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# Early Retirement and Financial Incentives Differences Between High and Low Wage Earners

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# **Early Retirement and Financial Incentives: Differences Between High and Low Wage Earners<sup>1</sup>**

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## **Abstract**

This paper investigates the impact of financial incentives on early retirement behaviour for high and low wage earners. Using a stylized life-cycle model, we derive hypotheses on the behaviour of the two types. We use administrative data and employ two identification strategies to test the predictions. First, we exploit exogenous variation in the replacement rate over birth cohorts of workers who are eligible to a transitional early retirement scheme. Second, we employ a regression discontinuity design by comparing workers who are eligible and non-eligible to the transitional scheme. The empirical results show that low wage earners are, as predicted by the model, more sensitive to financial incentives. The results imply that low wage earners will experience a stronger incentive to continue working in an optimal early retirement scheme.

Keywords: pensions, early retirement, labour market behaviour

JEL Classifications: J16, J22, J61

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### **Abstract in Dutch**

Financiële prikkels voor doorgaan of stoppen met werken hebben een belangrijke rol gespeeld bij de ontwikkeling van de participatie van ouderen in de afgelopen decennia. In deze studie onderzoeken we het verschil in de mate waarmee werknemers met een hoog en laag inkomen reageren op financiële prikkels voor vervroegde uittreding. We gebruiken een levenscyclusmodel om hypothesen af te leiden voor het gedrag van deze werknemers. Op basis van administratieve gegevens toetsen we de hypothesen met twee verschillende empirische methoden. Ten eerste maken we gebruik van een daling van de uitkeringshoogte voor opeenvolgende geboortejaren van werknemers die recht hebben op een overgangsregeling. Ten tweede maken we gebruik van een discontinuïteit in de rechten van werknemers die net wel of net niet recht hebben op de overgangsregeling. De empirische resultaten laten zien dat werknemers met een laag inkomen sterker reageren op financiële prikkels, zoals is voorspeld door het theoretische model. De resultaten betekenen dat in een optimaal stelsel voor vervroegde uittreding werknemers met een laag inkomen een relatief sterke prikkel ondervinden om langer door te werken.

*Steekwoorden:* pensioenen, vervroegde uittreding, arbeidsmarktgedrag

## 1. Introduction

Many countries are reforming their early retirement and pension schemes to guarantee the fiscal sustainability of the welfare system. In several countries, including Germany, Italy and the Netherlands, the reforms have led to a public debate on the differential impact on high and low wage earners. In particular low wage earners may need to continue working at old age as they are in need of income, while high wage earners may have the resources to finance early retirement. This may be seen as unfair as low wage earners may have ‘hazardous or arduous’ jobs, possibly reducing the time during which retirement benefit can be enjoyed (Zaidi and Whitehouse, 2009). Optimal early retirement and pension institutions should include financial incentives to induce workers in good health to continue working (Cremer *et al.*, 2004, 2008). For the assessment of the impact of such policy, it is useful to know how high and low wage earners react to such financial incentives.

Despite the extensive empirical literature, no study has investigated the difference in retirement behaviour of high and low wage earners.<sup>3</sup> The novelty of this paper is based on three elements. First, we investigate both theoretically and empirically the early retirement choices and responses to financial incentives of high and low wage earners. Second, we use administrative data from the second largest pension fund in Netherlands (the health care pension fund PFZW, the former PGGM). The data contain reliable information on pension and early retirement rights of employees, and in particular we know the benefit level at each possible early retirement age. Third, we exploit two sources of exogenous variation in order to identify the effect of financial incentives. The first source of variation comes from a transitional early retirement scheme that includes a reduction in replacement rates over successive birth cohorts. The precise knowledge of the benefit level at each possible early retirement age, together with exogenous variation in these benefit levels, improves measurement and identification of financial incentives over a large part of the aforementioned literature. The second source of variation comes from a government reform on the fiscal treatment of early retirement. The reform affects individuals who are eligible and non-eligible to the transitional scheme in a different way.

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<sup>3</sup> The extensive literature includes Lumsdaine and Mitchell (1999) and Gruber and Wise (2004). The latter study, which employs a structural approach, includes studies on Germany (Börsch-Supan *et al.*, 2004), the United Kingdom (Blundell *et al.*, 2004), Italy (Brugiavini and Peracchi, 2004) and the Netherlands (De Vos and Kapteyn, 2004). Studies which exploit a ‘quasi-natural’ experiment include Krueger and Pischke (1992), Baker and Benjamin (1999), Røed and Hangen (2003) and Euwals *et al.* (2010a).

The empirical results confirm the predictions of the stylized life-cycle model: low wage earners are more sensitive to financial incentives than high wage earners. A high cost of continuing working in terms of utility, possibly because of hazardous work and a faster deterioration of health does not reduce the higher sensitivity to financial incentives of low wage earners. So financial incentives for continuing working, which may be part of an optimal design of early retirement institutions, may induce in particular low wage workers to postpone early retirement.

The paper is organized as follows. Section 2 describes a model to illustrate the differences in behaviour between high and low wage earners. Section 3 discusses early retirement in Netherlands and in particular in the health care sector. Section 4 presents the data. Section 5 discusses the empirical strategies, while section 6 discusses the results.

## 2. Stylized model on high and low wage earners

This section employs a model to illustrate the potential impact of hazardous work on the reaction of high and low wage earners to financial incentives. The standard life cycle model shows that individuals retire at the moment the marginal utility of inactivity becomes equal to marginal productivity. Furthermore, individuals in poor health will retire earlier than individuals in good health. The sensitivity to financial incentives is however not clear upfront. Low wage earners may be more sensitive as their marginal utility to income is higher. Low wage earners may also be less sensitive as they may experience a stronger disutility of work, making working activity costly in terms of utility.

### 2.1 The model

Consider two types of individuals who differ in the wage level, i.e.  $w_H > w_L$ , with subscript  $H$  for the high wage earner and  $L$  for the low wage earner. Each of them has an instantaneous utility function  $U_t$  at age  $t$  in which consumption  $c_t$  and labour  $l_t$  are separable:

$$U_t = u(c_t) - r_t V(l_t) \tag{1}$$

where utility functions  $u$  and  $V$  fulfil the usual assumptions. The intensity of labour disutility  $r_t$  increases with age.

