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# Part-Time Pensions in the Netherlands

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# **Part-time pensions in the Netherlands**

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## **Abstract**

This research paper evaluates how part-time pension use affects the probability of retirement. The model used to estimate these effects allows individuals to switch from working to partial or full retirement and from partial retirement to full retirement. The model is estimated with individual data extracted from integral datasets of the Dutch population provided by the CBS. The dataset that estimates the models include all individuals between 51 and 65 and consists of yearly individual data from 2005 till 2008. The models also estimates how several individual household characteristics and characteristics from an individual's work environment affect the transition to retirement. The results from the model indicate that part-time pension use increases the probability of retirement. This finding is contrary to the popular belief that part-time pensions induce individuals to continue working beyond the statutory retirement age.

*JEL Codes: J26, H55, H75*

*Keywords: Part-time pensions, Partial retirement, Retirement decision.*

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## 1. Introductions

This paper evaluates how part-time pension options affect the individual retirement decision in the Netherlands. Part-time pension options give individuals the possibility to take up pension while reducing their weekly hours worked. The part-time pension options facilitate a gradual retirement path and more flexibility with regard to the decision to retire. This implies that the retirement decision is affected when individuals have these opportunities. The arguments in favor of part-time pensions by politicians and policy makers emphasize that part-time pension options can keep individuals employed as long as possible. They often state that individuals can and will use part-time pension options to stay in the labor force till the statutory retirement age or even beyond that age.

This paper evaluates whether part-time pensions actually facilitate these retirement trajectories. In the introduction of this paper we first provide a short overview of the Dutch Pension system, followed by a short historic overview of the policy stances towards retirement in the Netherlands. This is followed by a brief explanation of how part-time pension options function in the Dutch pension system and how these options can affect the retirement decision. This section is concluded by a short overview of the rest of this paper.

In order to understand how part-time pension options impact the retirement decision in the Netherlands it is necessary to briefly explain the pension system. The pension system in the Netherlands consists of three separate pillars. The first pillar is the state-pension (*AOW*), the second pillar is the occupational pension scheme and the third pillar consists of private benefit plans. The first pillar is a 'pay-as-you-go' system where the actual working population contributes to the pension benefits of the population that is 65 and older. The occupational pension scheme is an agreement between employee and employer and over 90% of the employers participate in this scheme. The financing of the occupational scheme is different from that of the state pension scheme. In the occupational scheme the employees and the employers pay a premium in the present for the future pension of the employee. The combinations of these two pillars along with the third pillar of private pension plans constitute the Dutch pension system.

Despite high participation in the occupational system there is considerable debate on the sustainability of the pension system. These concerns have increased due to the disappointing developments on the stock market, the low interest rates and the ageing of the Dutch population. An ageing society implies that the relative size of the working population declines, while the share of retirees increases. In the light of these developments policy stance towards retirement has shifted in the last two decades. In the Netherlands the past decades policy makers have concentrated on increasing participation rates on the labor markets.

The reason that participation rates were relatively low was due to the amount of inactive females and the early retirement ages of the elderly. During the late eighties and the early nineties many of the elderly retired before the statutory retirement age. This was facilitated by options to retire before the statutory retirement age and easily accessible disability benefits. During the last two decades early retirement options have been reduced and access to disability benefits has become more restrictive. Euwals *et al.* (2010) find that these policy reforms have effectively reduced early retirement rates in the Netherlands.

In the more recent years the focus has shifted from reducing early retirement towards stimulating individuals to continue working after the age of 65. This shift can be illustrated by the recent pension agreement between social partners and the labor unions in the Netherlands, and stimulating the availability of part-time pension options. The recent pension-agreement increases the statutory retirement age over time, and is scheduled to become attached to the life expectancy rates. This measure quite unambiguously decreases the burden of an aging society on the pension system. The stimulation of offering part-time pension options has a more ambiguous effect on the timing of the retirement decision.

In the Netherlands employees and employers can agree to let the employee reduce the amount of hours worked, while taking up pension for the amount of hours worked less. Part-time pension can be taken up before the statutory retirement age and are provided by the occupational pension funds. The financial consequences for an individual consist of an increase in current income at the expense of future pension entitlements. In addition the individual gains additional leisure by working less which comes at the cost of working less. This is not a direct consequence of part-time pensions since individuals can also work less without taking up part-time pensions. When individuals have the possibility to take up part-time pensions this increases the flexibility of choosing a path to retirement in two ways. Without the option of part-time pensions an individual could decide to refrain from working less as they are unable to cope with the loss resulting loss in income. The result is that an individual loses the option of gradual retirement and limits the choice set with regard to retirement paths. The second way part-time pensions increase flexibility is that they facilitate a smooth income stream. Without part-time pension options individuals often experience an income shock at retirement. These benefits that individuals gain from this increase in flexibility should be noted when evaluating the worth of part-time pensions to society.

This paper however, will focus on how current use of part-time pension options affects the retirement decision. Part-time pension options can increase or decrease the lifetime labor supply of an individual depending on how this option affects the timing of retirement. It is difficult to measure this effect since it is not possible a priori to determine what a part-time pension user would have

done were he or she not given to option of part-time pensions. In figure 1.1 the issue is demonstrated graphically by considering individual retirement paths with and without part-time pension options.

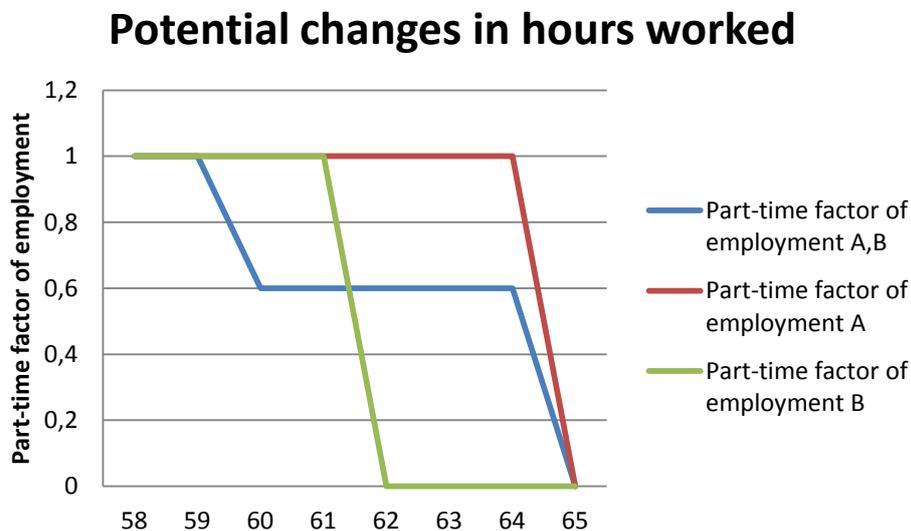


Figure 1.1: Potential trajectories before full retirement

The blue line in figure 1.1 depicts the retirement paths of individuals A and B which both use part-time pensions. The red line depicts labor supply of individual A (without part-time pension options) and shows that the part-time pension option reduces his or her lifetime labor supply when using part-time pensions. The green line shows the behavior of individual B who increases lifetime labor supply compared to the scenario with part-time pension options. In terms of increasing lifetime labor supply it would be preferable that part-time pension users are of type B.

Unfortunately it is only possible to observe actual behavior and not the behavior without part-time pensions. Van Soest *et al.* (2006) circumvent this issue by using to stated preferences techniques to analyze whether individuals would be willing to prolong retirement when offered partial retirement options. They found that individuals were willing to do so as long as the compensation would be sufficient. Unfortunately they do not further divulge into what sufficient compensation entails. According to Pearce and Özdemiroglu (2002) it must be taken into account that stated preferences can be biased as individuals might not weigh the alternatives equally.

This paper will focus on the actual retirement decision despite the earlier stated limitations. The goal of this paper is to estimate how part-time pension use affects the probability of transitioning to retirement. In addition we also estimate the effects of several characteristics (household and work environment) on the probability of transitioning to partial retirement. This will provide more insight as to which circumstances motivate individuals to enter partial retirement. This research will provide important information on how part-time pensions currently affect the individual transition to retirement. Furthermore this is by our knowledge the first attempt at

empirically estimating the effects of partial retirement options on the retirement decision. Another important feature of this paper is that it estimates the models with integral datasets for the entire population of the Netherlands. These models consist of working individuals between the age of 51 and 65 over a period of four years (between 2005 and 2008). More details on these transition models will be provided in section three. In the next section we will give an overview of the available literature on partial retirement. The fourth section will elaborate on the integral dataset that is used to estimate the transition models. The fifth section discusses the results from obtained from this model and the final section gives a conclusion and several recommendations for further research.

## **2. Literature**

The literature on the transition to retirement is very extensive, though the literature that also considers partial retirement into this transition has been scant. In this overview the literature is selected based on its contribution to understanding partial retirement and on the discussion on the effects of ageing. In the first part of this overview we will discuss literature that discusses the most preferable pension system with regard to developments such as ageing. In the second part we discuss literature on flexible retirement and more specifically the possibilities of part time pensions in the Netherlands. The final part of the literature discussion gives an overview of empirical literature on partial retirement outside the Netherlands. The goal of this overview to illustrate how current literature views partial retirement and how it is perceived to affect the retirement decision.

Bovenberg and Ewijk (2011) provide a conceptual framework for a pension system which has three guiding principles; insuring idiosyncratic risks, sharing macroeconomic risks across generations and facilitating life-cycle financial planning. The first function concerns the pooling of intergenerational risks when faced with imperfect insurance markets. The third function concerns the intergenerational risk sharing of systemic or macroeconomic shocks in incomplete markets. The incomplete markets refer to the limited tradability of human capital and the issue of market failure with regard to trading risks with future generations.

In the literature there is a lot of discussion whether the current pension system can facilitate these functions. The discussion of whether traditional pension systems are sustainable has arisen due to an ageing society, increases in the life expectancy rates, and the occurrence of financial crises. These events have laid bare the vulnerability of traditional pension systems. The inability of traditional 'pay-as-you-go' systems to cope with large shifts in population dynamics has made apparent that this system is unsustainable. In the Netherlands there is an additional collective occupational system that is capital financed; this means that pensions are financed by pension

premiums paid in the past along with the return made on these premiums. This component mitigates the effects of an ageing society with regard to the sustainability. Nonetheless politicians and social partners in the Dutch 'polder model' agreed that adjustments to the pension system were necessary. The recent pension agreement (*Rijksoverheid, 2011*) has made those adjustments to the current pension system. The most important being the increase in the statutory retirement age and the attachment of this age to changes in the life expectancy rates.

Bonenkamp *et al.* (2011) are concerned that the way these changes are implemented affects risk sharing across between current and future generations. In their research they formulate a theoretically superior pension fund on the hand of eight principles. These principles focus on risk sharing across generations, mandatory participation with freedom of choice in how individuals participate and is important that there is competition in the execution of the pension system. They refer to Canada as an example of a system that works in this way. Bos and Pikaart (2011) also discuss a pension vehicle without shareholders that should theoretically be superior. The goal of their paper was to design a pension vehicle that would not require pension buffers. The current buffers are difficult to sustain during economic downturn and can force pension funds to lower extended pension benefits. The pension vehicle they formulate offers a complete and transparent contract, holds no buffers and offers no guarantees. This vehicle has a specific indexed pension goal that is continuously pursued through an investment policy that is driven by risk management. They describe this system as a fusion between a defined benefit and defined contribution arrangement. The contract that they prescribe is legally possible in the third pillar and requires several legal adjustments to make it possible in the second pillar of the Dutch Pension system.

The literature discussed so far is quite theoretical and requires several adjustments in the organization of the Dutch pension system. These scenarios are not very likely to appear in the near future but can act as a set of guidelines that the pension system could aspire to. The next part discusses literature on flexible retirement and gradual retirement and how part-time pension options can facilitate these concepts.

Van Vuuren's (2011) discussion of flexible retirement opportunities formulates the benefits and the requirements of flexible retirement. An individual retirement path is flexible when the individual can adjust the working life to his or her circumstances and preferences. These adjustments must be possible in both the extensive margin (decision on whether to withdraw from the labor market) and the intensive margin (decision to change hours worked). This directly distinguishes part-time pension options from complete flexibility in the retirement decision. Part-time pensions options only allow adjustments in the intensive margin while complete flexibility requires adjustments in both margins. This formulation implies that part-time pension options are a component of flexible

retirement. A flexible retirement scheme can work as an insurance scheme where individuals can hedge against health and productivity risks by shortening their working life. The insurance scheme can also extend their working life if an individual is faced with wealth shocks. In order for this insurance mechanism to work there are three requirements that must be met. Van Vuuren (2011) investigates whether these requirements are met in the Netherlands. The first condition is that the starting date of pension take-up can be adjusted at limited cost. Most of the developed countries have moved to actuarially neutral pension schemes so the cost should be zero. It is possible that implicit costs arise due to population heterogeneity with regard to retirement behavior, but in general this requirement is met. The second requirement states that individuals must be willing to adjust labor supply after experiencing a pension shock. Most of the literature finds that individuals are willing to adjust their labor supply after experiencing a shock in pension wealth. The third requirement for flexible retirement opportunities states that labor market must be able and willing to facilitate the desired adjustment. The existing institutions can hamper an adjustment as it sometimes not possible to continue working beyond the statutory retirement age. In addition employers prefer younger employees since there a shorter time horizon to capitalize on older employees (Hairault *et al*, 2010). In the Netherlands job-to-job mobility is low and unemployment duration is high for the elderly. This indicates that there are problems in the labor market of the elderly. According to van Vuuren (2011) this requirement is only partially met and requires attention from both policy makers and researchers.

Flexibility in making the transition to retirement also has an effect on potential reforms in the pension system. In the Netherlands retirement schemes have subjugated to numerous reforms after the introduction of early retirement schemes. These early retirement schemes placed an implicit tax on continuing to work. During the nineties these early retirement schemes were reformed and the implicit tax on continuing to work was removed. According to Euwals *et al*. (2009) financial incentives of these reforms have led to an increase in the average retirement age by more than two years. Another reform that is considered effective at increasing the average retirement age is the increase of the statutory retirement age. The income effect of raising the statutory retirement age by two years raises the average retirement age by two or three months according to estimates in Euwals *et al*. (2010). These reforms have in common that they change the default retirement options available and also increase the social norms of retirement. Empirical findings by Mastrobuoni (2009) and Hanel and Riphahn (2009) suggest social norms and default retirement options play a significant role in the individual retirement decision. In a system with flexible retirement opportunities these reforms become less effective at prolonging the retirement decision. Flexible retirement opportunities dampen the normative and psychological effect of increasing the statutory retirement age. A solution

to this could be to raise the minimum age at which pension can be taken up by an amount that is proportional to the increase in the statutory retirement age.

Flexible retirement can distinguished from partial retirement by stating that the flexibility in a retirement scheme refers to the ease by which individuals can switch between working and retirement. Partial retirement options can refer to the amount of retirement paths available to individuals. These options can increase the flexibility and also the advantages gained from flexible retirement. In addition to increasing the flexibility, partial retirement has several specific benefits for both employees and employers. The benefits for employees consist of avoiding income shock that often occurs with abrupt retirement, increasing leisure time and according to Reday-Mulvey (2000) it reduces stress and increases job satisfaction. The latter also constitute as a benefit to employers as these changes can decrease absenteeism and increase productivity. In addition partial retirement options reduce adjustment costs associated with regard to employee turnover (Clark and Ghent, 2001). Delsen and Reday Mulvey (1996) state that employers benefit from partial retirement options since it reduces costs involved with retirement paths through disability or unemployment.

Despite the benefits of partial retirement options there is still reluctance among employers to offer partial retirement options. According to Hurd (1996) this reluctance can stem from fixed employer costs, the production technology or team production and the ability to retain job specific skills in partial retirement. Chen and Scott (2006) state that access to partial retirement could be restricted by the rules of defined-benefit pension plans. Kantarci and van Soest (2008) evaluate whether partial retirement options in the Netherlands can work as a tool to keep individuals employed longer. The survey that was fielded in this study indicates that there is substantial difference between the number of individuals in partial retirement and the number that wants to be in partial retirement. The latter is larger than the former and indicates that there are restrictions on access to these to partial retirement. The survey further indicates that the primary reasons that partial retirement is obstructed are due to employer preferences and the nature of employment.

The study by Kantarci *et al.* (2011) evaluates how partial retirement affects the Dutch pension system through sensitivity analysis on replacement rates. In their research the replacement rates of full retirement and partial retirement schedules before and after the statutory retirement age are compared. For this research they use actual pension formulas from an occupational Dutch pension fund, the state pension fund and the tax system. They find that partial retirement results in a smoother individual income path. In addition they find that under a full retirement scenario the retirement rates are very sensitive for changes in the pension formulas and for different worker characteristics. The replacement rates with partial retirement are far less sensitive to these changes. This implies that partial retirement schedule provides more security for individuals and corresponds

with the insurance mechanism formulated by Van Vuuren (2011). For individuals with relatively high income it is more favorable, in terms of replacement rates, to postpone retirement beyond 65 compared to low income individuals. These differences are less pronounced with partial retirement paths than with full retirement. With regard to access to partial retirement they find that the pension fund provides ample opportunities, and that restrictions originate elsewhere.

Ceelen (2007) researches the possibilities and impossibilities of part-time pension possibilities in the Dutch Pension system. The results of this research correspond with the findings from Kantarci *et al.* (2011). The paper states that in the Netherlands there are no severe obstacles for taking up pension part-time. It also describes an arrangement (*Levensloopregeling*) that can act as a substitute for part-time pension options. This arrangement allows individuals to save money in a specific account while working which can later be extracted for a specific purpose. Whether individuals partially retire through this arrangement or with part-time pensions should not matter for policy makers. Though costs in the execution are likely to be reduced if these routes are integrated into one partial retirement path.

Van Soest *et al.* (2006) assess the effects of partial retirement on the timing of the retirement decision. The difficulty with explaining retirement decisions is that these decisions are complicated and the individual choice sets for individuals often remain unobserved for researchers. Therefore an experiment is set up that uses perceived retirement opportunities and stated preferences on retirement for all individuals in the sample. Stated preference techniques are becoming increasingly common in the field of economics since the works of Barsky *et al.* (1997) Individuals are presented with hypothetical retirement scenarios which involve early, late and partial retirement. The answers to the questions based on these scenarios are used to estimate a structural life-cycle model of retirement preferences. An important result from this model is that individuals are willing to work part-time beyond the age of 65 if they receive proper financial compensation. This result along with the finding that there is general aversion against working full time till the age of 65 suggest that gradual retirement options are desired. The results with regard to perceived retirement opportunities suggest that employer restrictions on access to gradual and late retirement are substantial. Simulations that combine the perceived opportunities with the estimated preferences suggest that there is considerable scope to increase labor participation rates of elderly. This can be achieved relieving by relieving employer restrictions on partial retirement options. More research on these perceived restrictions is necessary in order to evaluate what they are and whether they can be removed.

Many other countries have adopted partial retirement opportunities in their retirement schemes. Delsen (1996) makes an interesting comparison of policies on gradual retirement in the

Denmark, Sweden and Finland. Sweden is considered as the only successful implementation of partial retirement with regard to reducing early retirement. The partial pensions were introduced in 1976 and offered a more than actuarially fair partial pension to individuals of 60 years and older. The system was an effort by government and employers and seen as a means to reduce labor costs during economic recession. The system was abolished in 2001 due to its high costs (Wadensjö, 2006) and a new system was introduced in 2003 that allows individuals to reduce working hours by 50% and to draw 100, 75, 50 or 25% of their full pension (Belloni *et al.* 2006). Wadensjö (2006) provides an in-depth analysis of the partial pension system in Sweden. The study investigates the consequences of partial retirement on labor force participation and labor supply. The conclusion states that the increased participation clearly exceeds the decrease in hours worked (induced by switching from full-time work to part-time work). This conclusion was based on viewing raw data instead of estimating econometric models, which makes it difficult to interpret this conclusion as definitive.

The Danish model for partial retirement was based on the Swedish model though access was restricted by past participation in the labor force (Belloni *et al.* 2006). According to Delsen (1996) the lack of success should be attributed to unfavorable labor market conditions which forced many employees to fully retire instead of entering partial retirement. The Finnish system failed due to similar reasons and also faced labor market that did not offer many part-time job opportunities. Reday Mulvey (2000) finds that in France and Germany partial retirement was a successful substitute for early retirement paths. Belloni *et al.* (2006) describes the partial retirement schemes in Spain, France and Germany. These systems offer the possibility to reduce weekly hours worked and simultaneously receive partial pensions. Access to these opportunities often required past contributions to social security systems. A comparison of these partial retirement schemes with the system in the Netherlands is made difficult by the fact partial pensions in the Netherlands are organized by many different occupational pension funds (Belloni *et al.* (2006).

### **3. Model**

The model that is used to estimate the effects of part-time pension use on the probability of retirement is a transition model. In this transition model an individual can be in three different states; working, partial retirement and full retirement. This model follows individuals from 2005 till 2008 with yearly observations. The sample consists of working (initially) individuals that are between the age of 50 and 65. An individual exits the sample when he or she fully retires; this implies that full retirement is an absorbing state. The state of partial retirement implies that an individual is working

and taking up pension part-time. Individuals are eligible to take up part-time pension or retire from the age of 55 and onwards. The individuals in the model can follow the paths depicted in figure 3.1.

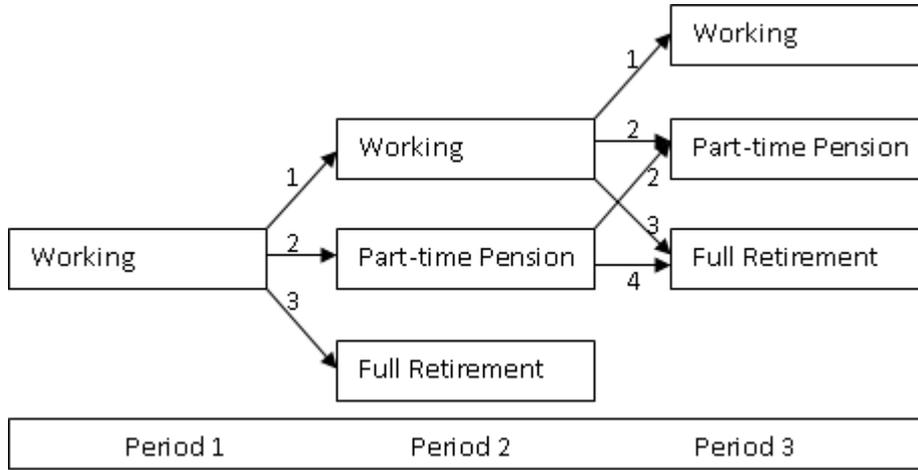


Figure 3.1: Transition scheme

In each period a working individual can make three choices regarding his or her status. In this framework there exist a total four paths which each have a respective probability of being chosen. The first trajectory represents the probability that an individual continues working. Trajectory number two reflects the probability of taking up a part-time pension and paths three and four are the probabilities that an individual fully retires from a working status or a part-time pension status respectively. It must be noted that in this framework it is not possible to undo the transition to full retirement (full retirement is an absorbing state).

This paper estimates two models based on this transition framework. The first estimated model focuses on paths one and two, and the second models focuses on paths three and four in the transition model. The first model is a logit regression that estimates the effects of individual characteristics on the probability of taking up part-time pension, and takes the following form:

$$Pr(DTP_{i,t}^* = 1) = G(a_0 + y_0 * DTP_{i,t-1} + \gamma_1 * E_{i,t-1} + \gamma_2 * C_{i,t} + \gamma_3 * Age_{i,t} + \gamma_3 * Year_{i,t}) \quad (1)$$

$DTP_{i,t}^*$  is a dummy variable that an individual  $i$  takes up part-time pension in period  $t$

$DTP_{i,t-1}$  is the lag of part-time pension use.

$E_{i,t-1}$  is vector of employment characteristics of individual  $i$  in period  $t-1$ .

$C_{i,t}$  = Vector of employment and household characteristics of individual  $i$  in period  $t$

$Age_{i,t}$  consists of age dummy variables for individual  $i$  in period  $t$

$Year_{i,t}$  consists of time dummy variables for individual  $i$  in period  $t$

$\varepsilon_{i,t}$  = error term

$i$  = individual,  $t$  = time in years

The right-hand side function is of following form:

$$G(t) = \frac{\exp(t)}{(1 + \exp(t))}$$

In this model we include a lag of the dependent variable as an explanatory variable since individuals can use part-time pensions in multiple years. When individuals gradually (over a span of more than one year) phases out of employment and into retirement than this effect is probability large and positive. The second model is a logit regression that estimates the effect of taking up part-time pension on the probability of retirement is displayed below.

$$Pr (Ret_{i,t}^* = 1) = H(\beta_0 * DTP_{i,t-1} + \beta_1 * E_{i,t-1} + \beta_2 * C_{i,t} + \beta_3 * AGE_{i,t} + \beta_4 * Year_{i,t} + \varepsilon_{i,t}) \quad (2)$$

$RET_{i,t}$  is the probability that an individual retires from the labor force in period  $t$ ,

$DTP_{i,t-1}$  indicates whether individual  $i$  is a part-time pension user in period  $t-1$

$E_{i,t-1}$  is a vector of employment characteristics of individual  $i$  in period  $t-1$ .

$C_{i,t}$  is vector of household characteristics of individual  $i$  in period  $t$ .

$AGE_{i,t}$  = age dummies for individual  $i$  in period  $t$

$Year_{i,t}$  consists of time dummy variables for individual  $i$  in period  $t$

$\varepsilon_{i,t}$  = error term

$i$  = individual,  $t$  = time in years (2006 till 2008)

Where the right-hand side is of the following form:

$$H(t) = \frac{\exp(t)}{(1 + \exp(t))}$$

The models are both estimated separately for men and women. The nature of employment (full time or part-time employed) demonstrates significant differences between men and women. These differences are illustrated in figure 3.2 which depicts the differences in the distribution of weekly hours worked of men and women older than fifty.

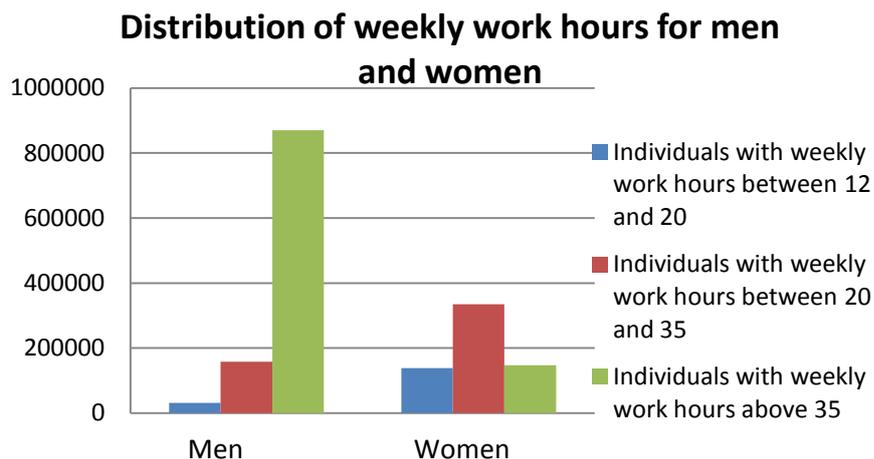


Figure 3.2: Gender-specific differences of the distribution of weekly work hours. Source: CBS Statline.

From this figure it is clear that older men mostly work full time while women mostly work part-time. These differences naturally have consequences for their pensions, and likely also for the retirement paths. The literature that compares retirement decisions between men and women find that gender does cause different outcomes. Drobnič (2002) find that there are indeed important differences in retirement behavior between men and women. And Coile (2004) measures retirement decisions of couples and finds that these decisions differ substantially between men and women. In the transition model we define working individuals strictly as employees employed by an employer. This means that self-employed individuals are excluded in the transition model. These individuals are excluded because pension arrangements in the second pillar for self-employed individuals are limited (van der Lecq and Oerlemans, 2009). In figure 3.3 the differences in their respective pension entitlements are displayed for both groups.

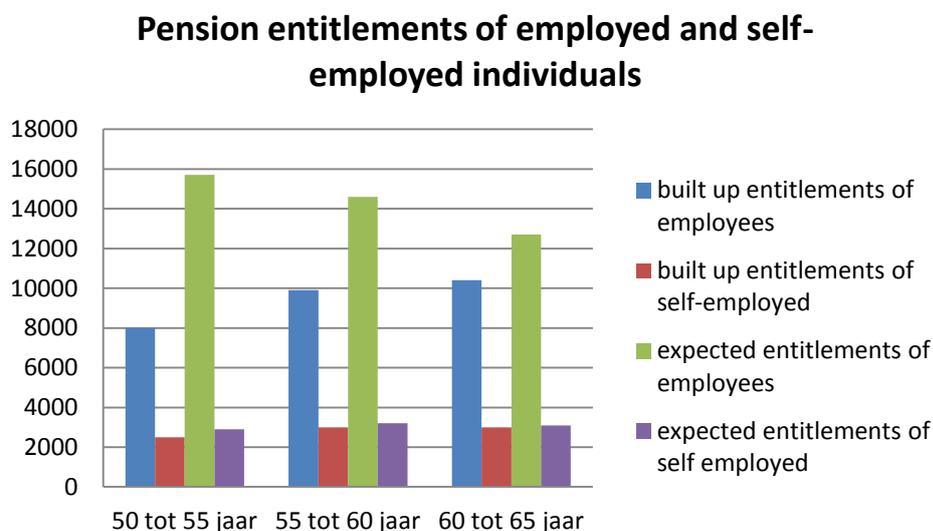


Figure 3.3: Pension entitlements of employed and self-employed individuals. Source: CBS Statline

This figure shows that self-employed individuals have far lower pension entitlements (and also far lower expected pension entitlements) in the second pillar compared regular employed individuals. Self-employed individuals often have private pension arrangements that not recorded on an integral level which makes the pension wealth of self-employed individuals difficult to observe. These differences between employed and self-employed have led to their exclusion from the model. The goal of these models is to estimate how part-time pension use affects the retirement path of men and women. Part-time pensions increase the flexibility that an individual has when choosing his or her retirement path. This transition model estimates the effect of the use of part-time pensions and will indicate how the retirement paths of these are affected.

The drawback of using this approach is that we cannot observe what a part-time pension user would have done had he or she not had the option of taking up part-time pensions. This drawback makes interpretation of the effects of part-time pension use difficult, as the users of part-time pensions stem from two groups. The first consists of individuals that would have continued working the same amount of hours without part-time pension options, but now opt for part-time pension use. The second group consists of individuals that would stop working if part-time pension take up was not an option. Since we are not able to distinguish these groups in estimating our model, the coefficients must be interpreted carefully. The model that estimates the probability of part-time pension will provide more insight into which individuals take up part-time pensions. Together these models indicate how part-time pension use currently affects the retirement path.

#### **4. Data**

The dataset constructed for estimating models (1) and (2) consist of a set of variables that are extracted from integral yearly micro datasets supplied by the Central Bureau of Statistics from the Netherlands. The following micro datasets were used to construct our final dataset; Pensioenaanspraken, SEC, SSB-Banen and the GBA. These micro datasets use combinations of two variables (Srtnum and Rin) to identify an individual, which makes it possible to couple files as depicted in figure 3.1. In table 3.1 the micro datasets are listed with a description of their content and of the variables used in our estimations. The variables are used either indirectly or directly, by which indirectly used variables consist of data used to identify individual status or partially construct one the variables in the estimations. Direct use means that the variable directly enters into the estimations. All the variables are observed yearly from 2005 till 2008.

Table 4.1: CBS Datasets

<b>Micro dataset</b>	<b>Description</b>	<b>Variables used</b>
Pensioenaanspraken (PA), for the years 2005, 2006, 2007, 2008.	This micro dataset on pension entitlements. This data is supplied by the pension funds in the Netherlands. They are based on the second pillar.	Indirectly: -built up pension entitlement (to identify Part-time pension use)
Sociaal Economische Categorie (SEC), for the years 2005, 2006, 2007 and 2008.	This micro dataset states the primary monthly source of income for each individual. Based on this primary source the individual assigned a category; employee, self-employed, disabled, unemployed, social security receiver, other benefit, pension, student, other	Indirectly: -Social economic category in September of each year (to identify individual status (employed/retired/disabled))
Sociaal Statistisch Bestand Banen (SSB-Banen), for the years 2005, 2006, 2007 and 2008.	This micro dataset which is part of the social statistical archive (SSB). This integral dataset contains both information on the employee and the employer.	Directly: -Fiscal wage: Yearly wage earned from employment -GKSBS: An ordinance on which the firm size is based. -SBI code: To identify public sector employment Indirectly: -Part-time factor (to identify part-time pension use), -Starting and end date of employment (to identify retirement)
Gemeentelijke Basis Administratie (GBA), for the years 2005, 2006, 2007 and 2008.	This micro dataset contain data from the municipal records. This information consists of data on the individual and of the household of the individual.	Directly: -gender, household type, marital status Indirectly: -Birth year (to calculate age)

Construction of dataset

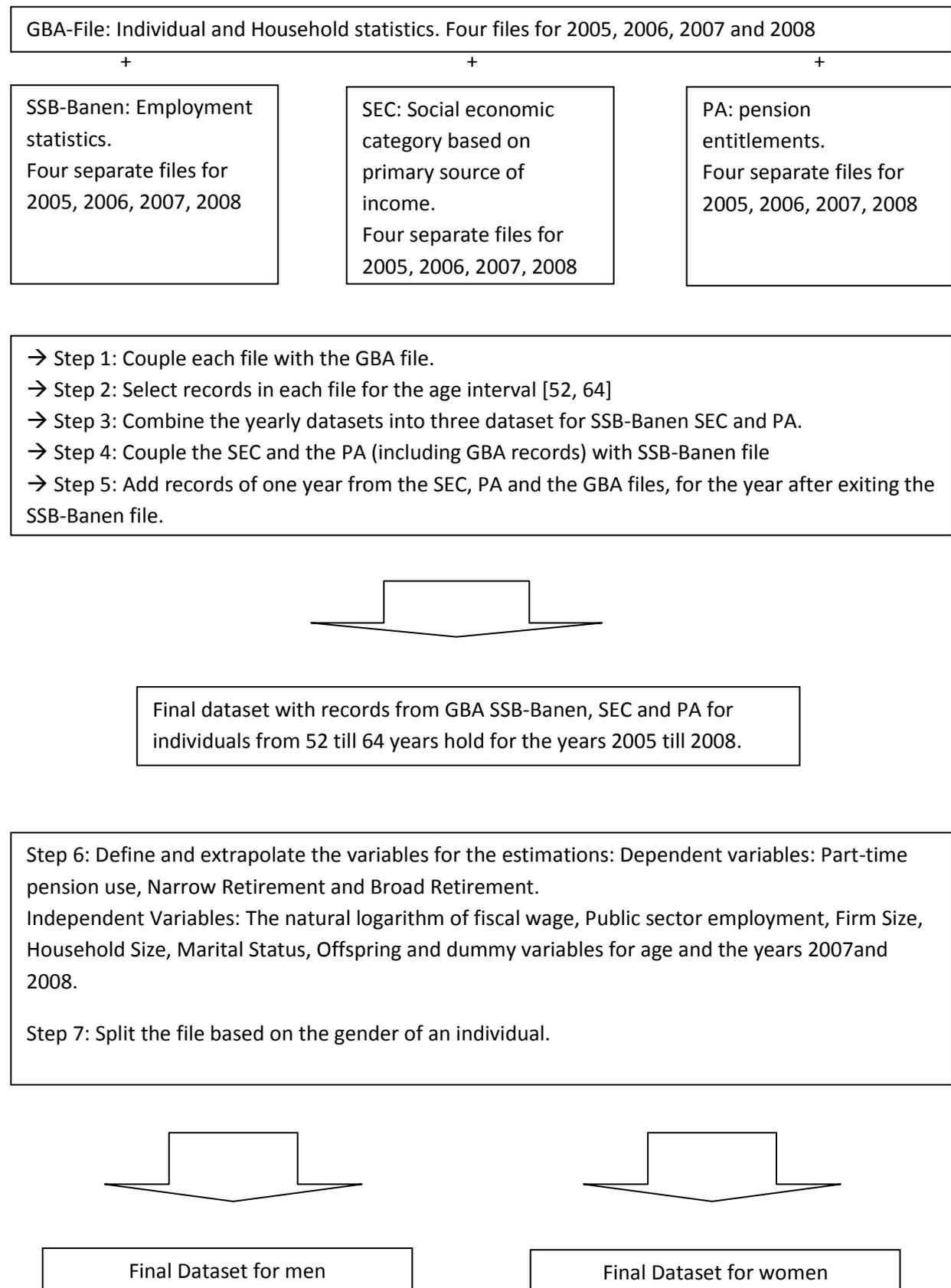


Figure 4.1: Construction of the Dataset

The four micro datasets can be coupled with each other by using combinations of Srtnum, Rin and Year. The first two identify the individual and the last is for the year in which the data is observed. The construction of the final datasets follows seven steps as illustrated in figure 4.1. In the first step the SSB-Banen, SEC and PA files are each coupled with the GBA file in order to select individuals based on their age. The individuals in our sample are between 51 and 65 years old, the lower bound of the interval is selected so that all transitions (retirement is only possible from the age of 55) to retirement are observed in the period between 2005 and 2008. The upper bound of the age interval is selected based on the restrictions on the dataset of the PA file which only has records of individuals till the age of 65. In figure 4.2 the amount of working individuals (in thousands) are depicted for the age intervals of [50, 64] and [65 and older].

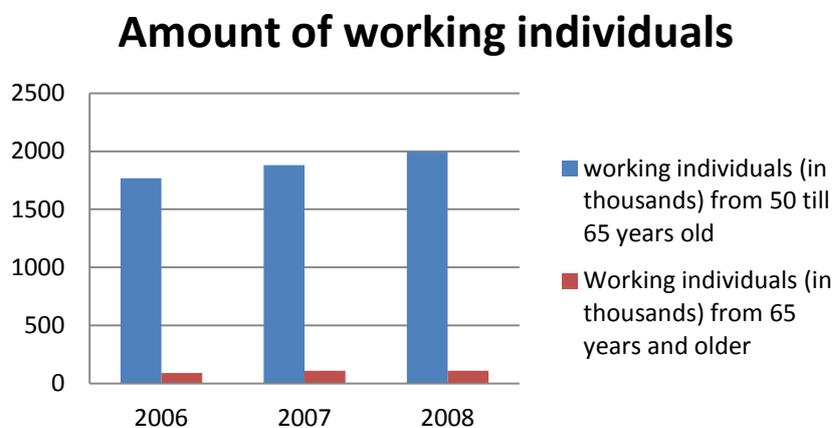


Figure 4.2 Amount of working individuals per age group. Source: CBS Statline

From this figure it is clear that amount of working individuals older than 65 is almost negligible compared to the share of the other age group. With the second step the birth year of each individual from the GBA file is subtracted from the year of the record to calculate the age of the respective individual. The next and third step is to combine for each dataset (SEC, SSB-Banen and the PA) the records for the years from 2005 till 2008 into one dataset. The records of the PA and the SEC files are coupled based on the records present in the SSB-Banen file in step four, so that our data includes the records of working individuals. The status of partial retirement and working are currently observed in the dataset but lacks the status of full retirement. With step five additional records are included from GBA, PA and SEC files for individuals that enter full retirement in the year 2006, 2007 or 2008. With this last step the records have been merged into one large dataset. From this dataset it is possible to create the variables that are estimated in the model.

With step six these variables are defined and extrapolated from the data. The extracted variables are described and defined in table 4.2 and consist of all the variables used to estimate the

econometric model. The final step is to split this dataset with all the necessary variables into two datasets; one for men and one for women. The final step is necessary because there are multiple differences between men and women regarding employment status and retirement motives.

Table 4.2: Variables

<b>Variable Name</b>	<b>Variable type and description</b>	<b>Definition</b>	<b>Source</b>
Part-time pension use	Dummy variable that assigns a one to part-time pension use and a zero otherwise	Individual reduce part-time factor of employment and experiences a drop in current pension entitlement.	PA(records of pension entitlements), SSB (records of part-time employment factor)
Narrow Retirement	Dummy variable that assigns a one for transition to narrow retirement and a zero otherwise	Individual exits the SSB-Banen file, and consecutively has pension or other as primary income.	SSB(records of end-employment), SEC (records from category in September)
Broad Retirement	Dummy variable that assigns a one for transition to broad retirement and a zero otherwise	Individual exits the SSB-Banen file, and consecutively no longer has wage as primary income.	SSB-Banen (records of end-employment), SEC (records from category in September)
LN(fiscal wage)	Natural logarithm of the yearly reported fiscal wage earned from employment.	Yearly fiscal wage earned by individual in year t	SSB-Banen (records of yearly fiscal wage)
Public sector employment	Dummy variable that assigns a one for public sector employment and a zero otherwise	Public sector defined as sector that includes government, education and healthcare sectors based on the SBI codes	SSB-Banen (records of SBI codes)
Firm size	Dummy variable that assigns a one when individual is employed in a large firm and a zero otherwise	Firms with more employees than 250 according to the SBS ordinance	SSB-Banen (records of sizes according to SBS ordinance)
One-person Household	Dummy variable that assigns a one to one person households and a zero otherwise	Individual is the only member of the household	GBA (records of household type)
Marital Status	Dummy variable that assigns a one when individual has a partner and a zero otherwise	Individual is either married or registered as 'living together'	GBA (records of civilian status)
Children	Dummy variable that assigns a one to individuals with children and a zero otherwise	Individual has one or more children	GBA (records of household type)
Age	Eight separate dummy variables that assign a one if the individual is of that age and a zero otherwise.		GBA (records of birth year)
Year	Two dummy variables for the year of the record, one dummy variable for the 2007 and one for 2008. 2006 is the base year.		N.A.

The variables in table 4.2 are extracted at step six and include both dependent and independent variables. The dependent variables consist of variables for part-time pension use and retirement (narrow and broad measures). The probability of part-time pension use is the dependent variable in the first model. The state of partially retired can be sustained multiple years which means that it is not an absorbing state. The transition from working to partial retirement is defined as a decrease in the built up pension entitlements and a decrease in the part-time factor of employment. The entitlement is valued as annuity that an individual would receive if he or she were to retire at that moment. The value of the annuity is calculated with the so-called '*Besluit, reken en procedureregels*' (Staatsblad 152, 2005). A decrease implies that the individual takes up pension, and a decrease in the part-time factor of employment implies a decrease in weekly work hours. If these two shifts occur between 2005 and 2006 it means that an individual takes up part-time pension in 2006. As can be seen in the transition framework after an individual takes up part-time pension, he or she can retain the status of partially retired. This means that part-time pension use is not an absorbing state and therefore the model that estimates the probability of part-time pension use includes the lagged dependent variable as additional explanatory variable.

In our second model we estimate effects on the probability of a transition to retirement. This transition can occur from partial retirement or from the traditional working status. The transition to retirement is measured separately with two variables; broad retirement and narrow retirement. The narrow definition requires that the primary source of income in September is from either pension or the category 'other', while the broad definition only requires that the primary source of income in September is not from employment or self-employment. Both definitions require that the individual exits the labor force prior to September in year  $t$  and after September in year  $t-1$ . The month September is chosen as the moment of observation as this month is the most representative of the actual category of the individual.

The independent variables in our dataset consist of employment characteristics and household characteristics. The employment characteristics consist of a wage variable, a sector variable and a variable for firm size. The wage level concerns the fiscal wage reported to the fiscal authorities for each year. The natural logarithm of this wage level is used when estimating the model in order to obtain sensible coefficients. The sector variable is a dummy variable that measures whether an individual is employed in the public sector. The public sector is defined as a sector that includes government (local and national), healthcare and the educational sector. These individuals are identified by using the SBI codes designated to those sectors. The third variable is a dummy variable for firms where a one is assigned to individuals employed in firms with more than 250

employees. This information is taken from the SSB-Banen file and the categories for size are based on the SBS ordinance.

The household characteristics consist of dummy variables for whether an individual is the only person in the household, whether an individual is married or registered living together and whether an individual has children. This information is taken from records on civilian status and household type from the GBA micro dataset. In table 4.3 and 4.4 the statistics for the entire population in the estimated models are displayed. The number of observations is larger than the amount of individuals estimated in the model because individuals are observed multiple years. The first table displays general information on the continuous variables in our model and the second table presents the mean and standard deviation of the dummy variables in our model.

*Table 4.3: Descriptive statistics for continuous variables*

<b>Continuous Variables</b>	<b>No. of observations</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>Min</b>	<b>Maximum</b>
<i>Women</i>					
<b>Yearly fiscal wage</b>	1.407.371	19.984,34	15.629,52	1	3.260.813
<b>Age (not based on estimated sample)</b>	1.407.371	56,88	2,93	50	64
<i>Men</i>					
<b>Yearly fiscal wage</b>	2.218.546	41.186,10	46.004,22	1	15.958.871
<b>Age (not based on estimated sample)</b>	2.218.546	57,31	3,01	50	64

*Source: Estimated samples.*

*Table 4.4: Frequency statistics for dummy variables.*

<b>Dummy Variables</b>	<b>No. of observations</b>	<b>Mean</b>	<b>Standard Deviation</b>
<i>Women</i>			
<b>Broad Retirement</b>	1.407.371	0,0813	0,2733
<b>Narrow Retirement</b>	1.407.371	0,0373	0,1896
<b>Part-time pension users</b>	1.407.371	0.0223	0,1477
<b>Active in public sector</b>	1.407.371	0.3297	0,4701
<b>Firm size</b>	1.407.371	0,4666	0,4989
<b>One-Person Household</b>	1.407.371	0,1851	0,3883
<b>Marital Status</b>	1.407.371	0,6815	0,4659

<b>Children</b>	1.407.371	0,2961	0,4566
<i>Men</i>			
<b>Broad Retirement</b>	2.218.546	0,0791	0,2699
<b>Narrow Retirement</b>	2.218.546	0,0483	0,2145
<b>Part-time pension users</b>	2.218.546	0.0177	0,1319
<b>Active in public sector</b>	2.218.546	0,0599	0,2374
<b>Firm size</b>	2.218.546	0,4027	0,4904
<b>One-Person Household</b>	2.218.546	0,1161	0,3204
<b>Marital Status</b>	2.218.546	0,7931	0,4051
<b>Children</b>	2.218.546	0,3906	0,4879

*Source: Estimated Samples*

These statistics give a general picture of the population in our model, and how the variables that used in estimating our model are related to our population. The wages show the most significant differences between men and women, where both the mean of the wage and the standard deviation of the wage is higher for men. The wages are not corrected for the part-time factor of employment which partly explains the lower average wage of women. Another difference is that women between the age of 50 and 65 are mostly active in the public sector while the opposite case holds for men. In addition to descriptive statistics of the entire populations tables 4.5 and 4.6 present the same statistics for several subpopulations. The subpopulations consist of part-time pension users, and retired individuals.

*Table 4.5: Descriptive statistics of Part-time pension users*

<b>Variable (Part-time pension)</b>	<b>No. of observations</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>Min</b>	<b>Maximum</b>
<i>Women</i>					
<b>Yearly fiscal wage</b>	37.326	11.727,47	6.891,822	98	109.186
<b>Age</b>	37.326	60,0072	2,58339	55	64
<b>Active in Public Sector</b>	37.326	0,4400	0,4960	0	1
<b>Firm size</b>	37.326	0,0127	0,2378	0	1
<b>One-person Household</b>	37.326	0,5345	0,4988	0	1
<b>Marital Status</b>	37.326	0,2537	0,4351	0	1

<b>Children</b>	37.326	0,1755	0,3804	0	1
<i>Men</i>					
<b>Yearly fiscal wage</b>	54.864	14.854,71	13.156,20	55	520.303
<b>Age</b>	54.864	61,3269	2,1381	55	64
<b>Active in Public Sector</b>	54.864	0,8000	0,2650	0	1
<b>Firm size</b>	54.864	0,07	0,258	0	1
<b>One-person Household</b>	54.864	0,0807	0,2723	0	1
<b>Marital Status</b>	54.864	0,8570	0,3500	0	1
<b>Children</b>	54.864	0,2115	0,4083	0	1

Table 4.5 provides background information on part-time pension users for all the variables in the models. From table 4.5 there are notable differences in the household characteristics of part-time pension users when comparing men and women. The women that use part-time pension are more often without a partner and without offspring, while the men that use part-time pensions mostly have children and are almost never single. This seems to imply that household characteristics play a different role when deciding to take up part-time pensions. The statistics for wage and age show little differences between men and women. Women are on average younger than their male counterparts, when using part time pensions. The standard deviations corresponding to those averages indicate that the age of women is more dispersed over the age interval of [55, 64]. The wages for women are lower when compared to those of men and the standard deviation is a lot smaller.

*Table 4.6: Descriptive statistics of Retired individuals*

<b>Variables (Narrow Retirement)</b>	<b>No. of observations</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>Min</b>	<b>Maximum</b>
<i>Women</i>					
<b>Age</b>	55.072	60,7663	1,7277	56	64
<b>One-person Household</b>	55.072	0,2609	0,4391	0	1
<b>Marital Status</b>	55.072	0,6248	0,4841	0	1
<b>Children</b>	55.072	0,1136	0,3173	0	1
<i>Men</i>					

<b>Age</b>	116.604	60,9351	1,78050	56	64
<b>One-person Household</b>	116.604	0,0942	0,2921	0	1
<b>Marital Status</b>	116.604	0,8430	0,3638	0	1
<b>Children</b>	116.604	0,1947	0,3960	0	1
<b>Variables (Broad Retirement)</b>					
<i>Women</i>					
<b>Age</b>	125.987	59,3947	2,5402	55	64
<b>One-person Household</b>	125.987	0,2099	0,4072	0	1
<b>Marital Status</b>	125.987	0,6767	0,4670	0	1
<b>Children</b>	125.987	0,1779	0,3824	0	1
<b>men</b>					
<b>Age</b>	194.636	60,1806	2,4016	55	64
<b>One-person Household</b>	194.636	0,1275	0,3334	0	1
<b>Marital Status</b>	194.636	0,7915	0,4062	0	1
<b>Children</b>	194.636	0,2305	0,4211	0	1

Finally table 4.6 displays information on retired individuals, where we present background information for both definitions of retirement. The differences between narrow and broad retirement are mostly negligible, the most notable difference between two groups is that the average age is lower for the definition of broad retirement. In both cases the men retire later than their female counterparts and women retire relatively more from the public sector. The households characteristics for men and women are quite different, though the differences are not as large as for part-time pension users. The women have fewer attachments outside of their working life in terms of partners and offspring compared to men. This concludes the discussion of the variables used in the models.

## 5. Results

This section discusses the results of the effects on both the probability of retirement and on the probability of part-time pension use. In table 5.1 the probabilities of part-time pension use, narrow retirement and broad retirement in the estimated sample are displayed for each year. The

probabilities for part-time pension use are relevant for estimated coefficients in the first model while the other probabilities are relevant for the coefficients estimated in the second model. The probability of retirement is higher for men than for women while the probability of part-time pension use is larger for women.

*Table 5.1: Probabilities of Dependent Variables.*

<b>Dependent variable</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
<b>Women</b>			
Probability of Part-time Pension use	0,0208	0,0227	0,0236
Probability of Narrow Retirement	0,0360	0,0345	0,0307
Probability of Broad Retirement	0,0868	0,0745	0,0668
<b>Men</b>			
Probability of Part-time Pension use	0,0180	0,0215	0,0247
Probability of Narrow Retirement	0,0456	0,0488	0,0424
Probability of Broad Retirement	0,0819	0,0790	0,0678

The results of our logit estimations are displayed in three separate tables. The results from model that estimates the effects on the probability of part-time pension take up will be presented in table 5.2 and the results of effects on the probability of narrow and broad retirement are presented in table 5.3 and in the appendix. The models are estimated using standard logit regressions, but have also been estimated using panel logit regressions with random effects. The results of these regressions are very similar and so are differences between men and women, therefore we only present the results for standard logit regressions.

In our model we assume that there exists no unobserved heterogeneity. The results are presented for men and women separately, and contain the coefficients resulting from the regression of the models. In addition the corresponding marginal effects on the probability of the dependent variable are added. The estimated models are non-linear and therefore it is necessary to calculate the marginal effects so the effects on the probability of the dependent variables are interpreted properly (Cameron & Trivedi, 2009). In our estimations we calculate the marginal effects at means;

this means that marginal effects are calculated for the average of the independent variable in the estimated sample.

The models consist of both discrete variables and continuous variables. The interpretation of the marginal effect of the independent variable (X) on the dependent variable (Y) depends on the type of variable (discrete or continuous). The marginal effects of the discrete variables in our model are the change in probability that Y equals 1 (individual fully retires), when X changes from zero to one. This marginal effect at the mean measures the effect of a discrete change of from zero to one in X on the probability that Y equals 1 at the mean of X. The marginal effects of continuous variables measure the instantaneous rate of change in the probability that Y equals 1. This implies that if X changes by a very small amount then the probability that Y equals 1, changes by the marginal effect multiplied by that very small amount. The scale of the independent variable influences whether this approximation can hold up, and where a smaller scale leads to a closer approximation.

**Table 5.2: Logit estimation results for Men and Women (52-64)**

Dependent variable: Part-time pension take up  
 Log likelihood: -86978,02 (women) -143831,97 (men)  
 Pseudo R2: 0,4800 (women) 0.4007 (men)  
 Observations: 1407371 (women) 2218546 (men)  
 Period: 2006, 2007 , 2008 yearly observations

Independent variables	Coefficients (women)	Marginal effects (women)	Coefficients (men)	Marginal effects (men)
Constant	-2.521*** (0.0664)		-1.057*** (0.0431)	
Part-time pension use (t-1)	4.788*** (0.0165)	0.035*** (0.0004)	4.369*** (0.0134)	0.035*** (0.0003)
Yearly Fiscal Wage(t-1)	-0.240*** (0.0066)	-0.002*** (0.0001)	-0.419*** (0.004)	-0.003*** (0.0001)
Public Sector (t-1)	0.590*** (0.0157)	0.004*** (0.0001)	0.361*** (0.0222)	0.003*** (0.0002)
Firm size (t-1)	-0.039** (0.0155)	-0.002** (0.001)	-0.054*** (0.0123)	-0.0004*** (0.0001)
One-person Household	0.017 (0.0214)	0.0001 (0.0002)	-0.286*** (0.0261)	-0.002*** (0.0002)
Marital Status	-1.354*** (0.0201)	-0.010*** (0.0001)	0.282*** (0.0202)	0.002*** (0.0002)
Children	-0.127*** (0.0216)	-0.001*** (0.0001)	-0.375*** (0.0136)	-0.003*** (0.0001)

Year2007	0.320*** (0.0185)	0.002*** (0.0001)	0.231*** (0.0145)	0.002*** (0.0001)
Year2008	0.246*** (0.0183)	0.002*** (0.0001)	0.279*** (0.0142)	0.002*** (0.0001)
Age56	0.332*** (0.0295)	0.002*** (0.0002)	-0.294*** (0.0316)	-0.002*** (0.0002)
Age57	0.240*** (0.0296)	0.002*** (0.0002)	-0.194*** (0.0290)	-0.001*** (0.0002)
Age58	0.425*** (0.0287)	0.003*** (0.0002)	0.044* (0.0261)	0.0003* (0.0002)
Age59	0.542*** (0.0282)	0.004*** (0.0002)	0.328*** (0.0234)	0.003*** (0.0002)
Age60	0.805*** (0.0273)	0.006*** (0.0002)	0.785*** (0.0207)	0.006*** (0.0002)
Age61	1.721*** (0.0250)	0.013*** (0.0002)	1.550*** (0.0184)	0.013*** (0.0002)
Age62	1.285*** (0.0286)	0.010*** (0.0002)	1.584*** (0.0192)	0.013*** (0.0002)
Age63	1.394*** (0.0321)	0.010*** (0.0002)	1.612*** (0.0209)	0.013*** (0.0002)

Table 5.2: with standard errors in brackets, \*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.1$ .

Table 5.2 presents the results for the effects on the probability of part-time pension take up for both men and women. The dummy variables for age indicate that the probability of part-time pension use increases with age. The marginal effects of age for women are larger when compared to men till the age of 60. From the age of 60 onwards however, the marginal effects on the probability of part-time pension use are larger for men. Women exit the labor force earlier than men which could imply that they also enter part-time retirement at an earlier age. The sign of part-time pension use in period  $t-1$  is positive as expected, which means that entering partial retirement increases the probability of staying in partial retirement.

For the effect of the wage we take the natural logarithm of the yearly fiscal wage and regress that wage on both men and women. The sign is negative for men and women and indicates that higher wages decrease the probability of part-time pension take up. The sign of this effect is in line with the expectation that individuals with higher wages are less willing to enter partial retirement. The income effects are larger for men which is as expected as men are still the primary breadwinner in most households according to Knijn en Wel (2001). The dummy for working in the public sector

indicates that, for both genders, the probability of part-time use increases when individuals work in the public sector. Individuals working at a large firm are less likely to use part-time pension according to the estimated marginal effects.

The effects of household characteristics on the probability of part-time pension use show more differences between men and women. The marginal effect of being in a one-person household is positive for women but statistically insignificant and negative for men. The negative coefficients imply that one-person households have a lower probability of part-time pension use than larger households. This effect for men is in line with the expectations as one person-household have less attachments outside of work. The effects of marital status on the probability of part-time pension use are negative for women and positive for men. This means that women with a partner are less likely to use part time pension while men with a partner are more likely to partially retire. The sign of the effect on the probability of part-time pension use by men is in line with expectations as men with a partner have more attachments outside of their working environment. The explanation as to why the effect of having a partner decreases the probability of partial retirement for women is less clear cut. An explanation could be that women with a partner are not the breadwinner in the household, and that they do not consider part-time pensions when working less.

The marginal effects of individuals having children on the probability of part-time pension use are negative for both men and women. The probability of partial retirement could be lower due to the financial burden of having to raise children. According to Hurd (1987) households with children are likely to save more, and since part-time pension use is a form of dis-saving, this could indicate why they are less likely to initiate part-time pension plans. The effects of the dummy variables for the years 2007 and 2008 increase the probability of part-time pension use compared to base year 2006. This sign is probably the result of more employers and pension funds offering the option of partial retirement.

This concludes the discussion of the effects of the independent variables on part-time pension use. Most of the results are in line with our expectations, though these expectations are mostly not based on literature that specifically estimates effects on the probability of part-time pension take up. The reason for this is that to our knowledge this is the first time that research has been done on what affects the probability of part-time pension use.

**Table 5.3: Logit estimation results for Men and Women (52-64)**

Dependent variable: Narrow Retirement  
Log likelihood: -169759,28 (women) -331772,12 (men)  
Pseudo R2: 0,2476 (women) 0.2275 (men)  
Observations: 1407371(women) 2218546 (men)  
Period: 2006, 2007 , 2008 yearly observations

Independent variables	Coefficients (women)	Marginal effects (women)	Coefficients (men)	Marginal effects (men)
Constant	-3.314*** (0.0471)		-2.118*** (0.0318)	
Part-time pension use(t-1)	0.744*** (0.0181)	0.009*** (0.0002)	0.487*** (0.0145)	0.010*** (0.0003)
Yearly fiscal wage (t-1)	-0.202*** (0.0043)	-0.003*** (0.0001)	-0.254*** (0.0027)	-0.005*** (0.0001)
Public (t-1)	0.529*** (0.0103)	0.007*** (0.0001)	-0.127*** (0.0149)	-0.002*** (0.0003)
Firm size (t-1)	0.397*** (0.0102)	0.005*** (0.0001)	0.409*** (0.0069)	0.008*** (0.0001)
One-person Household	-0.186*** (0.0167)	-0.002*** (0.0002)	-0.218*** (0.0151)	-0.004*** (0.0003)
Marital status	-0.124*** (0.0147)	-0.002*** (0.0002)	0.221*** (0.0120)	0.004*** (0.0002)
Children	-0.561*** (0.0154)	-0.007*** (0.0002)	-0.407*** (0.0085)	-0.008*** (0.0002)
Age56	0.171*** (0.0365)	0.002*** (0.0004)	-0.303*** (0.0278)	-0.006*** (0.0005)
Age57	0.599*** (0.0321)	0.007*** (0.0005)	0.103*** (0.0238)	0.002*** (0.0004)
Age58	1.064*** (0.0286)	0.013*** (0.0003)	0.584*** (0.0203)	0.011*** (0.0004)
Age59	1.342*** (0.0270)	0.017*** (0.0003)	0.955*** (0.0183)	0.019*** (0.0003)
Age60	3.488*** (0.0205)	0.044*** (0.0003)	2.541*** (0.0139)	0.050*** (0.0003)
Age61	3.244*** (0.0219)	0.041*** (0.0003)	2.964*** (0.0139)	0.058*** (0.0003)
Age62	3.647*** (0.0223)	0.046*** (0.0003)	3.399*** (0.0142)	0.066*** (0.0003)
Age63	3.287*** (0.0251)	0.042*** (0.0003)	2.964*** (0.0161)	0.058*** (0.0003)
Year2007	-0.160*** (0.0116)	-0.002*** (0.0001)	-0.096*** (0.0082)	-0.002*** (0.0001)

Year2008	-0.316*** (0.0117)	-0.004*** (0.0001)	-0.288*** (0.0083)	-0.006*** (0.0003)
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Table 5.3: with standard errors in brackets, \*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.1$ .

Tables 5.3 presents the results derived from estimating the model for the probability of full retirement. The table presents the results with narrow retirement as the dependent variable and in the appendix the results are presented with broad retirement as the dependent variable. The signs of the coefficients are mostly the same regardless of the dependent variable. The interpretation of the effects is based predominantly on the results in table 5.3, unless the results for broad retirement require an additional explanation.

The main variable of interest when estimating this model is the effect of part-time pension use. The coefficients and marginal effects are positive for both men and women, and indicate that part-time pension use increases the probability of retirement. This sign is not in line with the expectation in literature that partial retirement prolongs the full retirement decision. Since it is not possible to know what an individual part-time pension user would have done without this option, is it difficult to make a definitive conclusion. If part-time pension use does prolong the retirement decision than this result can only be explained by accepting that part-time pension users have a strong bias for early retirement. This is an interesting result for policy makers because it implies that part-time pension options are not used to continue working till 65 or beyond the age of 65. The marginal effects of part-time pension use are larger for men then for women and when comparing the results, which indicates that the retirement decisions of men are affected more by part-time pension use.

The effects of wages decrease the probability of retirement in the case of men, while they have the opposite effect on women. The marginal effect for men is in line with expectations, but the result found for women is somewhat counterintuitive. For women a higher wage increases the probability of retirement, this could imply these women find that they have sufficient pension income and that women with lower incomes postpone retirement because they find that do not have sufficient pension income.

The effect of public sector employment on the probability of retirement is positive for women and negative for men. The expectation is that public sector employees retire earlier than private sector employees. The sign of the coefficient for women is in line with the expectations while the result for men is puzzling. Apparently men in the public sector have a lower probability of full retirement compared to men in the private sector. A more thorough investigation of the differences in retirement statistics between public sector and private sector employees is depicted in figure 5.1.

## Shares of working men (55-65) that retire per sector

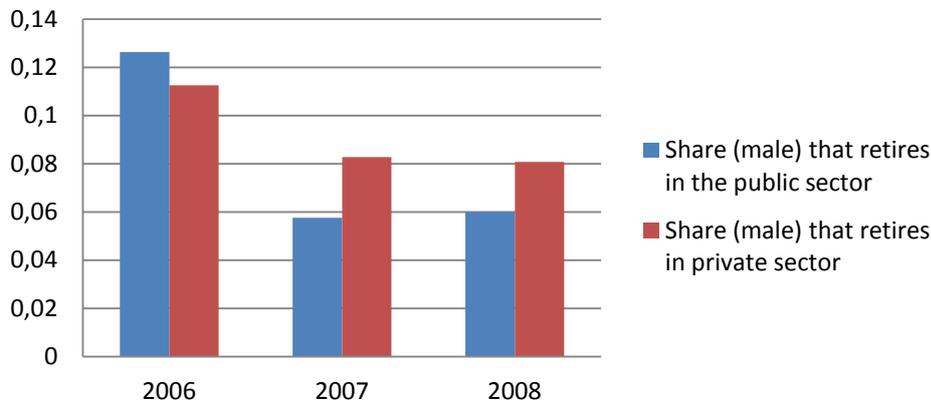


Figure 5.1: The share of working men (between 55 and 65) that retire per sector. Source: CBS Statline

This figure depicts the share of working men (between 55 and 65) that retire per sector (public and private) from 2006 till 2008. This figure shows that the share of working men that retire in 2007 decreases a lot more in the public sector than in the private sector. In 2008 the shares remain constant compared to the previous year and the share of retired men in the public sector remains smaller than in the private sector. This could explain why the coefficient for men in the public sector is negative instead of positive.

The sign of the coefficient for firm size is positive for both men and women. The result that individuals are less likely to retire before 65 in smaller firms is expected as large firms can more easily offer early retirement opportunities. This concludes the discussion of the effects of employment characteristics on the probability of retirement.

The effects of household characteristics on the probability of retirement again show significant differences between men and women. One-person households decrease the probability of retirement for men and women which is line with expectations. This implies individuals with fewer attachments prefer to remain in employment. Men living with a partner or who are married are likely to retire earlier while women with a partner are less likely to retire. These results are similar to those found for the effect of marital status on the probability of part-time pension use. The individuals that have children tend to retire later, as the marginal effects are negative for both men and women. It is possible that individuals with children have build up less savings due to raising children and therefore have prolong retirement.

This concludes the discussion of the effects measured on the probability of retirement. The key finding from this estimated model is part-time pension use increases the probability of full retirement. This means that individuals do not seem to use part-time pensions to gradually retire at

the statutory retirement age or later, but instead retire earlier than the statutory retirement age. It is still possible that part-time pension use by the individuals in our model prolongs the retirement decision. If this is the case, then part-time pensions are primarily used by individuals that have a strong bias to retire relatively early.

## **6. Conclusion**

The goal of this thesis was to evaluate how part-time pension use affects the transition from working to retirement. The first model estimates how household and job characteristics influence the probability of part-time pension use. The second model estimates how part-time pension use affects the probability of full retirement. The second model also estimates how the aforementioned household and job characteristics affect the probability of full retirement. These models are estimated separately for men and women due to differences in their preferences and circumstances.

The key finding of our model is that part-time pension use increases the probability of full retirement. The drawback of this finding is that it is impossible to know when an individual would retire had he or she not had the option of part-time pensions. In addition we have provided insight into how household and job characteristics affect the probability of full retirement and part-time use. This research seems to indicate that partial retirement is primarily used by individuals to retire before the statutory retirement age. Policy makers often promote part-time pensions as a means to continue working beyond the age of 65 (statutory retirement age) or at least till the age of 65. This preferred use of part-time pensions is very absent in the findings of my research. This at least raises the question whether part-time pensions are taken up by the 'wrong' individuals. The findings in this thesis indicate that part-time pensions are primarily used by individuals that want to retire early. It must be stated that this does not necessarily mean that part-time pension have harmful effects but it does mean that it not used as was intended by policy makers.

Further research on partial retirement should focus on why this unintended use of part-time pensions occurs and also what obstructs the intended use of part-time pensions. Further research requires improvements on the available data on part-time pension use. More details on the amount of pension an individual takes up provide a better picture of his or her retirement path. Research that aims to identify whether part-time pension use, delays or advances the decision to retire should focus on fielding surveys. These surveys should be fielded to retired individuals with part-time pension options and to those without. Questions should focus on whether the option changed their planned retirement date.

Another way to explain part-time pension use is by extending the option value approach of Stock and Wise (1988) by including partial retirement paths in their option value model. This model explains retirement decisions by evaluating the option value of continuing employment. The contribution of such an approach is that it focuses on the incentives that individuals face regarding retirement. Stock and Wise (1988) design a model based on this option value approach and found that this model can quite accurately explain the discontinuous jumps of retirement rates at certain ages. Part-time pension options can affect the option value of continuing to work and including these options into an option value model can explain the incentives for partial and full retirement decisions.

It is also important that policy makers understand that part-time pension options increase the flexibility of the Dutch pension system. According to van Vuuren (2011) more flexible retirement opportunities (such as part-time pensions) can undermine the effectiveness of increasing the statutory retirement age with regard to postponing the retirement decision. A solution to this issue could be to increase the minimum age at which individuals can take up part-time pensions proportionally to the rise in the statutory retirement age.

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## Appendix: A

**Table 5.3: Logit estimation results for Men and Women(52-64)**

Dependent variable: Broad Retirement

Log likelihood: -336163,96 (women) -518007,24 (men)

Pseudo R2: 0,1531 (women) 0,1561(men)

Observations: 1407371(women) 2218546 (men)

Period: 2006, 2007 , 2008 yearly observations

Independent variables	Coefficients (women)	Marginal effects (women)	Coefficients (men)	Marginal effects (men)
Constant	-1.421*** (0.0269)		-0.572*** (0.0232)	
Part-time pension use(t-1)	0.119*** (0.0166)	0.006*** (0.0008)	-0.017 (0.0139)	-0.001 (0.0007)
Yearly fiscal wage (t-1)	-0.517*** (0.0036)	-0.026*** (0.0001)	-0.396*** (0.0021)	-0.019*** (0.0001)
Public (t-1)	0.086*** (0.0075)	0.004*** (0.0004)	-0.201*** (0.0122)	-0.096*** (0.0005)
Firm size (t-1)	0.129*** (0.007)	0.006*** (0.0003)	0.128*** (0.0055)	0.006*** (0.0005)
One-person Household	-0.071*** (0.0119)	-0.004*** (0.0005)	-0.049*** (0.0109)	-0.002*** (0.0004)
Marital status	0.004 (0.0101)	0.0001 (0.0005)	0.016* (0.0088)	0.001* (0.0003)
Children	-0.359*** (0.0080)	-0.017*** (0.0004)	-0.332*** (0.0064)	-0.016*** (0.0003)
Age56	0.905*** (0.0136)	0.044*** (0.0006)	0.571*** (0.0129)	0.027*** (0.0006)
Age57	1.000*** (0.0135)	0.049*** (0.0006)	0.667*** (0.0126)	0.032*** (0.0006)
Age58	1.094*** (0.0136)	0.054*** (0.0006)	0.897*** (0.0119)	0.043*** (0.0006)
Age59	1.153*** (0.0136)	0.057*** (0.0006)	0.996*** (0.0116)	0.048*** (0.0005)
Age60	2.329*** (0.0114)	0.115*** (0.0005)	1.985*** (0.0098)	0.096*** (0.0004)
Age61	2.117*** (0.0129)	0.104*** (0.0006)	2.320*** (0.0100)	0.112*** (0.0004)
Age62	2.469***	0.122***	2.719***	0.131***

	(0.0137)	(0.0007)	(0.0104)	(0.0005)
Age63	2.194*** (0.0166)	0.108*** (0.0008)	2.309*** (0.0123)	0.111*** (0.0006)
Year2007	-0.262*** (0.0079)	-0.013*** (0.0004)	-0.188*** (0.0064)	-0.009*** (0.0003)
Year2008	-0.3526*** (0.0080)	-0.017*** (0.0004)	-0.346*** (0.0065)	-0.016*** (0.0003)

Table 5.3: with standard errors in brackets, \*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.1$ .