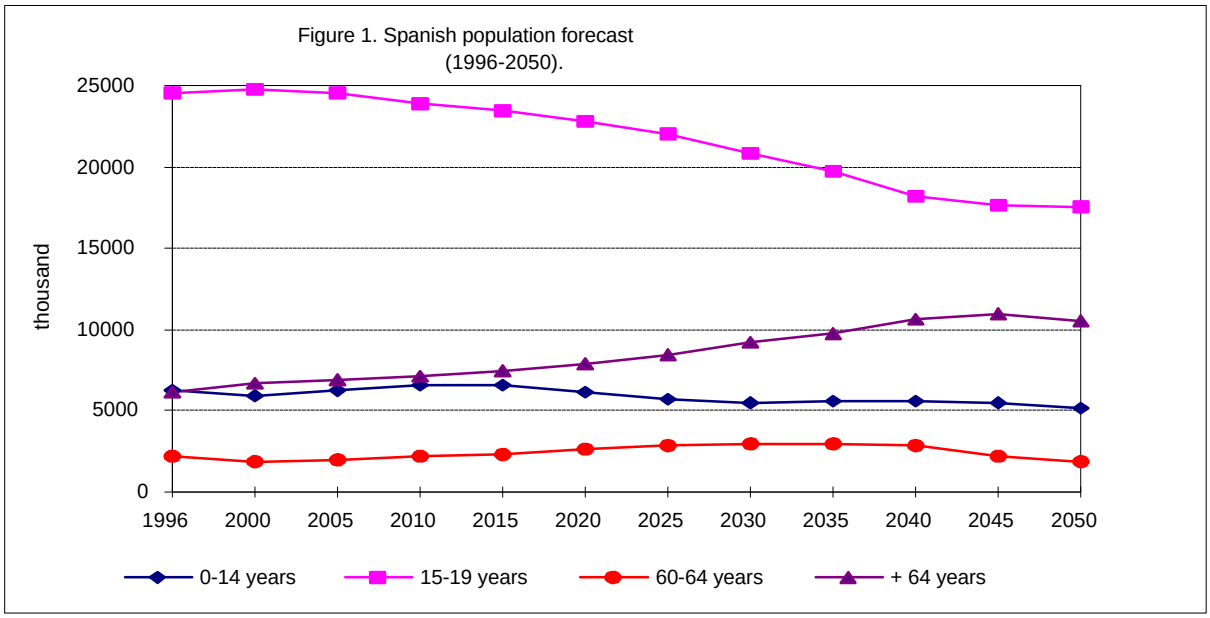

Figure 1: Source: Forecast made by Fernández Cordón in July, 1996 (CSIC) (see Herce et al. (1996)).

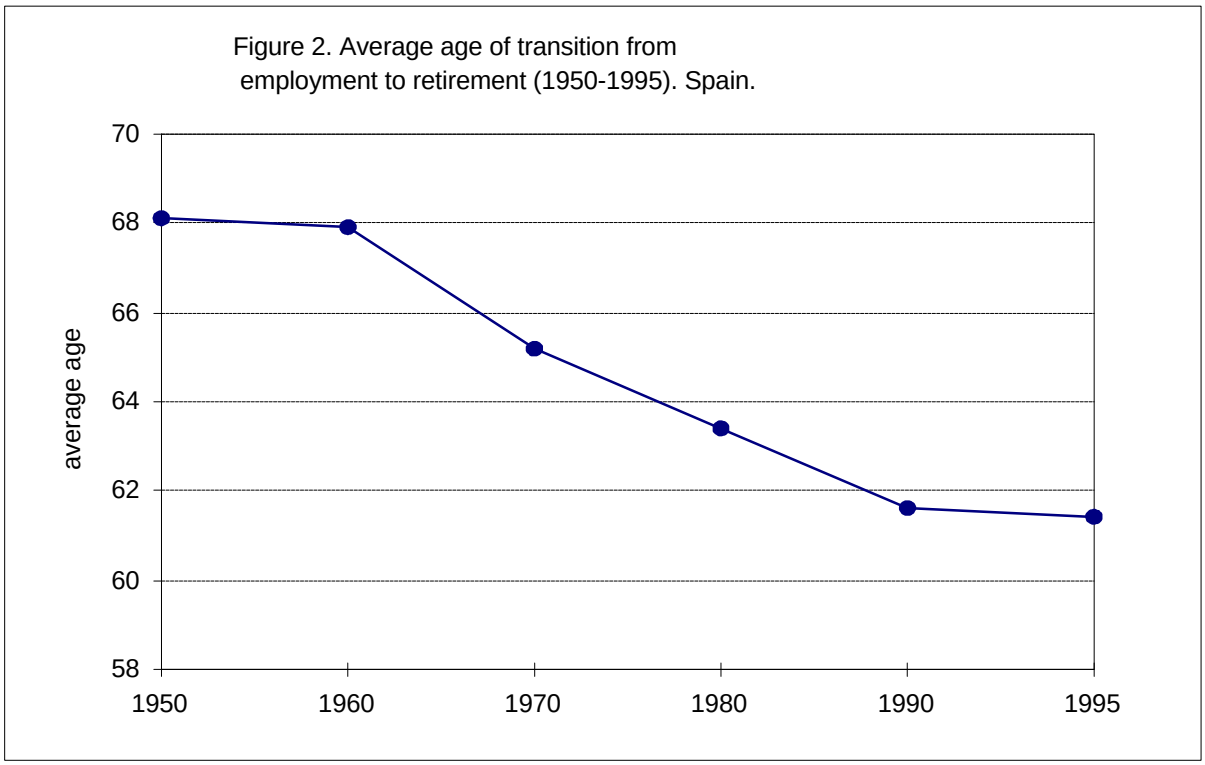

Figure 2: Source: Blöndal and Scarpetta (1998).

Figure 3. Empirical hazard rate for exit from employment to early retirement.