Following Cremer *et al.* (2004, 2008), we implement several simplifying assumption. We design the model such that it illustrates the impact of the curvature of the felicity function

$u$  and the disutility of labour  $r_t$  on early retirement behaviour. The assumptions will impact the magnitude of the effects, but will leave the basic idea of the possible difference in magnitude for high and low wage earners unaffected. Some of the assumptions will be discussed later on. We assume separability, concavity of the instantaneous utility functions, perfect capital markets and certain lifetime such that each individual sets the level of consumption equal in all periods. As we will ignore the intensive margin of labour supply, we additionally assume  $l_t=l$  to be time invariant and equal to one.<sup>4</sup> We assume individuals have no liquidity constraints.<sup>5</sup> The model reduces to a static model, and the choice is between the length of working life  $z$  and life cycle consumption  $c$ . Since consumption and labour are time invariant, lifetime utility can be written as:

$$U = hu(c) - R(z) \tag{2}$$

with life span  $h$  and retirement age  $z$ , and where

$$R(z) = \int_0^z r_t \tag{3}$$

The lifetime budget constraint is given by:

$$hc = zw - T(w, z) \tag{4}$$

with wage rate  $w$  and  $T(w, z)$  is the difference between total tax payment and total retirement benefits.

$$T(w, z) = z\tau(w) - (h - z)p(z) \tag{5}$$

where  $\tau(w)$  is the payroll tax and  $p(z)$  is the level of the pension benefit. The benefit may depend on the length of the working life  $z$  through a pension benefit formula. Considering that the pension system could be actuarially fair or unfair, we define  $p(z)$  as follows:

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<sup>4</sup> This assumption plays an important role in the optimal taxation literature (Cremer *et al.*, 2004, 2008). In our case, it is not a restrictive assumption because the disutility of work depends on  $z$  and  $\alpha$ . The latter parameter will determine the differences in the disutility of work between high and low wage earners.

<sup>5</sup> This assumption guarantees consistency with the empirical model which is based on Stock and Wise (1990).

$$p(z) = \delta p_0 + (1 - \delta) \frac{z\tau(w)}{(h-z)} \quad (6)$$

where  $\delta$  represents the level of actuarial fairness. In case of an actuarial unfair system the pension benefit is independent of the earning history ( $\delta=1$ ), and in case of an actuarial fair system the net present value of the pension benefit is equal to the net present value of the taxes ( $\delta=0$ ). In practice, most pension systems in the world are a mixture of the two extreme systems. Substituting the term in  $T(w,z)$ , the budget constraint can be rewritten as follows:

$$hc = z(w - \delta(\tau(w) + p_0)) + \delta p_0 \quad (7)$$

The first order conditions with respect to  $c$  and  $z$  lead to the marginal rate of substitution between  $c$  and  $z$ :

$$MRS_{c,z} = \frac{R'(z)}{u'(c)} = w - \delta(\tau(w) + p_0) \quad (8)$$

where the right-hand side of the equation represents the marginal net wage, whereby  $\delta(\tau(w) + p_0) = T_z'(w, z)$  represents the implicit tax on retirement. Individuals continue working until the marginal disutility of working is not compensated anymore by the marginal utility of additional income generated by working. In general, the high wage earner has a higher *MRS*, meaning that she works and consumes more than the low wage earner. When the two types differ also in the disutility of work (i.e.,  $R'_H(z) < R'_L(z)$ ) the comparison between the two marginal rates of substitution is less clear. For  $\delta > 0$  (when the pension system is at least partly actuarially unfair) there is a downward bias of the optimal retirement age for both types. This insight is confirmed by the research discussed in the introduction.

In order to derive the different sensitivity of the two types to financial incentives, we need to calculate the elasticities of retirement age ( $z$ ) with respect to the wage rate ( $w$ ) and the level of the pension benefit ( $p$ ). These elasticities can be derived with implicit differentiation, but it is however not possible to determine which type of worker is more sensitive to the financial incentives coming from the wage level (price effect) and the pension benefit level (which is partly an income effect). In order to illustrate how the financial incentives affect the retirement age for the two types of workers, we provide a numerical example.



## 2.2 Numerical example

The two types of workers differ in their wage level, that is  $w_H > w_L$ . They may also differ (or not) in their disutility of work. We illustrate also the case in which low wage earners have a higher disutility of work  $R'_H(z) < R'_L(z)$  as it is generally believed that these workers have physically more demanding jobs.

We consider the following functional forms for utility and disutility:

$$u(c) = -c^{-\gamma} \quad (9)$$

$$R(z) = (1 - z)^{-\alpha} \quad (10)$$

We first consider the case in which high and low wage earners differ in the wage level only, i.e.,  $w_H = 2 > w_L = 1$ . The other parameter values are chosen such that individuals work a major part of their adult life. The values are open for discussion and we return to the issue later. The simple model predicts that for the partly actuarial fair case, low wage earners work a larger part of their life than high wage earners (Table 1). The model also shows that an actuarial unfair system ( $\delta=1$ ) leads to early retirement.

**Table 1: Elasticities in case individuals differ in wage only**

	Consumption	Retirement age	Compensated wage elasticity	Pension elasticity
	c	z	e_c(z) w.r.t. w	e(z) w.r.t. p
<b>Partly actuarial fair (<math>\delta=0.5</math>)</b>				
High wage earners	1.705	0.856	0.152	-0.024
Low wage earners	0.861	0.873	0.163	-0.050
<b>Completely actuarial unfair (<math>\delta=1</math>)</b>				
High wage earners	1.665	0.832	0.216	-0.069
Low wage earners	0.820	0.799	0.495	-0.301

Note: wages  $w_H = 2 > w_L = 1$  and parameter values  $\gamma=0.5$  and  $\alpha=0.05$  for both high and low wage earners.

The elasticities of  $z$  (i.e., retirement age) with respect to the wage rate and the pension benefit level are larger for low wage earners. The interpretation is obvious as low wage earners are on the steep part of their utility function. That is, a marginal increase in consumption leads to a large increase in marginal utility. Furthermore, the elasticity with respect to the benefit level is particularly large in an actuarial unfair system. The prediction is

in line with the low participation rates of elderly in countries with a high implicit tax rate, including the Netherlands (Gruber and Wise, 2004, De Vos and Kapteyn, 2004).

The question now is whether differences in disutility of work can turn the results upside down. We consider the case in which high and low wage earners differ both in their wage rate and their disutility of work. The low wage earners now work a smaller part of their life than high wage earners (Table 2).

The higher disutility of work for low wage earners does not make them less sensitive to financial incentives. Changes in financial conditions lead to sizable changes in behaviour. Moreover, the elasticity with respect to the benefit level in case of an actuarial unfair system becomes larger. This is again in line with the fact that in many European countries, of which most have an actuarial unfair system, in particular low wage earners retire early.

**Table 2: Elasticities in case individuals differ in wage and disutility of work**

	Consumption	Retirement age	Compensated wage elasticity	Pension elasticity
	c	z	e_c(z) w.r.t. w	e(z) w.r.t. p
<b>Partly actuarial fair (<math>\delta=0.5</math>)</b>				
High wage earners	1.705	0.856	0.152	-0.024
Low wage earners	0.788	0.769	0.290	-0.100
<b>Completely actuarial unfair (<math>\delta=1</math>)</b>				
High wage earners	1.665	0.832	0.216	-0.069
Low wage earners	0.755	0.637	0.974	-0.661

Note: wages  $w_H = 2 > w_L = 1$  and parameter values  $\gamma=0.5$  and  $\alpha_H = 0.05 < \alpha_L = 0.1$ .

Clearly the choice of parameters values  $\alpha$  and  $\gamma$  affects the outcomes. The values have been chosen such that individuals work a major part of their adult live, a fact that is in line with labour market statistics. So other parameter values and other model specifications will of course lead to different results. In particular, two elements may play a role: lifetime expectancy and time preference. In our model specification, lifetime ( $h$ ) is certain and it is the same for high and low wage earners, while time preference is not included.<sup>6</sup> Our prediction of low wage earners being more sensitive to financial incentives holds however under many

<sup>6</sup> Sensitivity analysis shows that life time ( $h$ ) and time preference have an impact on the optimal choice of consumption ( $c$ ) and retirement age ( $z$ ), but the impact on the elasticities is limited.

different specifications as low wage earners are on the steep part of their utility function. Still there may be model specifications and parameter values for which this is not the case and in the end it is an empirical question. The next sections will test the hypothesis.

### **3. Early retirement in the Dutch health sector**

Identification of the impact of financial incentives on early retirement behaviour will be based on changes in early retirement conditions of workers in the health care sector. This section describes the early retirement reforms in the Netherlands and the way they affected health care sector workers. The next section illustrates early retirement behaviour of high and low wage earners in the sector. The figures in this section and the empirical analysis in the next sections are based on administrative data from the health care sector pension fund for the years 1999 – 2006. Such data contain reliable information on pension and early retirement rights of employees. Furthermore, the results will not necessarily be representative for all workers in the Netherlands as women with caring type of jobs are overrepresented (see Appendix A for details on the data and descriptive statistics).

#### *3.1 Early retirement reforms in the Netherlands*

Until about one decade ago, the financial incentive for an individual to continue working at old age was low in the Netherlands. Most sectors had a generous early retirement scheme during the 1980s and the 1990s. Workers with a career which met conditions on tenure within the sector, qualified for an actuarial unfair early retirement benefit (the so-called VUT) at age 60. The gross replacement rate of the benefit was about 80% of the last earned wage and continuing to work did not affect the replacement rate. So the implicit tax continuing to work was 80% to 100%. The actuarial unfair schemes were considered highly responsible for the low participation rate of elderly during the 1980s and the 1990s (De Vos and Kapteyn, 2004).

Policy improved the incentives to continue working at old age. First, the stakeholders, i.e., the unions and employer organizations, decided to reform the early retirement schemes starting from the end of 1990s onwards to guarantee the sustainability of the schemes. The new schemes would offer an actuarial fair early retirement benefit with a lower replacement rate. Actuarial fairness implies that postponement (advancement) of early retirement leads to an increase (decrease) in the benefit level, the net present value of the benefit is more or less

independent of the age of retirement.<sup>7</sup> The starting date of the transition to the new schemes varied by sector. Civil servants were the first to be confronted with changing early retirement conditions as the reform of their scheme started on April 1, 1997. Health care sector workers were the second group as the reform of their scheme started on January 1, 1999.

To ease the pain of the reform, most sectors installed a transitional arrangement. The reform was harsh for workers close to eligibility for the old scheme as the replacement rates of the new schemes were substantially lower. Workers close to eligibility and who participated continuously in a pension fund of a sector for a certain number of years were offered access to a more generous transitional scheme.

A second policy that improved the incentives to continue working was installed on January 1, 2006. The Dutch government decided to stop the fiscally favourable treatment of actuarial unfair early retirement schemes from that date onwards. A higher participation rate of elderly was an explicit policy goal and the government no longer wanted to subsidise schemes that discourage participation. The decision speeded the transition process as it was already decided to transform the schemes towards actuarial fair schemes. The speeding up was substantial; many sectors of industry were going to have an actuarial fair system in 2015.

### *3.2 The way the reforms affected workers in the health care sector*

From January 1, 1999 onwards, health care sector workers had no access anymore to the actuarial unfair scheme (the so-called VUT). Instead, workers had access to the new actuarial fair benefit with a lower replacement rate (the so-called FLEX).

Workers have a claim on the new benefit on the first day of the month in which they become 60 years old. The benefit level at age 60 is 1.75% of the basic salary for each year of participation to the pension fund. This is equal to the number of working years in the sector as participation is mandatory. The new scheme is less attractive even for workers who have been working in the sector for 40 years as their replacement rate is 70%, while the old scheme offered a replacement rate of 80%. In case of advancement or postponement of early retirement, the level of benefit is adjusted in an actuarially fair manner.

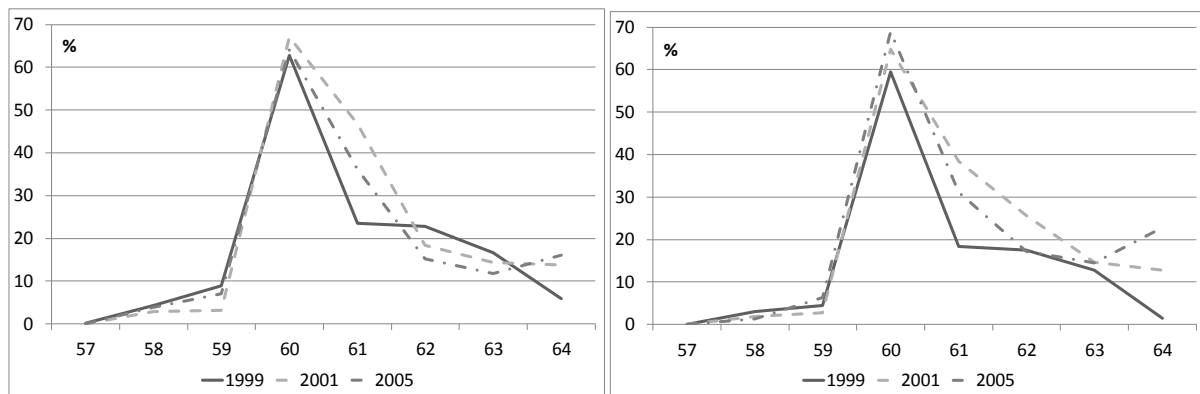
Workers close to age 60 had access to a transitional arrangement (the so-called OBU). The arrangement contains elements of the old and the new scheme. First, workers have access to the scheme in case they have been working uninterrupted in the sector for the last ten years

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<sup>7</sup> The actuarial adjustment is calculated on the basis of the time discount factor used by the pension fund; for the individual worker the adjustment may not be actuarial fair as the individual discount factor may be different.

(a condition that held for the old scheme as well). Second, the scheme is actuarial unfair as continuing working does not result in a higher benefit level. Note the scheme became actuarial fair in 2006 because of government policy. Third, the scheme has a transitional nature as the replacement rate was brought back over time from 80%, the rate of the old scheme, to 70%, the rate of the new scheme. Workers born in 1939 or before got a replacement rate of 80%, workers born in 1940 got 79%, and further down workers born in 1948 got 71%. Workers born in 1949 and later had no access to the transitional arrangement.

**Figure 1: hazard rate for early retirement, high (left) and low (right) wage earners**



Source: administrative data of the pension fund of the health care sector, 1999-2006, own calculations.

Note: Probability of early retirement conditional on being employed at year  $t-1$ , Kaplan-Maier estimator for workers eligible to the transitional scheme. High and low wage earners are defined on the basis of a fixed effects model, see Appendix B for details.

### 3.3 Early retirement behaviour in the health care sector

Descriptive statistics do not reveal a substantial difference in early retirement behaviour between high and low wage earners. The hazard rate into early retirement is rather similar for both types of workers (Figure 1). Many workers have access to the transitional early retirement scheme at age 60 and most of them take that opportunity.<sup>8</sup> This result is in line with previous research on the impact of the old early retirement scheme (Kerkhofs *et al.*, 1999, De Vos and Kapteyn, 2004, Heyma, 2004).

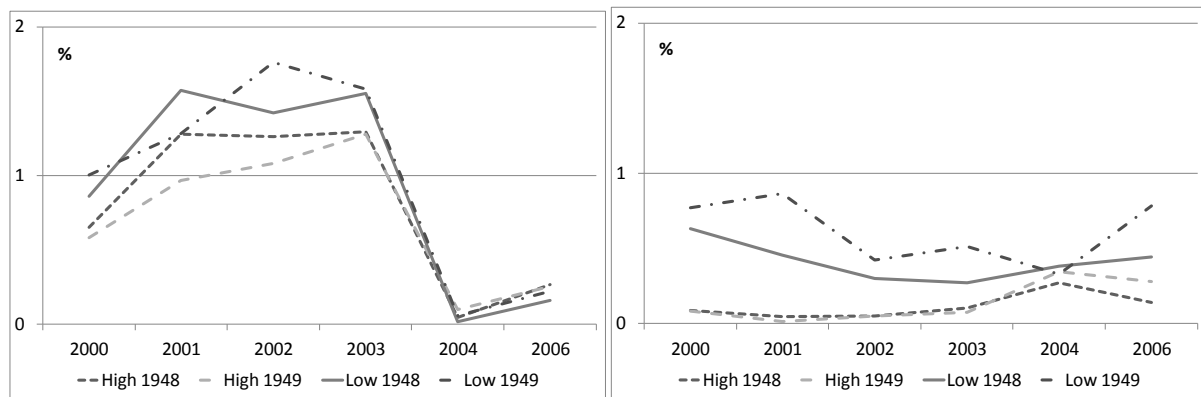
The scheme of the health care sector offers the opportunity of part-time retirement at age 58 or 59, but this opportunity does not seem popular. Workers who have access to an early retirement benefit at age 60 can retire at age 58 (59) and receive 50% of the benefit

<sup>8</sup> We consider workers who have access to the transitional arrangement only; workers without access may have a much lower labour market attachment or may have substantial pension rights outside the health care sector.

during ages 58 to 61 (59 and 60). From age 62 (61) onwards they receive the full 100% of the benefit. The take up of part-time early retirement does not seem to differ between high and low wage earners, as well.

The decrease in the replacement rate of the transitional arrangement may have led to a decreasing conditional probability (hazard rate) to retire, but this trend does not seem to be present in Figure 1. The conditional probability to retire early actually seems to increase over time for both high and low wage earners. The reason may however be that the fraction of workers that is eligible to the transitional scheme at age 60 also increases over time. The empirical analysis of the next section will take the exact timing of the early retirement rights into account, and it will use the exact timing to identify the impact of the financial incentives.

**Figure 2: Hazard rate for disability (left) or other exit route (right)**



Source: administrative data of the pension fund of the health care sector, 1999-2006, own calculations.

Note: probability for disability and other exit route conditional on being employed at year  $t-1$  for high and low wage earners born in 1948 (last birth year eligible to transitional scheme) and 1949 (not eligible). High and low wage earners are defined on the basis of a fixed effects model, see Appendix B for details.

### 3.4 Alternative exit routes and the 2006 policy reform

Alternative exit routes may be relatively attractive for generations born in 1949 and later as they are not eligible to the (rather generous) transitional early retirement scheme. The 2006 policy reform makes early retirement however more attractive again, as from that date onwards it pays to postpone early retirement. As the reform was certain to be implemented in 2005, this may have induced workers born in 1949 and later to continue working in 2005. We compare workers who are born in 1948 (i.e. so who are eligible to the transitional scheme) and individuals who are born in 1949 (i.e. who are non-eligible), both having at least ten years of tenure in the sector.

As workers born in 1948 and 1949 could not yet retire early during our period of observation, which is 1999 – 2006, the question is whether the 2006 policy reform changed their labour market exit behaviour through disability or other exit routes (i.e. unemployment and inactivity). The conditional probability of leaving the labour market through disability or other exit routes is small for both birth years (Figure 2). For both high and low wage earners, the two cohorts have similar trend for the inflow in disability as well as for the use of other exit routes.

#### 4. Empirical strategy

We employ two identification strategies to estimate the impact of financial incentives on early retirement behaviour. First, we exploit exogenous variation in the replacement rates over birth cohorts of workers who are eligible to the transitional scheme. Second, we employ a regression discontinuity design by comparing individuals who are eligible and non-eligible to the transitional scheme.

##### 4.1 Workers eligible to the transitional scheme

To exploit the variation in the replacement rates over birth cohorts, we use the empirical model of Stock and Wise (1990). We select working individuals between age 57 and 63 years old and who are eligible to the transitional scheme. We distinguish between high and low wage earners on the basis of a fixed effect wage regression.<sup>9</sup> The variable of interest is the probability to retire in year  $t+1$  given that the individual works in year  $t$ . Using a Linear Probability Model with random effects we estimate the following equation:

$$P(y_{it+1} = \text{retired} | y_{it} = \text{employed}) = X_{it}\beta + \gamma SSW_{it} + \delta FI_{it} + \varphi OVW_{it} + u_i + \varepsilon_{it} \quad (11)$$

where  $X_{it}$  is composed by a set of demographics, age dummies, employment characteristics and the unemployment rate.<sup>10</sup> The variable  $SSW_{it}$  represents Social Security Wealth,  $FI_{it}$  represents the financial incentive for the price (wage) effect and  $OVW_{it}$  represents the Option Value to Wait. Note that because of the administrative data we know exactly the benefit level

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<sup>9</sup> The classification is made on the basis of the fixed effect, which is estimated conditional on demographics and employment characteristics (but not educational attainment). See Appendix B for details.

<sup>10</sup> The demographics include gender, marital status, nationality and number of children, while the employment characteristics include the number of jobs and tenure in the sector.

at each possible retirement age. This improves the measurement and identification of the financial incentives over a large part of the literature discussed in the introduction. We use two different measures for the financial incentive, the implicit tax on continuing to work and the peak value (Stock and Wise, 1990). Social Security Wealth is the Net Present Value of the early retirement and pension benefits ( $B_t^{ER}, B_t^P$ ) the individual would receive retiring at age  $t$ :

$$NPV_{it}(R) = \sum_{s=R}^{64} \gamma_t \delta^{(s-t)} B_t^{ER}(R) + \sum_{s=65}^T \gamma_t \delta^{(s-t)} B_t^P(R) \quad (12)$$

where  $R$  is the retirement age,  $\delta$  is the discount factor and  $\gamma_t$  is the survival probability.<sup>11</sup> Each individual is eligible to the new actuarial fair scheme (FLEX) at any age above age 55, and becomes eligible to the transitional scheme (OBU) at age  $a_i^{OBU}$ . Therefore  $SSW_{it}$  is equal to:

$$SSW_{it} = I(a_{it} < a_i^{OBU})SSW_{it}^{FLEX} + I(a_{it} \geq a_i^{OBU})SSW_{it}^{OBU} \quad (13)$$

The implicit tax of postponing retirement from year  $t$  to year  $t+1$  is given by:

$$IT_{it} = - \frac{SSW_{it+1} - SSW_{it}}{W_{it+1}} \quad (14)$$

where  $W_{it+1}$  is the wage at year  $t+1$ .<sup>12</sup> The peak value is the maximum difference in social security wealth when retiring at future ages and retiring at current age:

$$PV_{it} = \max(SSW_{iu} - SSW_{it}) \quad u = t + 1, \dots, M \quad (15)$$

where  $M$  is the year in which the individual reaches mandatory retirement age of 65. Finally, the option value to wait gives the gain of postponing retirement:

$$OVW_{it} = \begin{cases} 0 & \text{if } a_{it} \geq a_i^{OBU} \\ SSW_{it}^{OBU} - SSW_{it}^{FLEX} & \text{if } a_{it} < a_i^{OBU} \end{cases} \quad (16)$$

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<sup>11</sup> The time discount rate of 3% and the survival table are provided by the pension fund of the health care sector.

<sup>12</sup> The wage at  $t+1$  in the implicit tax formula is given by pensionable salary in  $t+1$  used by the pension fund to calculate the pension benefit level.



where  $SSW_{its}^{OBU}$  is the net present value of social security wealth for individual  $i$  at year  $t$  and reaching eligibility for the (generous) transitional OBU scheme in year  $s$ .

Using the empirical model of equation (11), we test whether low wage earners react stronger to financial incentives represented by the social security wealth (the income or pension effect), the financial measure for the return to continuing working (the price or wage effect), and the option value to wait. So we expect to find larger parameter estimates, representing the size of the reaction to financial incentives, for low wage earners.

Note that the computation of the net present value of the early retirement and pension benefits, which underlies the financial incentives, does not take potential differences in lifetime expectancy and time preference into account. Empirical evidence suggests that low wage earners have a lower life expectancy and higher time discount rate.<sup>13</sup> The potential overestimation of the net present value for low wage earners leads to an underestimation of the parameters for this group. We nevertheless decide to test our hypotheses on the basis of the assumptions as we have no information on the true life expectancy and time discount rate and the results give a lower bound for the true difference between high and low wage earners.

#### 4.2 *Workers eligible and non-eligible to the transitional scheme*

Workers born in 1948 and 1949 should be rather similar in many respects, but they differ substantially in their early retirement pension rights. Workers born in 1948 may be eligible to the transitional scheme, while workers born in 1949 are not eligible. We exploit a treatment-control design to estimate the impact to have access, whereby the so-called ‘treatment’ group includes individuals born in 1948 and the ‘control’ group includes individuals born in 1949. We select individuals with tenure of at least 10 years to guarantee that individuals meet the eligibility condition of the transitional scheme in both groups.

The variable of interest is the conditional probability of working, entering the disability scheme or using another exit route in year  $t+1$  given the status of working in year  $t$ . The use of a Regression Discontinuity Design (RDD) approach assures that the average outcome for individual marginally above the 1948 birth year threshold represents a valid counterfactual for the outcomes for individuals just below the threshold. Using a multinomial logit model we estimate the following equation:

$$P(y_{it} = \{empl, disabled, other\} | y_{it+1} = empl) = X_{it}\beta + \gamma I(b_i = 1948) + \varepsilon_{it} \quad (17)$$

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<sup>13</sup> See, for example, Kalwij *et al.* (2009).

with birth year  $b_i$ . We also investigate the existence of an anticipation effect of the reform using the following equation:

$$P(y_{it} = \{empl, disabled, other\} | y_{it+1} = empl) = X_{it}\beta + \gamma_1 I(b_i = 1948) + \gamma_2 I(t = 2005) + \gamma_3 I(b_i = 1948)I(t = 2005) + \varepsilon_{it} \quad (18)$$

The interaction variable measures the anticipation effect of the reform in 2006 on the labour market outcomes. As from 2006 onwards postponement of early retirement becomes more attractive, one may expect to see an increased propensity to continue working in 2005.

## 5. Empirical results

On the basis of the theoretical model described in section 2, we expect low wage earners to be more sensitive to financial incentives than high wage workers. We use the empirical models of the previous section to test the hypothesis.

### 5.1 Workers eligible to the transitional scheme

The first identification strategy exploits the change in the replacement rate of the transitional scheme over birth cohorts. The results confirm the theoretical prediction as low wage earners are indeed more sensitive to financial incentives (Table 3).

The effect of Social Security Wealth (*SSW*) can be considered as a measure of the income effect. The empirical literature reports a small but significant effect. We find that for high wage earners the impact of *SSW* is small and not always significant. For low wage earners, we find a more substantial and significant effect. An increase in *SSW* with 22,000 euro (the median wage for low wage earners) leads to increase of the conditional probability to retire of 1%-or 0.4%-point for the model with the implicit tax or the peak value. This implies a decrease of early retirement age of one month or half a month. The income effect is small, a result that is in line with the empirical literature discussed in the introduction.

The variables Option Value to Wait (*OVW*), Implicit Tax (*IT*) and Peak Value (*PV*) could be considered as measures of the price effect. The empirical literature discussed in the introduction reports a substantial and statistically significant effect on the decision to retire. The *OVW* has a negative and highly significant effect on retirement. The effect is substantially larger for low wage earners. In other words, a high reward on waiting for retirement lowers the probability to retire the next year in particular for low wage earners.

**Table 3: Conditional probability of early retirement, marginal effects <sup>(a)</sup>**

	High wage earners		Low wage earners		High wage earners		Low wage earners	
Option Value of Waiting <sup>(b)</sup>	-0.018	***	-0.208	***	-0.011	**	-0.123	***
	(-0.004)		(0.011)		(-0.005)		(0.012)	
Social Security Wealth <sup>(c)</sup>	-0.001		0.047	***	-0.002		0.017	***
	(0.001)		(0.003)		(0.001)		(0.004)	
Implicit tax	0.030	***	0.050	***				
	(0.003)		(0.003)					
Peak Value <sup>(d)</sup>					-0.045	***	-0.814	***
					(0.010)		(0.033)	
Demographics	yes	***	yes	***	yes	***	yes	***
Employment characteristics	yes		yes	***	yes		yes	***
Unemployment rate	-0.013	***	-0.004	***	-0.013	***	-0.005	***
	(0.001)		(0.001)		(0.001)		(0.001)	
# observations	79,655		80,991		79,655		80,991	

Source: administrative data of the pension fund of the health care sector, 1999-2006.

(a) Probability to retirement conditional on employment at year  $t-1$ , linear random effects model, standard errors between parenthesis, parameter values with \*, \*\* and \*\*\* are statistically significant at a level of 10%, 5% and 1%. High and low wage earners are defined on the basis of a fixed effects model (Appendix B). The financial variables on option value, social security wealth and peak value are measured in 100,000 euros. Demographics include age dummies, gender, marital status, children and migration background. Employment characteristics include number of jobs and tenure. Complete estimation results are reported in Appendix C.

(b) Option value of becoming eligible to the transitional early retirement scheme (equation 16).

(c) Social security wealth, the net present value of the early retirement and pension benefit (equation 13).

(d) Peak value, social security wealth maximised by choosing the optimal early retirement age (equation 15).

The implicit tax  $IT$  has a positive and highly significant effect: a high implicit tax on continuing to work leads to a high probability of retiring the next year. A change from a actuarial fair system (i.e. an implicit tax of zero) to a actuarial unfair system (i.e. an implicit tax of one) implies an increase in the conditional probability of 3%-points for high and 5%-points for low wage earners. The  $PV$  has a strongly negative and highly significant effect. For low wage earners, a decrease of the option value of 22,000 euro (which roughly is similar to a change in the implicit tax from zero to one) implies an increase in the conditional probability of retirement of 18%-points. This implies a decrease in the early retirement age of about one year. The size of the price or wage effect may seem large, but it is in line with the literature discussed in the introduction. Moreover, note the reforms in the Netherlands imply a change from a completely actuarial unfair to a completely actuarial fair system and the participation rates of the age groups 55-64 have indeed increased strongly (Euwals *et al.*, 2009).

The differences in the impact of the financial variables (i.e., *SSW*, *OVW*, *IT* and *PV*) on high and low wage earners are statistically significant. As mentioned before, these variables are computed assuming the same survival probability and the same discount rate for both high and low wage earners. Given the definition of these variables, different survival probability and discount rate for the two groups would have a “re-scaling” effect on *SSW* (and consequently on the other variables) widening the differences between high and low wage earners. Therefore, our results can be considered as a lower bound for the difference between high and low wage earners.

Considering the other variables it turns out that individuals having children and individuals who have more than one job are less likely to retire next year (see Appendix C for the estimation results). Furthermore women, married and natives are more likely to retire earlier. The modal retirement age, independent of the financial incentives, turns out to be 60 years. The fact that financial variables do not fully explain a peak in the retirement probability at a certain age is a common finding in the literature and hints at the fact that other aspects, for example social norms in behaviour, play a role as well.

## 5.2 *Workers eligible and non-eligible to the transitional scheme*

The second identification strategy compares individuals who are born in the year 1948 (i.e., who are eligible to the generous transitional scheme) to individuals who are born in the year 1949 (i.e., who are not eligible). We consider two labour market outcomes: the probability of inflow in the disability scheme and the probability of entering an alternative exit route (i.e. unemployment or inactivity). Note that not exiting through disability or another exit route implies continuing to work as the workers are too young to be eligible for early retirement. One may expect the 1948 birth cohort to be less likely to enter the disability scheme as they will have access to the transitional early retirement scheme within a few years.

The results do hint at a significant difference in labour market behaviour between the two birth cohorts (Table 4). This holds for both high and low wage earners. Note that for both groups the size of the effect is rather small in economic terms. The 1948 birth cohort has only a 0.2%-point smaller probability to enter disability than the 1949 birth cohort. As the difference between the cohorts is small, the difference between high and low wage earners is small as well. Furthermore, the results do not hint at an anticipation effect of the 2006 reform for both high and low wage earners.

**Table 4: Conditional probability of disability or other exit route, marginal effects <sup>(a)</sup>**

	High wage earners				Low wage earners			
	RRD		Anticipation		RRD		Anticipation	
			2006 reform				2006 reform	
<u>Disability</u>								
Cohort48	-0.002	***	-0.002	***	-0.002	***	-0.002	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Year05			0.001				0.001	
			(0.002)				(0.002)	
Cohort48 * Year05			0.000				0.000	
			(0.002)				(0.000)	
Demographics	yes	***	yes	***	yes	***	yes	***
Empl. char.	yes		yes	***	yes	***	yes	***
Unempl. rate	-0.007	***	-0.007	***	-0.008	***	-0.008	***
	(0.000)		(0.000)		(0.000)		(0.000)	
<u>Other exit routes</u>								
Cohort48	0.000		0.000		0.000		0.000	
	(0.000)		(0.000)		(0.000)		(0.001)	
Year05			0.000				0.006	
			(0.000)				(0.002)	
Cohort48 * Year05			0.000				0.000	
			(0.000)				(0.000)	
Demographics	yes	***	yes	***	yes	***	yes	***
Empl. char.	yes	***	yes	***	yes	***	yes	***
Unempl. rate	0.001	***	0.001	***	-0.008	***	-0.007	***
	(0.000)		(0.000)		(0.000)		(0.000)	
# observations	9701		9701		8897		8897	

Source: administrative data of the pension fund of the health care sector, 1999-2006.

(a) Probability of disability or other exit route conditional on employment at year  $t-1$  for the birth cohorts 1948 and 1949, linear random effects model, standard errors between parenthesis, parameter values with \*, \*\* and \*\*\* are statistically significant at a level of 10%, 5% and 1%. High and low wage earners are defined on the basis of a fixed effects model (Appendix B). Demographics include age dummies, gender, marital status, children and migration background. Employment characteristics include number of jobs and tenure. Complete estimation results are reported in Appendix C.

## 6. Conclusion

This paper investigates the impact of financial incentives on early retirement behaviour of high and low wage earners. Using a stylized life-cycle model we derive empirical

implications on the behaviour of the two types. The model predicts that low wage earners are more sensitive to financial incentives than high wage earners.

We use administrative pension fund data from the Dutch health sector to test the hypothesis. In order to identify the effect of financial incentives on early retirement we employ two identification strategies. First, we look at the early retirement choices of individuals who are eligible to a transitional early retirement scheme. The empirical analysis exploits a gradual change in the replacement rate over successive birth cohorts. We use direct measures of financial incentives like social security wealth, option value to wait to become eligible, implicit tax and peak value. The precise knowledge of the benefit level at each possible retirement age, which is available because of the administrative data, together with the exogenous variation in these benefit levels improve measurement and identification of the impact of financial incentives on early retirement behaviour over a large part of the literature. Second, we look at the labour market behaviour of two successive birth years, 1948 and 1949. We exploit a regression discontinuity approach as the first birth cohort is the last one to be eligible to the transitional early retirement scheme, while the second cohort is not eligible. We study differences in flow in disability and alternative labour market exits routes. We additionally test for an anticipation effect of the 2006 policy reform.

The empirical results show that low wage earners are more sensitive to financial incentives than high wage earners. The difference in behaviour is substantial for almost all measures for the financial incentives. Both the income effect (measured by social security wealth) and the price effect (measured by the peak value and the option value to wait) are more important for low wage earners. We do find evidence for a difference in behaviour between the 1948 and 1949 birth cohort, but the difference in size is small. The difference between high and low wage earners is small as well and we find no statistically significant anticipation effect for the 2006 policy reform.

An optimal early retirement scheme may include an early retirement option from a certain age onwards with an actuarial unfair adjustment of the benefit level in case the individual decides to continue working (Cremer *et al.*, 2004, 2008). The early retirement option serves as an insurance against unobservable health shock. In such a scheme healthy workers experience a financial incentive to continue working, even though there may be an implicit tax on continuing. Our results imply that such a scheme will induce low wage earners to continue working. In the public debate this may not be expected as the outcome from an optimal scheme, in particular as special pensions for workers with ‘hazardous’ work are common practice in many countries (Zaidi and Whitehouse, 2009).

Many questions are still open for future research, in particular on the exact impact of financial incentives. The models used in this study do not allow for liquidity constraints and short-sighted or irrational behaviour. From theory we know that liquidity constraints may affect high and low wage earners in a different way. High wage earners may experience such constraints early in life as they start working late and they have steep wage profiles. Low wage earners may experience liquidity constraints later in life as they may want to borrow against their social security rights. The latter liquidity constraints may however result from short-sighted or irrational behaviour, which may occur among low wage earners more often. On the empirical side there exist intriguing challenges as well. The Dutch 2006 policy reform, for example, will offer great opportunities to identify the causal impact of financial incentives on retirement behaviour in the upcoming years.

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## Appendix A: Data

The empirical analysis in this study is based on administrative data from the second largest pension fund in the Netherlands, the health care sector pension fund PFZW (former PGGM). The fund placed the administrative records of its participants for the years 1999 – 2007 at the disposal of Statistic Netherlands. The data is processed such that it can be merged to other administrative data available at Statistic Netherlands.

The administrative pension fund data is a yearly cross-section containing individual records of the participants of the fund. The data contains information on gender, date of birth, working hours, wages, tenure and pension and early retirement rights. The kind of occupation is not available in the data, but nevertheless we know that the occupations vary from nurses to medical doctors and include supporting activities like administration. Note that not all medical doctors are included in the data as many are self-employed. The number of observations in the dataset increases from 0.8 million in 1999 to 1.2 million in 2006. The number of observations in the data increases over time for two reasons. The Dutch health sector is growing due to population growth and ageing, which leads to an increase in the demand for health care. Furthermore, the fund is expanding due to the acquisition of firms that belong to the sector but that were not yet participating in the fund.

We merge the administrative pension fund data to two other datasets. The first is the administrative municipality dataset (GBA), which is based on population registers. It contains demographic information like birth, marriage, local migration and mortality. The second is the administrative employment register dataset (SSB\_jobs), which is based on the national employment insurance registers and on the tax registers. The registers contain information on working hours, salary and some firm information (see Euwals *et al.*, 2010b, for details)

The health sector employs many part-time working women (Table 5). This is due to large number of nursing jobs within the sector. Furthermore, many individuals are between age 25 and 50. Only few individuals have tenure in the sector of more than 30 years, which is largely the result of a relatively young workforce. A minority of employees works fulltime, whereby the fraction has increased from about one out of four in 1999 to about one out of three in 2006. The gross fulltime wage ranges from 20 to 42 thousand euro per year in 2006. Wage inequality has increased over time. The gross fulltime wage of the upper quintile (q90) has increased with 32% while for the lowest quintile (q10) it has increased with 26%.

**Table 5: Descriptive statistics, age 15-64, 1999-2006 <sup>(a)</sup>**

	1999	2000	2001	2002	2003	2005	2006
thousands							
Observations	787	881	808	1.158	1.032	1018	1109
Gender							
	%						
Female	82	82	83	82	83	84	84
Male	18	18	17	18	17	16	16
Age							
<20	1	1	2	2	2	2	1
20-24	6	7	8	8	9	9	8
25-29	12	10	10	10	10	11	10
30-34	14	14	13	13	11	11	10
35-39	16	16	15	14	13	13	12
40-44	17	17	16	16	15	15	14
45-49	15	19	15	15	15	15	15
50-54	12	12	12	12	12	13	13
55-49	6	7	7	8	9	9	10
60-65	2	2	3	3	3	2	6
Working hours							
1-11 hours	14	15	16	34	21	9	9
12-23 hours	31	30	29	23	27	27	28
24-31 hours	20	20	20	16	19	20	21
32-35 hours	11	11	12	9	12	12	12
36 and more hours	24	24	23	18	21	31	31
Tenure							
0-9 years	61	59	60	56	55	57	52
10-19 years	26	27	29	28	28	27	28
20-29 years	12	12	14	13	14	13	15
30-39 years	1	2	2	2	3	3	5
>40 years	0	0	0	0	0	0	0
Fulltime salary <sup>(b)</sup> thousands							
Q10	15.4	15.7	16.4	16.9	18.0	18.9	19.4
Q25	17.9	18.4	19.2	19.8	21.2	22.3	22.8
Q50	22.0	22.6	23.8	24.5	26.6	27.9	28.4
Q75	26.6	27.5	28.9	30.2	32.5	33.9	34.3
Q90	31.7	32.9	34.6	36.4	38.9	40.9	41.7

Source: administrative data of the pension fund of the health care sector, 1999-2006.

(a) Participants of the pension fund PFZW, the pension fund of the health care sector. The participants include former participants (so-called 'sleepers') and exclude PFZW and PGM employees. The participants include, for example, nurses, social workers, and physicians employed by a hospital. The years 2004 and 2007 are not used as the data are incomplete for these particular years.

(b) The so-called 'pensionable' salary in gross terms.

During the first year of observation, the year 1999, about 95% of workers born before 1949 is eligible to the transitional scheme. Most of them have access at age 60; only a small percentage of workers have access at age 61 or later (see also Euwals, Trevisan and van Vuren, 2010). The later access is partly the result of the requirement to be working in the sector for at least 10 years. Selection may also play a role however. Workers eligible at age 60 may have decided to continue working and are therefore eligible at age 61. The number of employees who do not satisfy the requirements for the transitional arrangement is higher in 2006. This may again be a selection effect as to be eligible one needed to be employed in the sector in 1998.

Individuals who are and are not eligible to the transitional scheme differ in several aspects. The major difference is represented by tenure distribution; the majority of the 'non-eligible' has tenure lower than ten years. This is a result of the conditions to be eligible. The two groups differ in other aspects as well. Many of the non-eligible individuals are women, work part-time for one to eleven hours per week, and have lower wages.

## **Appendix B: Definition of high and low wage earners**

The study identifies the difference in the impact of financial incentives on early retirement behaviour between high and low wage earners. Another obvious choice to distinguish between groups would have been educational attainment, but unfortunately it is not observed in the administrative data.

To distinguish between high and low skilled workers we use the variable on the fulltime wage. In order to maintain the same composition of the two groups over all periods we run a fixed effect model on the fulltime wage using demographic variables and time dummies. We use the following equation:

$$W_{it} = \alpha_i + X_{it}\beta + \delta_t + \varepsilon_{it} \quad (19)$$

where  $W_{it}$  is the fulltime wage,  $\alpha_i$  is the individual fixed effect and  $\delta_t$  is the time effect. The vector  $X_{it}$  contain exogenous variables including number of children, marital status, number of jobs, tenure and unemployment rate. Next, we look at the distribution of the individual fixed effect and we define high skilled workers as individuals who have fixed effect higher than the median and low skilled workers as individuals who have a fixed effect lower than the median.

The estimation results may be sensitive to the choice of the cut-off point to distinguish between the high and low wage earners. For this reason we performed some sensitivity analyses, using the (25<sup>th</sup>, 75<sup>th</sup>) percentile and the (10<sup>th</sup>, 90<sup>th</sup>) percentile as cut-off points. The conclusions from these analyses are in line with the results presented in the study.

## Appendix C: Estimation results

**Table 6: Conditional probability of early retirement, marginal effects <sup>(a)</sup>**

	High wage earners		Low wage earners		High wage earners		Low wage earners	
OVW	-0.018 ***	(0.004)	-0.208 ***	(0.011)	-0.011 **	(0.005)	-0.123 ***	(0.012)
SSW	-0.001	(0.001)	0.047 ***	(0.003)	-0.002 ***	(0.001)	0.017 ***	(0.004)
Implicit tax	0.030 ***	(0.003)	0.050 ***	(0.003)				
Peak Value					-0.045 ***	(0.010)	-0.814 ***	(0.033)
Female	0.012 ***	(0.003)	0.052 ***	(0.005)	0.011 ***	(0.003)	0.035 ***	(0.005)
Dutch	0.014 ***	(0.004)	0.004	(0.004)	0.014 ***	(0.003)	0.005	(0.004)
Children	-0.009 ***	(0.003)	-0.014 ***	(0.003)	-0.010 **	(0.003)	-0.014 ***	(0.003)
Married	0.007 **	(0.003)	0.019 ***	(0.003)	0.007 **	(0.003)	0.018 ***	(0.003)
Number of jobs	0.001	(0.004)	-0.015 ***	(0.003)	0.001	(0.004)	-0.015 ***	(0.003)
Tenure	0.000	(0.001)	-0.002 ***	(0.000)	0.000	(0.000)	-0.001 ***	(0.000)
Age 57	-0.335 ***	(0.006)	-0.332 ***	(0.004)	-0.351 ***	(0.006)	-0.355 ***	(0.004)
Age 58	-0.359 ***	(0.004)	-0.342 ***	(0.004)	-0.373 ***	(0.004)	-0.348 ***	(0.004)
Age 60	-0.243 ***	(0.010)	-0.246 ***	(0.007)	-0.249 ***	(0.010)	-0.240 ***	(0.007)
Age 61	-0.262 ***	(0.013)	-0.245 ***	(0.008)	-0.268 ***	(0.013)	-0.243 ***	(0.008)
Age 62	-0.327 ***	(0.018)	-0.308 ***	(0.010)	-0.331 ***	(0.018)	-0.309 ***	(0.010)
Unempl. rate	-0.013 ***	(0.001)	-0.004 ***	(0.001)	-0.013 ***	(0.001)	-0.005 ***	(0.001)

(a) Probability to retirement conditional on employment at year  $t-1$ , linear random effects model, standard errors between parenthesis, parameter values with \*, \*\* and \*\*\* are significant at a level of 10%, 5% and 1%.

**Table 7: Conditional probability of disability or other exit route, marginal effects <sup>(a)</sup>**

	High wage earners				Low wage earners			
	RRD		Anticipation 2006 reform		RRD		Anticipation 2006 reform	
Disability								
Cohort48	-0.002	***	-0.002	***	-0.002	***	-0.002	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Year05			0.001				0.001	
			(0.002)				(0.002)	
Cohort48 * Year05			0.000				0.000	
			(0.002)				(0.000)	
Age	0.002	***	0.002	***	0.002	***	0.002	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Female	0.004	***	0.003	***	0.002	*	0.001	***
	(0.000)		(0.000)		(0.001)		(0.000)	
Dutch	-0.002	***	0.000		-0.001	*	-0.000	
	(0.000)		(0.001)		(0.000)		(0.000)	
Children	-0.001	***	-0.001	***	-0.001	***	-0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Married	-0.002	***	-0.001	***	-0.001	***	-0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Number of jobs	0.000		-0.003	***	-0.004	***	-0.003	***
	(0.000)		(0.000)		(0.001)		(0.000)	
Tenure	0.000		0.000		0.000		0.000	***
	(0.001)		(0.000)		(0.000)		(0.000)	
Unempl. rate	-0.007	***	-0.007	***	-0.008	***	-0.008	***
	(0.000)		(0.000)		(0.000)		(0.000)	

(a) Probability of disability or other exit route conditional on employment at year  $t-1$ , linear random effects model, standard errors between parenthesis, parameter values with \*, \*\* and \*\*\* are statistically significant at a level of 10%, 5% and 1%. High and low wage earners are defined on the basis of a fixed effects model.

**Table 7 continued: Conditional probability of disability or other exit route**

	High wage earners		Low wage earners	
	RRD	Anticipation 2006 reform	RRD	Anticipation 2006 reform
Other exit routes				
Cohort48	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)
Year05		0.000 (0.000)		0.006 (0.002)
Cohort48 * Year05		0.000 (0.000)		0.000 (0.000)
Age	0.000 (0.000)	0.000 (0.000)	0.003 *** (0.000)	0.002 *** (0.000)
Female	0.001 *** (0.001)	0.002 *** (0.000)	0.000 (0.000)	0.000 (0.000)
Dutch	0.000 (0.000)	0.001 * (0.000)	0.001 * (0.000)	0.001 ** (0.000)
Children	0.000 (0.000)	0.000 (0.000)	0.001 * (0.000)	0.001 *** (0.000)
Married	0.000 (0.000)	0.001 (0.001)	-0.001 *** (0.000)	-0.002 *** (0.000)
Number of jobs	0.001 *** (0.000)	0.001 *** (0.000)	-0.004 *** (0.000)	-0.004 *** (0.000)
Tenure	0.000 (0.000)	0.000 (0.000)	0.000 *** (0.000)	0.000 (0.000)
Unempl.rate	0.001 *** (0.000)	0.001 *** (0.000)	-0.008 *** (0.000)	-0.007 *** (0.000)







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