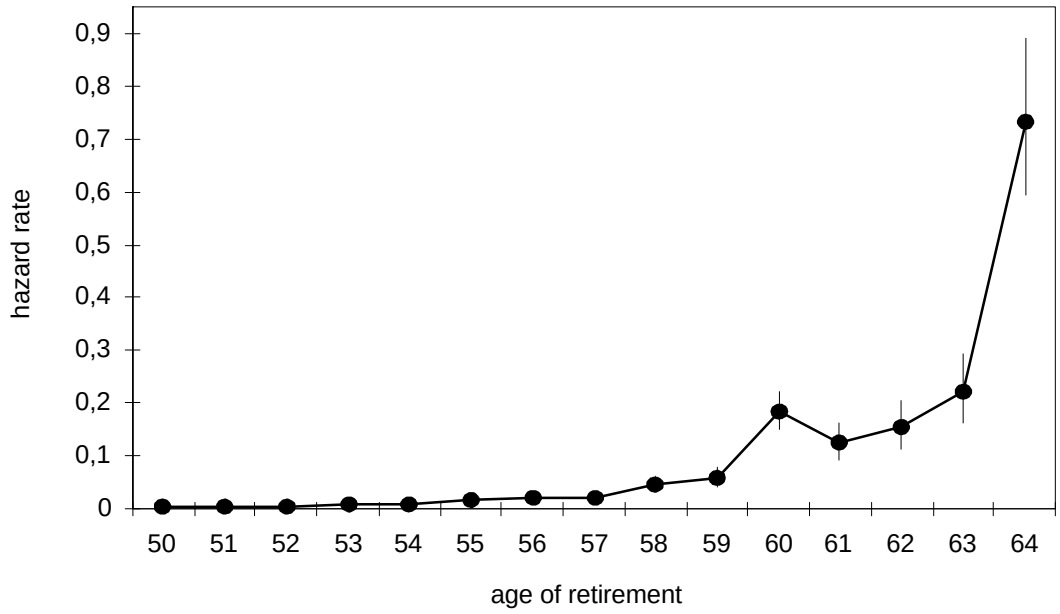

Figure 3:

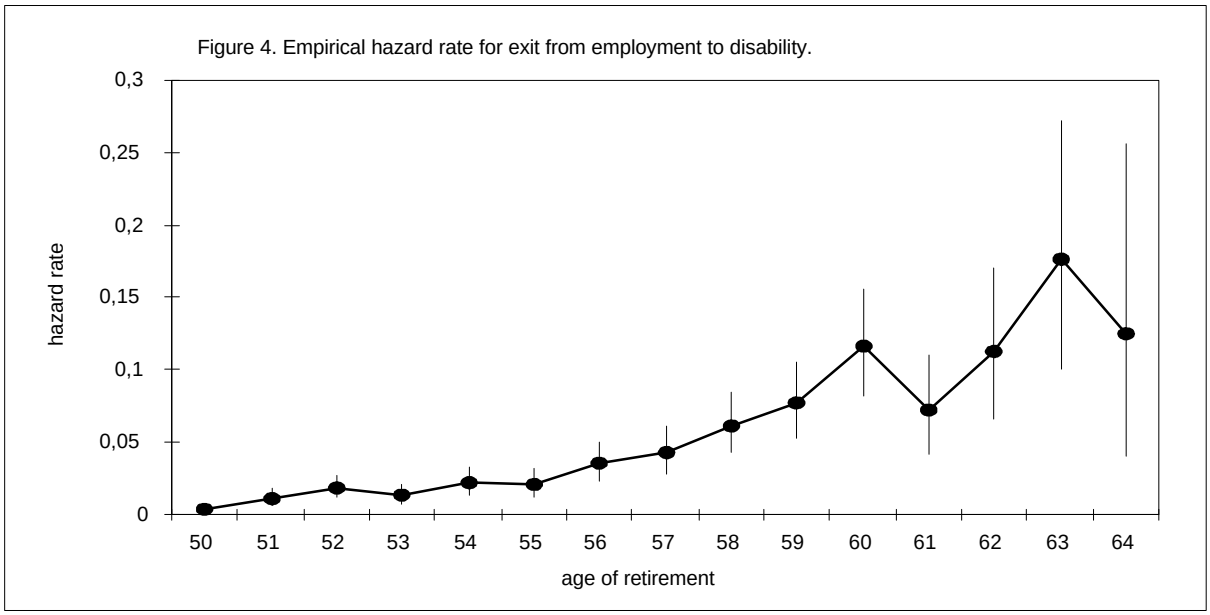
Figure 4. Empirical hazard rate for exit from employment to disability.
hazard rate
0,3
0,25
0,2
0,15
0,1
0,05
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement

Figure 4:

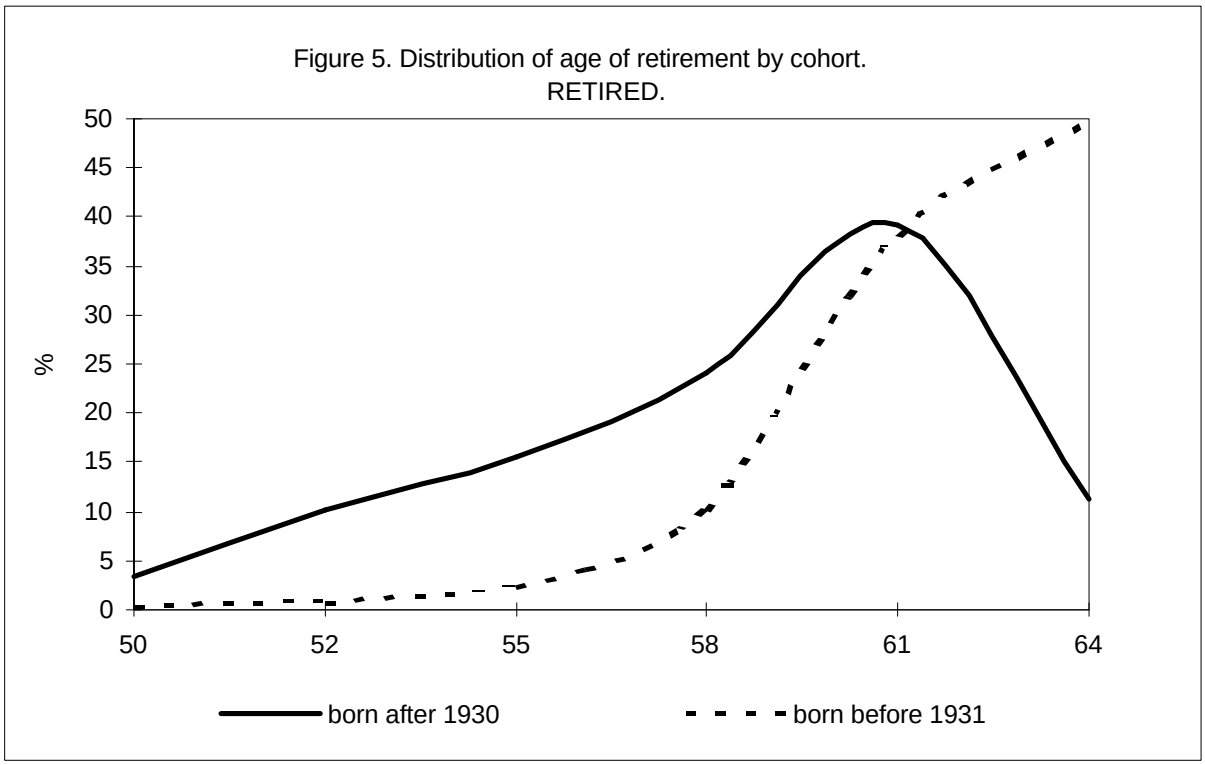
Figure 5. Distribution of age of retirement by cohort.
RETIRED.
%
50
45
40
35
30
25
20
15
10
5
0
50
52
55
58
61
64
born after 1930
born before 1931

Figure 5:

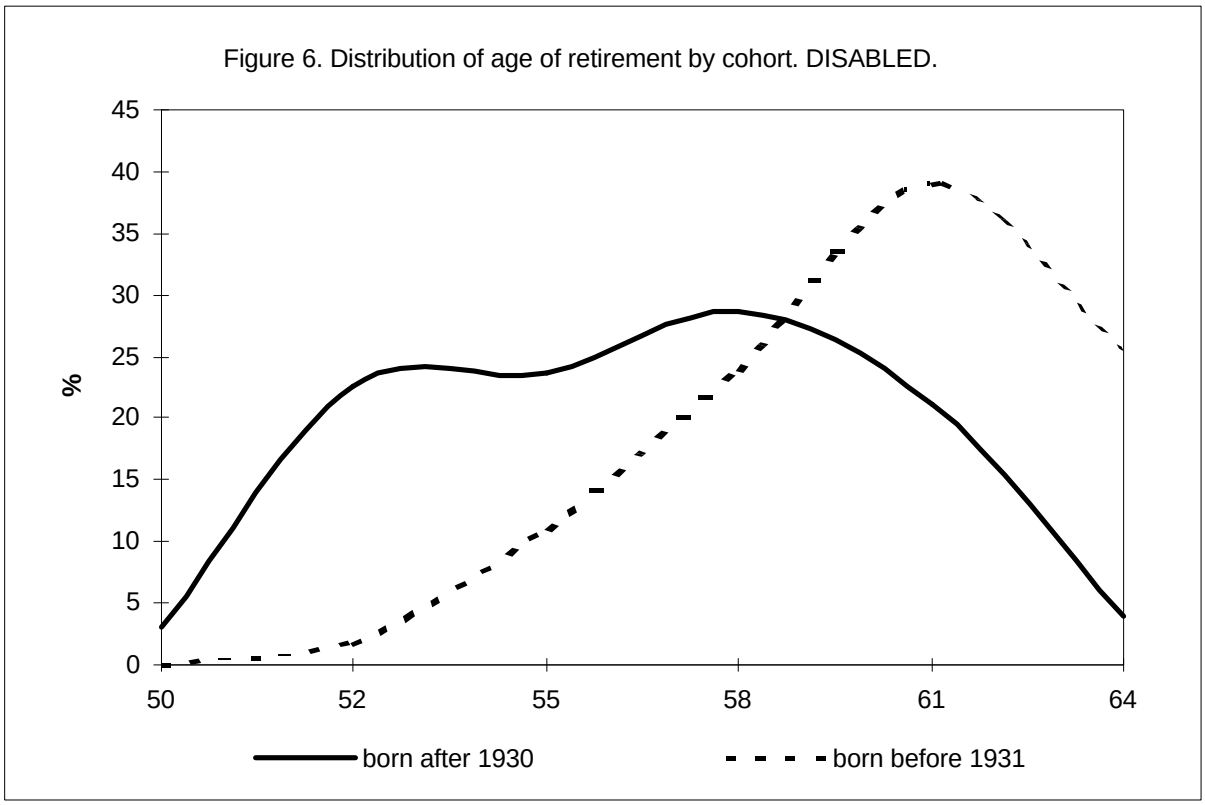
Figure 6. Distribution of age of retirement by cohort. DISABLED.
45
40
35
30
25
20
15
10
5
0
%
50
52
55
58
61
64
born after 1930
born before 1931

Figure 6:

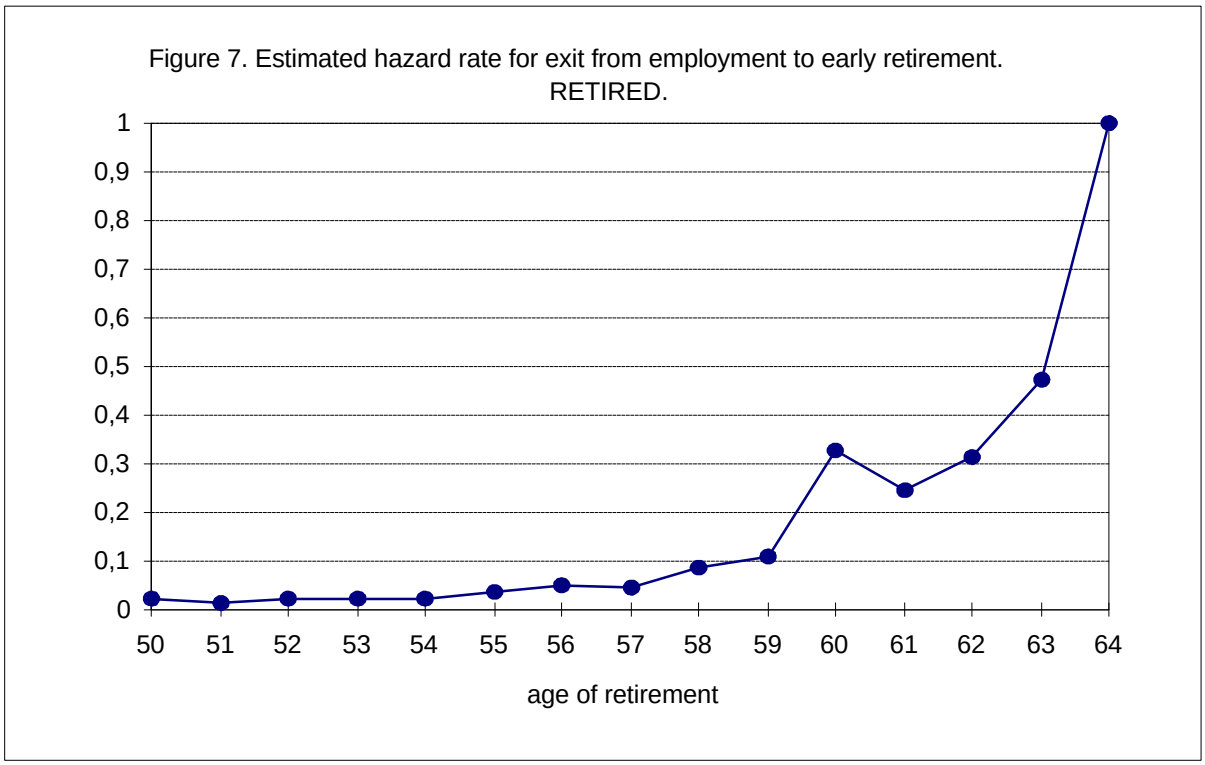
Figure 7. Estimated hazard rate for exit from employment to early retirement.
RETIRED.
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement

Figure 7:

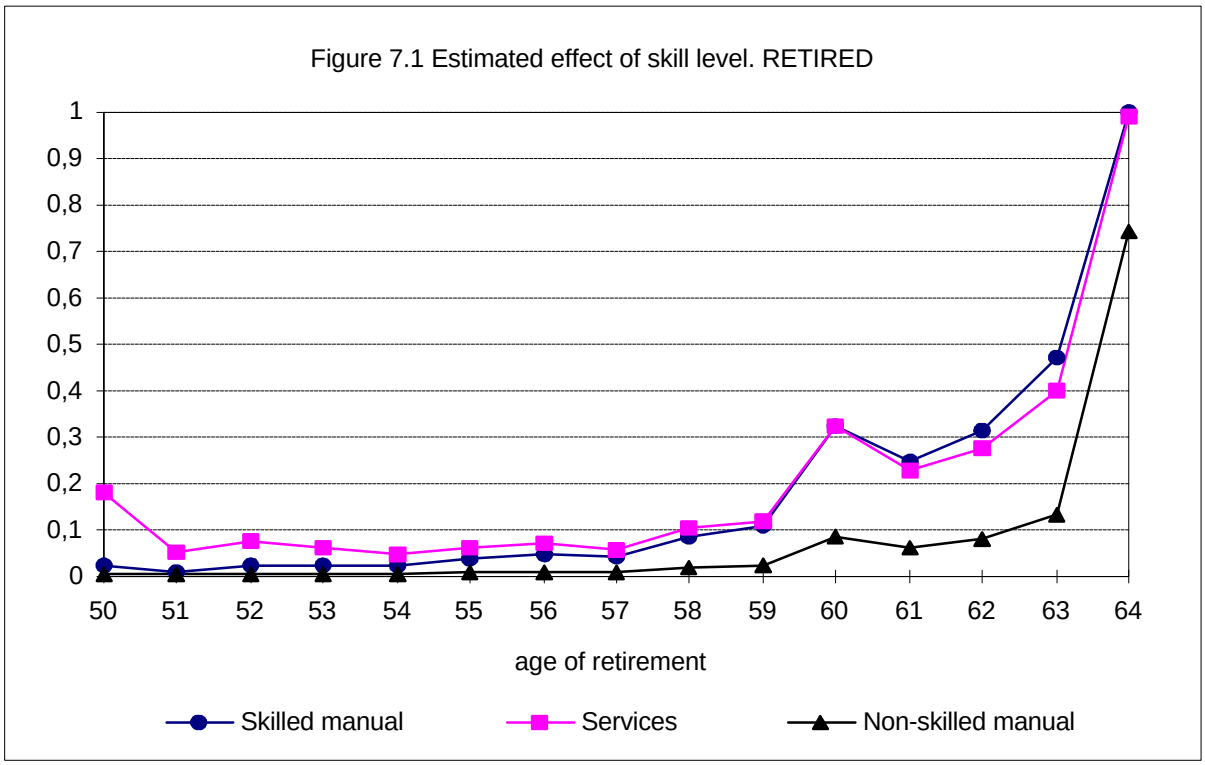
Figure 7.1 Estimated effect of skill level. RETIRED
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Skilled manual
Services
Non-skilled manual

Figure 8:

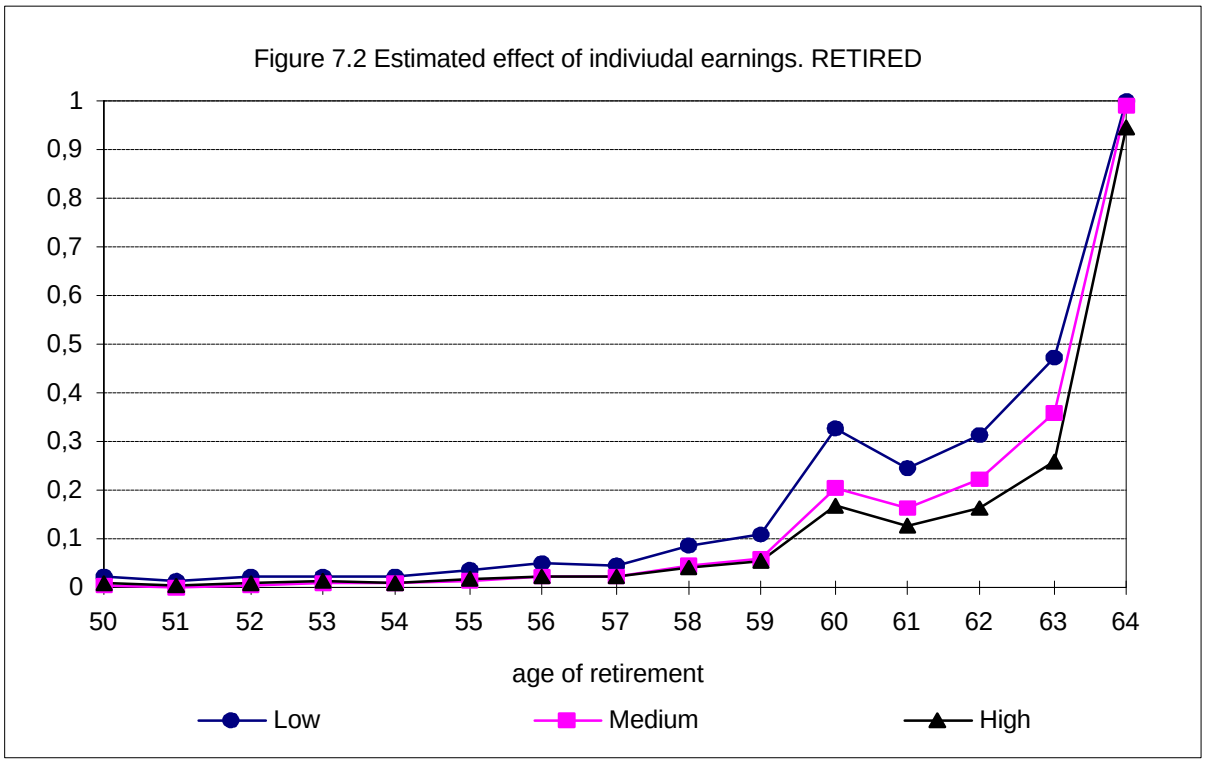
Figure 7.2 Estimated effect of indiviudal earnings. RETIRED
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Low
Medium
High

Figure 9:

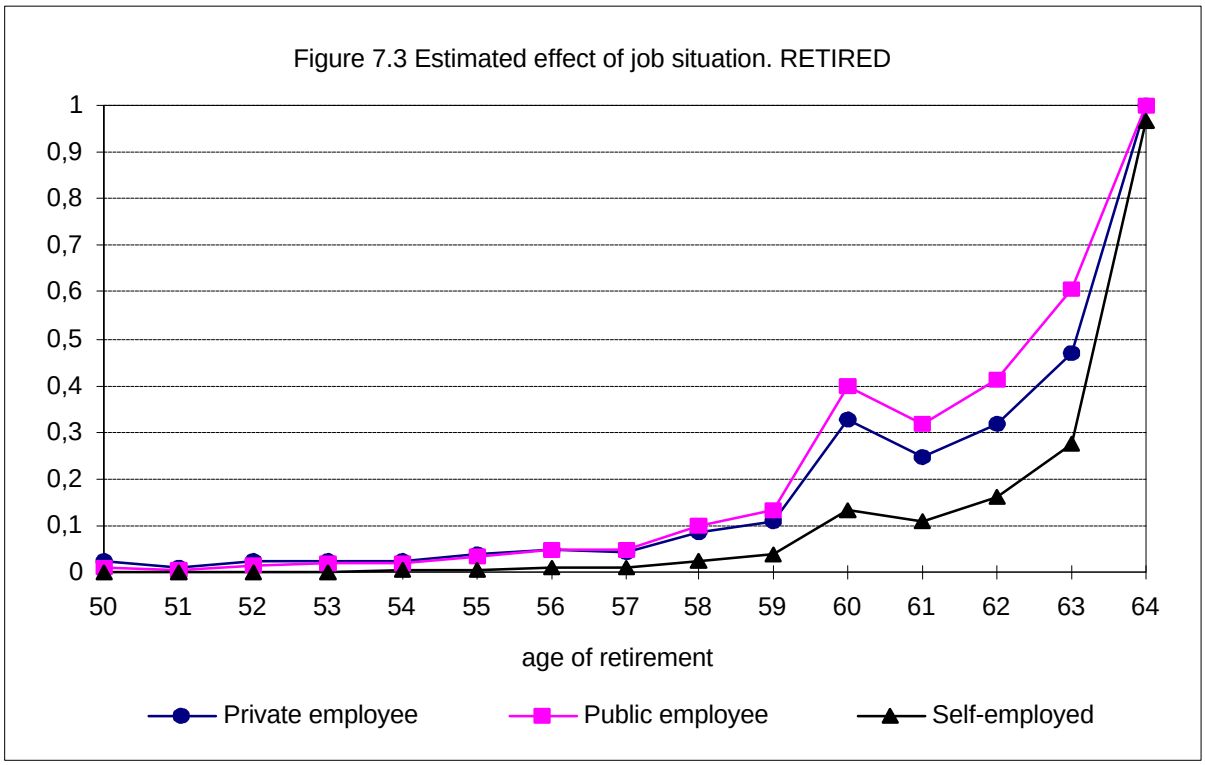
Figure 7.3 Estimated effect of job situation. RETIRED
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Private employee
Public employee
Self-employed

Figure 10:

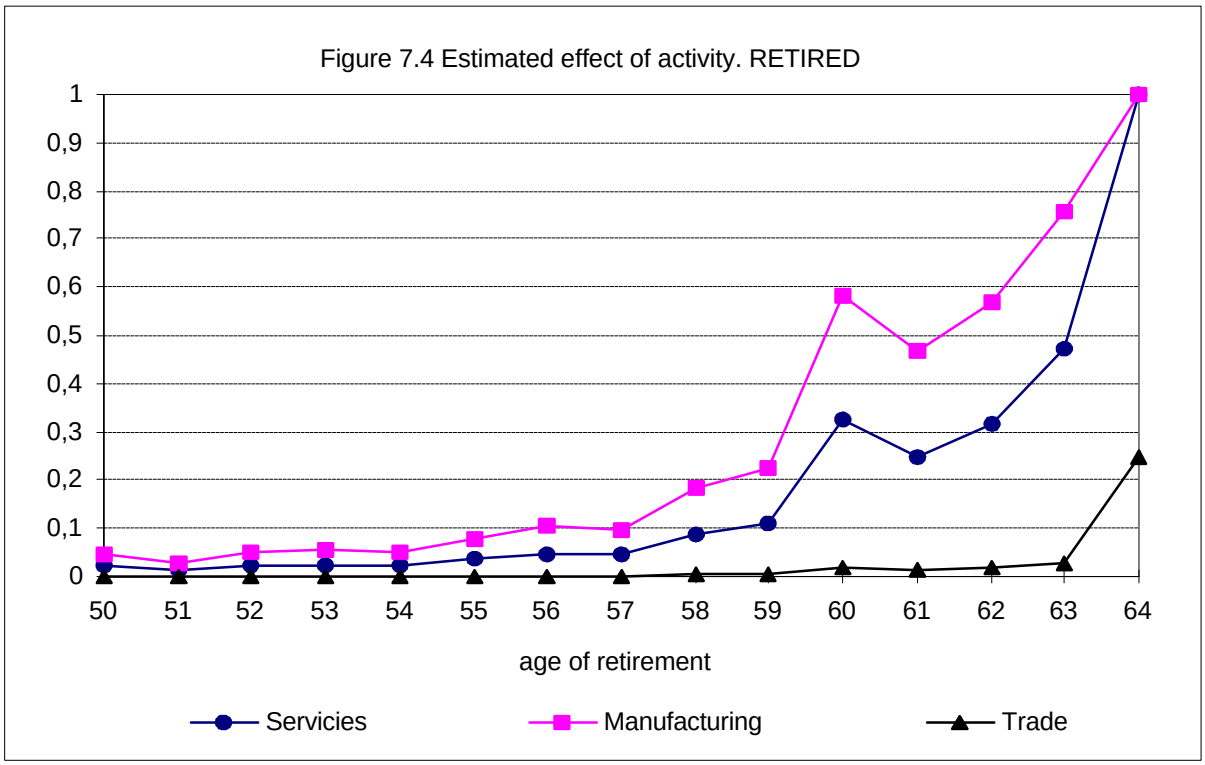
Figure 7.4 Estimated effect of activity. RETIRED
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Servicies
Manufacturing
Trade

Figure 11:

Figure 8. Estimated base-line hazard. DISABLED

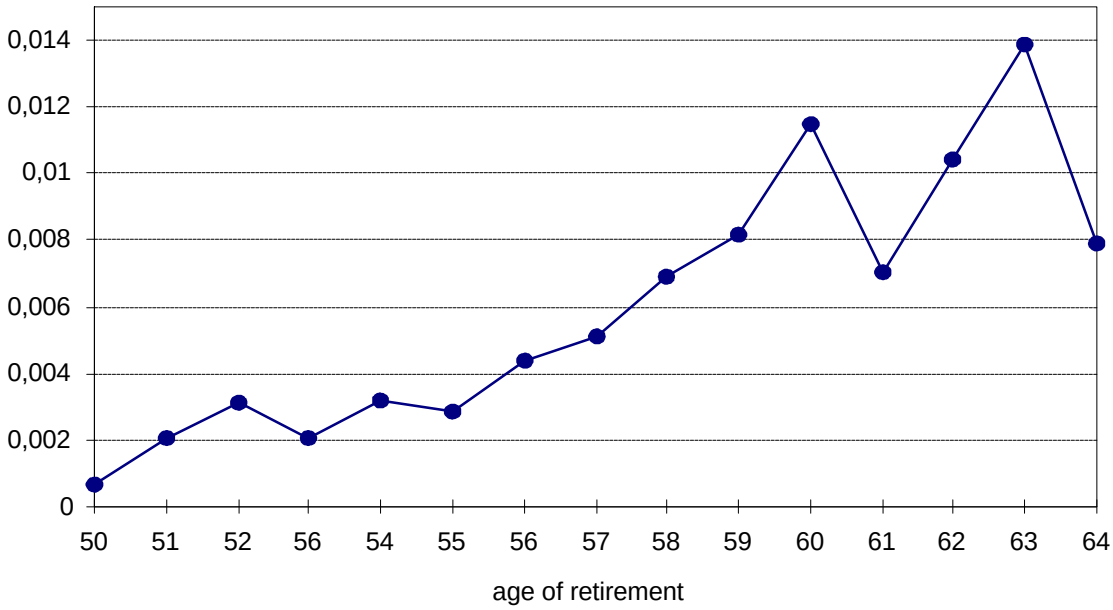

Figure 12:

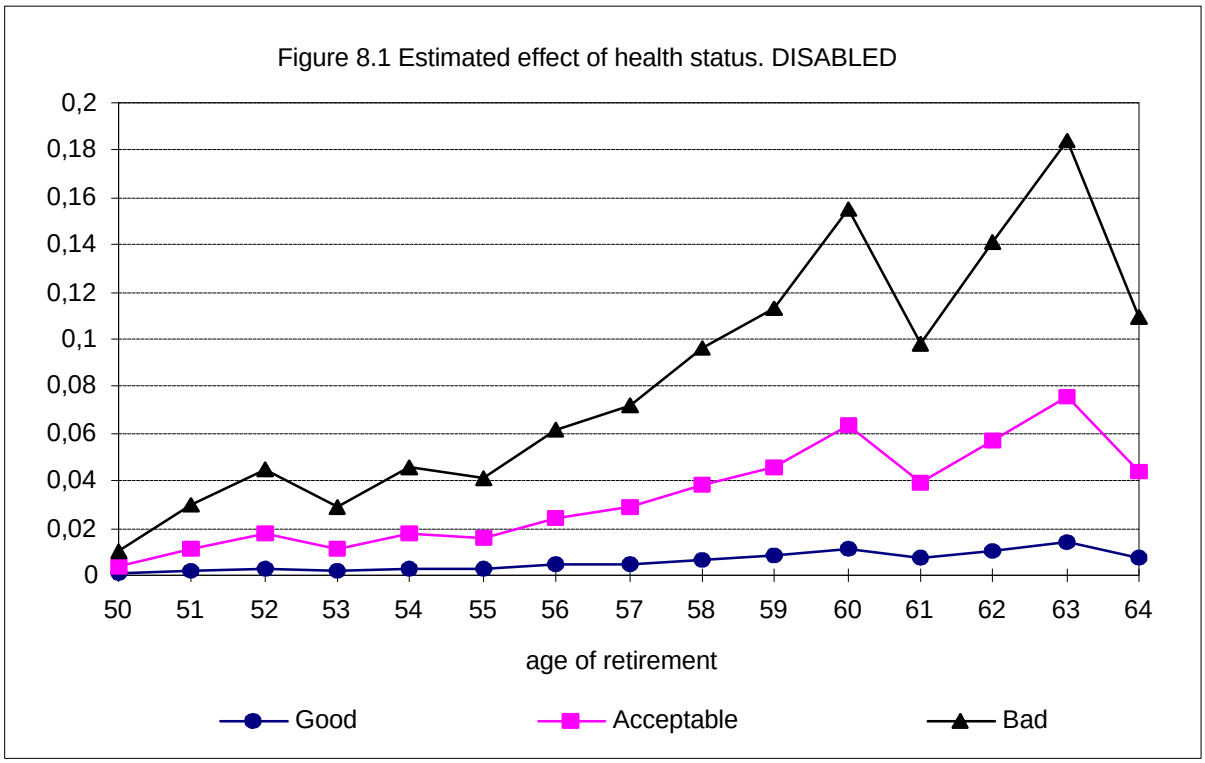
Figure 8.1 Estimated effect of health status. DISABLED
0,2
0,18
0,16
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
age of retirement
Good
Acceptable
Bad

Figure 13:

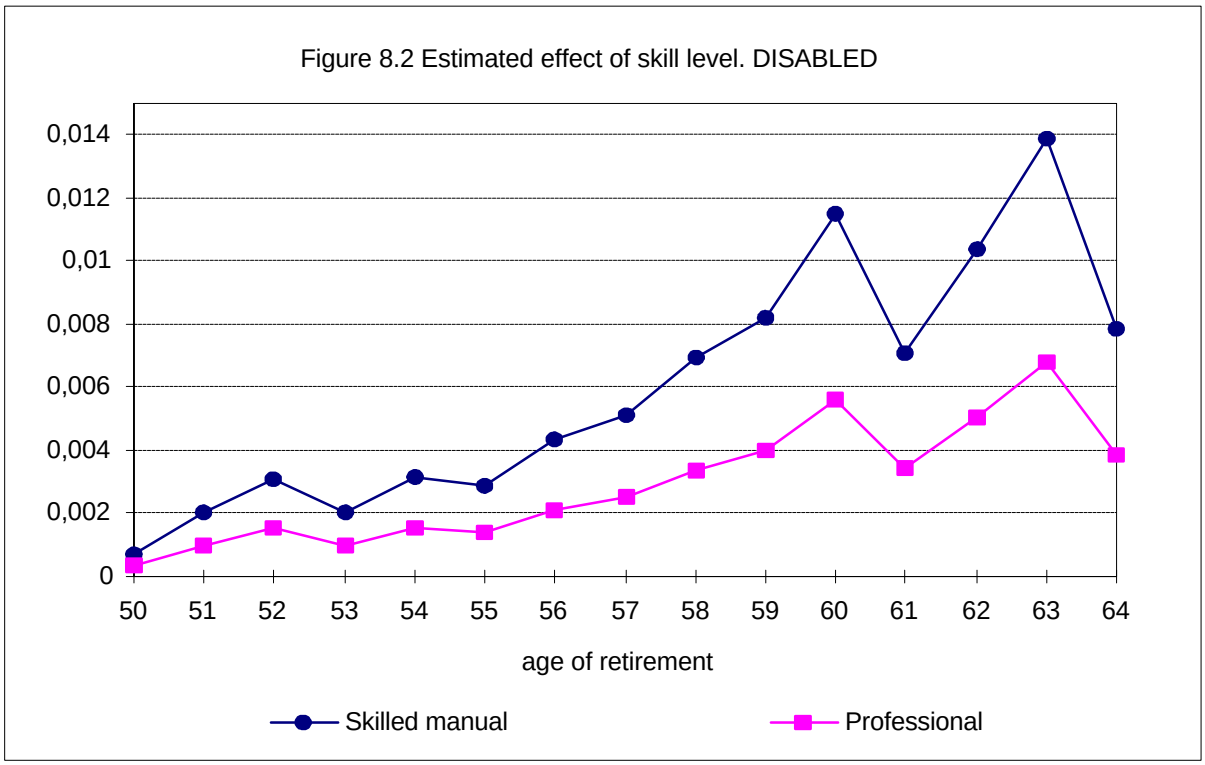
Figure 8.2 Estimated effect of skill level. DISABLED
0,014
0,012
0,01
0,008
0,006
0,004
0,002
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Skilled manual
Professional

Figure 14:

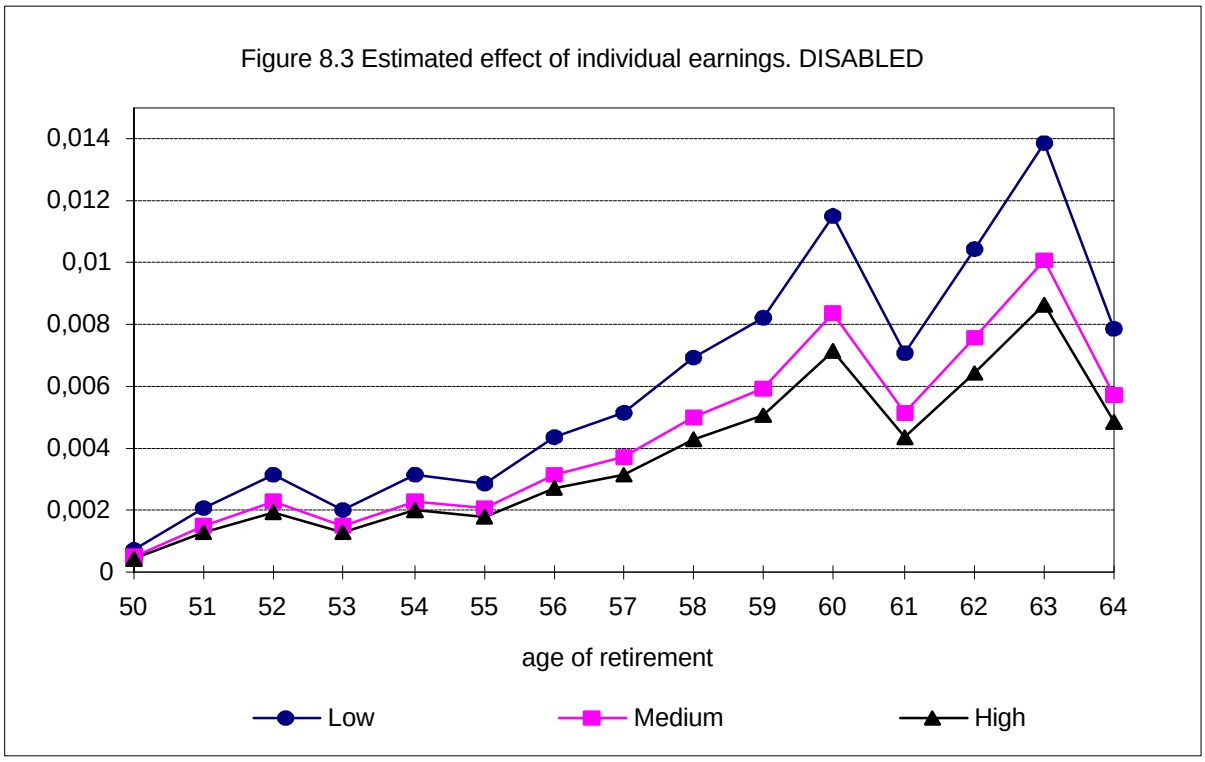
Figure 8.3 Estimated effect of individual earnings. DISABLED
0,014
0,012
0,01
0,008
0,006
0,004
0,002
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Low
Medium
High

Figure 15:

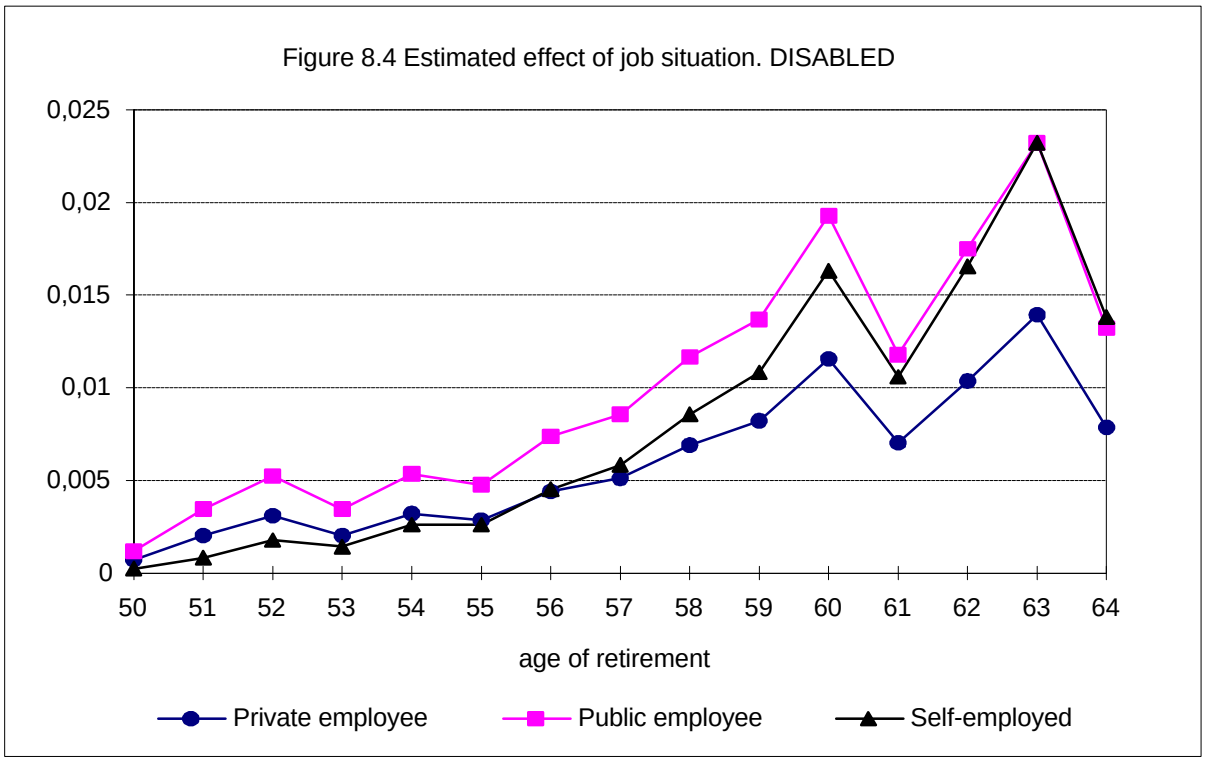
Figure 8.4 Estimated effect of job situation. DISABLED
0,025
0,02
0,015
0,01
0,005
0
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
age of retirement
Private employee
Public employee
Self-employed

Figure 16: