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Labor Force Participation of Older Workers in the Netherlands

An Analysis of Recent Policy Measures

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Abstract

The labor force participation of Dutch elderly workers is considered to be extremely low in comparison to other Western countries. In 2003 the participation rates of the older workers in the Netherlands were below the OECD average; 6 percentage point for women and 2 percentage point for men. Especially in the 70s and 80s several financial incentives contributed to this decline. However, nowadays the sustainability of the Dutch pension system is under pressure. Both the increased life expectancy of individuals and the aging of the population increased the old-age dependency ratio, implying an enormous rise in public pension spending. Public spending is expected to rise from 4,7% of GDP to 8,8% in 2040. Hence, it is clear that reforms are inevitable in the future. Recently announced reforms by the Dutch government, imply in particular that individuals will have to keep working for a longer period. For this to be effective, the labor force participation of older workers has to increase. This thesis will both empirically analyze the effects of the upcoming reforms in the Netherlands, as well as analyze some scenarios, concerning the retirement decision of older workers. Hence, will the reforms lead to an increase in the period that individuals stay active in the labor force?

Chapter 1: Introduction

1.1 Problem motivation

During the late 70s and especially in the 80s, the Dutch economy was characterized by high unemployment rates among young workers and low economic growth (Euwals, van Vuuren, & Wolthoff, 2010). In order to try to solve this problem, the government wanted to get rid of older less productive workers and make room for younger less expensive workers instead. As a result the first 'early retirement scheme' was introduced in 1976-1977 in the Netherlands. This was the so-called VUT[1] arrangement. This arrangements' main goal was to promote the well-being of older workers, but it was also aiming at creating job opportunities for young workers, and thereby trying to reducing the high youth unemployment rates (Nelissen, 2001).

During this period several other alternative benefit programs gained popularity as well, and became popular means of exiting the labor market before reaching the statutory retirement age of 65. Popular exit routes were: disability insurance (DI) and unemployment benefits (UB); WAO and WW respectively in Dutch. As a consequence the number of older workers, mainly in the age range 50-65 leaving the labor market early was increasing. In the period 1975-1985 the number of people that was using DI as an exit route rose from 21% to 37%, and the number of people exiting via ER increased in this period from 2% to 10% (Kapteyn & de Vos, 1997). The reason for the popularity of these schemes was due to their features; namely all were characterized by very weak eligibility conditions, very generous replacement rates and relatively long entitlement periods (Lindeboom, 1998).

By reason of these financial incentives that were provided by the several benefit schemes, the labor force participation of older workers in the age range 55-65 declined to dramatically low levels[2], implying an effective retirement age of 57 years on average over the years (Euwals, van Vuuren, & Wolthoff, 2006).

[1] VUT arrangement: Vervroegde Uittreding in Dutch, which means early retirement.
[2] By the end of the 80s the labor force participation rates for workers were 38% and 13% for the age groups 55-60 and 60-65 respectively, according to Statistics Netherlands (CBS).

In the early 90s, the Dutch government recognized for the first time that these schemes were providing adverse effects on the labor force participation. As a response, the programs have been subject to several reforms over the last couple of years. First of all, the ER scheme is transformed from a generous and actuarially unfair pas-as-you-go[3] (PAYG) scheme into a less generous and more actuarially fair funded scheme (Nelissen, 2001). Moreover, in 2003 the government decided to abolish the follow-up of 2.5 years unemployment benefits for the long-term unemployed. This abolishment eliminated the possibility for people to effectively retire at 57.5 years. And lastly the government decided to limit the eligibility conditions for DI and reduce the benefit levels for the partially disabled (Bovenberg & Gradus, 2008).

However, recent developments such as the increasing life expectancy of individuals and the extreme low levels of interest rates have made it even more important to promote higher labor force participation in order to ensure the sustainability of the public finances. Due to the aging of the population, the cost of the Dutch public pension, the AOW, is expected to rise from $4{,}7\%$ of GDP to $8{,}8\%$ in 2040 (Bovenberg & Gradus, 2008). This implies that the measures taken in the 90s were not sufficient enough to increase the labor force participation of older workers to a certain level as such to preserve the sustainability of the system. That is why we are in need of further reforms (Bovenberg & Gradus, 2008). It is necessary that the reforms are effective and will induce a rise in the labor force participation rates of older workers, and eventually contribute to the sustainability of the first pillar of the Dutch pension system.

1.2 Research Goal

Last year (2012) the Dutch government announced a new "pension agreement". This agreement was topic of severe discussions between the labor unions and the coalition. However they managed to agree on a set of measures and reforms that will be implemented in the future. The main measures are:

- The statutory retirement age (age that you become eligible for receiving AOW) will be increased, first in 2020 to 66 and eventually to 67 in 2025.
- The state pension (AOW) will be increased as of January 1 2013 with $0{,}6\%$ per year.
- The AOW will be made flexible, which allows individuals to choose when they want to retire. If you decide to retire earlier this implies a lower AOW benefit and vice versa.

[3] Pay-as-you-go financing of a scheme implies that contributions of current workers are used to pay for the (early) retirement of the current retirees.

- Workbonus; individuals who continue to work will receive a 'bonus' from age 61-64 in still in the labor force.

However, recently the government decided to change some aspects of the pension agreement as part of the cut backs that have to me made concerning the prevailing standards of the budget deficit. As a consequence immediate reforms are needed. Hence, the eligibility age of the state pension (AOW) will start to increase sooner, and next to that the reform measures concerning the yearly increase of the AOW and the flexibility option will no longer be implemented. Nevertheless, these are still interesting measures with possible significant effect on the retirement decision. Therefore, we will analyze these measures as possible scenarios in this thesis.

Aside from the measures from the pension agreement, the government strives to make it more attractive for older workers to stay longer and healthier in their job which is part of the so-called "vitaliteits pakket".

All in all, it is of great importance to increase the labor force participation of older workers as the need is greater now than ever. Even though previous attempts failed or turned out not to be very effective, the new package of measures is intended to increase the labor force participation considerably. Therefore, this research will be about the expected long-term effects of the new measures on the labor force participation of elderly. Will the participation actually increase? Hence, this thesis will elaborate on the question whether the new package of measures as planned by the Dutch government will increase the labor force participation of older workers in the long-term.

1.3 Research approach

In order to be able to perform a solid research, basic knowledge of the Dutch pension system is needed. This together with the history and overview of the current pension and benefits programs, based on academic literature, will form the second chapter.

Subsequently, in the next chapter the incentive measures will be discussed and especially the effect on individual retirement behavior will be explained. Building on this analysis we will simulate the effects of the following measures:

- The statutory retirement age will be increased; to 66 in 2019 and 67 in 2023.
- The state pension (AOW) will increase from 2013-2028 by $0{,}6\%$ per year

- The state pension (AOW) will become flexible; meaning that people could choose to delay their retirement for up to 5 years, delaying implies a yearly increase of 6,5% of your pension and vice versa.
- Workbonus; individuals who continue to work will receive a 'bonus' from age 61-64 if still in the labor force.

In order to find what the effects of the proposed reforms are on the labor force participation, we will use the concept of Social Security Wealth (SSW) as presented by Coile and Gruber (2000). Hence, the SSW before and after the reforms will be compared in order to gain insight in the effects. This comparison will be done by performing a probit regression analysis which is widely used in economic literature (Coile & Gruber, 2000). Probit regression analysis is used in policy simulations, and that is why it is a very applicable method to use in this thesis. Prior to the calculations and the regression analyses, the incentive measures will be specified, such as the accrual and implicit tax (Stock & Wise, 1988). However, these incentive measures and further explanation of the SSW concept will all be discussed in detail in Chapter 3.

1.4 Research outline

As mentioned above, prior to the analysis some basic knowledge about the history and development of the early retirement and other benefit programs in the Netherlands will be discussed. This will be done in Chapter 2. Subsequently, Chapter 3 will cover the research method in detail and will model the current situation using the current incentives. Thereupon, Chapter 4 will present the results of the empirical analysis and show the effects of the reforms on the retirement decision of Dutch elderly workers. And finally Chapter 5, will contain the conclusion and recommendations based on the results of the analysis and furthermore some suggestions will be made for possible future research in this field of study.

Chapter 2: Early retirement and other benefit programs in the Netherlands

In this thesis the upcoming increase of the statutory retirement age in the Dutch pension system, as well as some other possible scenarios will be simulated to look into the effects on the labor force participation of older workers. But beforehand, the Dutch pension system will be described in Section 2.1. Section 2.2 will review the early retirement programs in the Netherlands and the undertaken reforms to the ER schemes. Other benefit programs that are known for serving as an exit route out of the labor market as well as related reforms will be discussed in Section 2.3. Then in Section 2.4 the previously taken reforms and their effects on the labor force participation will be summarized and at the same time an overview of the current situation will be presented. And finally Section 2.5 elaborates on the new measures as presented in the pension agreement of 2011 and gives a detailed overview of the scenarios along with the possible effects according to previous results and economic theory.

2.1 The Dutch pension system

Nowadays, the Dutch pension system is considered to be one of the best systems in the world. However it has not always been that way. In the economically flourishing period after the Second World War, an extensive welfare state was set up in the Netherlands. It consisted out of a pension system and a public disability insurance scheme. In 1957 the General Old Age Act (AOW, Algemene Ouderdom Wet) was installed, hence the Dutch state pension system was set up (Van Riel, Hemerijck, & Visser, 2002). This was the beginning of the system as we know it today.

The current system as it nowadays exists consists out of three pillars. The first pillar is the public pension scheme which is called the AOW in Dutch. Every Dutch citizen is entitled to this old age pension which you receive from the age of 65 on. The first pillar is financed on a pay-as-you-go base, which implies that the currently working pay for the retirees. As said before, every Dutch citizen is entitled to this pension, which is accrued at a flat rate of 2% per year from the age of 15 until 65. The level of the AOW is independent of tenure, experience or other income, but it depends on household composition. In general, every individual at the age of 65 will receive an AOW benefit level that is equal to 50% of the

statutory minimum wage, and a single household will receive 70% of the statutory minimum wage (Bovenberg & Meijdam, 2001).

The second pillar of the Dutch pension system consists of funded occupational pensions. Participation in occupational plans is in general compulsory for workers. Furthermore, the usual eligibility age for these pensions is 65, as for the public pension. Although there is a great variety in the offered pension arrangements, the majority of these are of the defined-benefit (DB) type and aim to pay on average a pension income of 70% of the final wage after 40 years of contribution (Mastrogiacomo, Alessie, & Lindeboom, 2002).

Finally, the third pillar is based on private savings, for example through annuity insurance. Private contributions in the third pillar are tax deductible provided that they do not result in a total pension income exceeding 70% of the final wage at age 65. Given the fact that most supplementary pensions aim at having an ambition level of 70% of final wages, there is little room for the third pillar pensions (Van Riel et., 2002).

Summing up, the Dutch pension system has a three pillar construction with the third pillar being relatively small in size compared to the other two pillars. In this thesis the focus will solely be on the first and second pillar, nevertheless it is good to have a clear understanding of how the system operates as a whole.

2.2 Early retirement schemes in the Netherlands

In the late 50s the Dutch government started setting up an extensive welfare state. At the beginning the two main elements in the system were the state pension (AOW) and the occupational pensions from the second pillar. However, during the late 70s and 80s the Dutch economy was facing an economic downturn and was subject to high unemployment rates, mainly among the young (Euwals et al., 2010). As the government was trying to combat this, they installed in 1976 the first early retirement scheme (VUT) in addition to the already existing schemes. It started as an experiment in a couple of industries, but soon it expanded and became common good in the other industries as well. The aim of the regulation was mainly to improve the well-being of older employees. And on the other hand it served for the improvement of the employment of the young and along with that trying to reduce the high unemployment rates among young workers (Nelissen, 2001).

At the beginning the ER scheme was a flat rate scheme, with very weak eligibility conditions and very generous benefits, which made it very attractive. As said previously, it was a perfect way to lower the youth unemployment by getting rid of older unproductive workers. Besides, it was also very attractive for older employees, since they may have a preference for early retirement because of bad health or household situation (Kapteyn & de Vos, 1997).

The early retirement schemes were financed on a pay-as-you-go base and were highly actuarially unfair. This means that upon the worker reaches the eligibility age for early retirement, he can retire and will receive early retirement benefits which are equal to 80% of the last earned wage in gross terms. However, due to the progressive element in the tax system and the continuation of pension rights accrual when early retired, the actual benefit one received from the ER scheme was higher than 80%, making it a very attractive exit route out of the labor market (Euwals, van Vuren, & van Vuuren, 2011). Due to this actuarial unfairness, working one additional year, and thereby postponing early retirement, would not lead to an increase in the replacement rate. Hence, an additional year in work is implicitly taxed at very high rates, for many workers this rate was around 100%. By means of this high implicit tax on working another year and the financial incentives, the ER schemes became very attractive, which resulted in a decline of the labor force participation rates of workers in the age range 55-65 (Nelissen, 2001).

Even though the decline of the participation rates was in accordance with the goal of the ER scheme to create more jobs for young workers, the government started to doubt the effects as the costs became too high. Soon it appeared that the welfare state and the early retirement schemes were not going to be sustainable in the long-run. That is why the early retirement schemes were subject to a series of reforms during the years that followed (Euwals et al. 2011). The most important reforms will be discussed in the next subsection as well as the resulting effects on the labor force participation.

2.2.1 Reforms in the early retirement schemes

The number of people exiting the labor market via ER schemes had reached significantly high levels and due to the high number of recipients the costs became higher than expected. Meanwhile the decline of the participation of older workers became undesirable. Hence, it was obvious that reforms were needed in order to prevent a further increase of ER recipients and thereby a further decline of labor participation rates of older workers.

This resulted in an agreement between the unions and the employer organizations (Euwals et al., 2006). The generous and actuarially unfair ER schemes had to be transformed into less generous and actuarially fair schemes, by removing the implicit tax. This transition started in 1997 and was supposed to be completed by 2022, however in 2006 a new law was accepted concerning this. This new law was a move towards a direct transition to actuarial fairness of the scheme. The early retirement schemes became incorporated into the capital-funded occupational pension system. These new schemes brought actuarial adjustments across different retirement ages, nevertheless the early retirement wealth was considerably lower now. Some of the large Dutch pension funds provided an early retirement benefit of around 70% of the average earned wage at an age of 63 (Euwals et al., 2006). This switch towards funded schemes created more choice possibilities concerning early retirement by offering flexible pension contracts (Nelissen, 2001).

About one decade later, the sustainability of the entire pension system is under pressure due to the severe aging of the population and the increased life expectancy of individuals. The aging of the population is not only a financial problem, but it is also problematic for the labor market (Bruinshoofd & Grob, 2005). The old-age dependency ratio rises, which implies a strong change in the ratio between workers and retirees. Now for every retiree there are 4 workers, whereas over 20 years this will decline to only 2 workers. Hence, in order to keep the AOW affordable it is highly necessary that people will stay longer in work and thereby delay their exit out of the labor market.

2.3 Other benefit programs in the Netherlands

As mentioned before, in the 80s early retirement programs and several other benefit programs have contributed to enormous exit rates out of the labor market of workers before reaching the statutory retirement age of 65. The programs that were used as exit routes at that time and the reforms that have been undertaken will be discussed below.

2.3.1 Disability Insurance

The disability insurance, in Dutch Wet op Arbeidsongeschiktheid (WAO), was introduced in 1967 in the Netherlands. This disability insurance covers all employees, and it insures workers who do not recover from sickness within a period of 2 years (Euwals et al., 2011). The DI benefits were very generous at the beginning; you would receive benefits that were equal to 80% of your final pay. Furthermore, the eligibility conditions for receiving DI were very weak, as the medical examinations were often not that strict, and while being on disability you often kept accumulating pension rights if still employed. All this made it very attractive for both employees and employers to use it as an exit route out of the labor market. Employers even started to offer older workers a bonus in addition to their social insurance income if exit the labor market via DI (Groot & Heyma, 2004). Due to all the above mentioned characteristics of this scheme, the number of DI recipients increased more than was expected. As a result many reforms took place starting in the late 80s (Euwals, et al., 2011). The reforms that were undertaken due to the fact that the effects of the incentives started to have an adverse effect on the labor participation, will be discussed in the next subsection.

2.3.2 Reforms in disability insurance schemes

As the inflow into DI increased more than was previously anticipated on, the Dutch government decided to change the generous replacement rate the scheme was offering. The replacement rate was decreased to 70% of the final pay and the entry conditions were somewhat tightened. However, the reform did not have a sufficient impact on the cost reduction and the number of recipients of DI (Euwals et al., 2011). The reason for this disappointing result was the fact that the reduction of the replacement rate was repaired by the unions in the collective labor agreements. In the 90s more reforms were brought to the disability insurance scheme, more financial incentives were introduced to make employees and employers aware of the use of sickness and disability benefits. Until 1993 a person that was fully disabled would receive a benefit for an unlimited period of time that is wage-related. However, as of that moment the DI benefit levels were made dependent of the person's age and history of employment and besides the recipient was obliged to have medical examinations at regular intervals in order to verify that one's eligibility still holds. From 1993, the duration of the benefits depended on age and ranged from 0 to 6 years. After this first period, the benefit level was lowered and the amount of the reduction depended on previous wages and age (Lindeboom, 1998). As a result the number of people receiving DI benefits decreased somewhat, nevertheless in the late 90s this number started to increase

again. That is why in 2001 a commission[4] was appointed to look at the DI scheme and to propose recommendations for decreasing the number of recipients. With the recommendations from this advice council the Cabinet Balkenende I introduced in 2006 a major change to the DI scheme. The reform was intended to limit the eligibility by sharpening the entry conditions into DI and reducing the benefit levels for the partially disabled. Partially disabled, people that have a degree of disablement of at least 35%, or people who have a good chance of recovery, can receive a supplement to the their wage if they work or otherwise apply for unemployment benefits if no longer being in work (Bovenberg & Gradus, 2008). The new Disability Act was implemented on January 1, 2006 whereas in 2004 already the more sharp screening of the loss in earnings capacity was implemented. In the end, it can be stated that all these measures had effect on the number of individuals receiving DI and thereby exiting the labor market too early; the number of disabled persons has fallen the last couple of years (Bovenberg & Gradus, 2008).

2.3.3 Unemployment benefits

The unemployment benefit program in the Netherlands was in the 80s also a popular alternative to use as an exit route out of the labor market. The unemployment insurance program consists of two elements: unemployment benefits (UB) and social assistance (SA). However, UB is only discussed here in detail, since those benefits had effect on the labor force participation.

The unemployment benefit (UB) program is used as a safety net to protect individuals who experience a loss of income due to involuntary unemployment. Entitlement to unemployment benefits depends on past job tenure and work experience. The duration of the benefits has a maximum of 5 years, and the replacement rate is a fixed percentage of previous earnings (Van Ours, 2003). After this maximum period of receiving UB one can apply for SA[5], which will be provided until the mandatory retirement age. The level and eligibility of the SA are means-tested; this implies that one's wealth level and the level of income of a possible partner are taken into consideration (Lindeboom, 1998). A requirement of the UB program is that it is obligatory to engage in an active search for (re)employment in order to maintain receipt of the benefits (Van Ours, 2003). This requirement for active job search does not apply to individuals that are older than 57.5 years; hence this implies that for those individuals UB can be viewed as a pre-pension retirement income. That is why it was an attractive route of exiting the labor market before reaching the retirement age; hence it contributed to the large decline in the labor force

[4] Analyse van de voorstellen van de adviescommissie arbeidsongeschiktheid Donner II (2001).
[5] Social Assistance is provided as income support for those who cannot provide for themselves, and who are not eligible for other support programs such as DI, UB or AOW.

participation of older workers. In view of the expected long-term increase in the cost of aging and therefore the need to promote greater labor participation of older workers, the Dutch government decided to bring along some reforms to the unemployment benefit programs. In the next subsection the taken policy measures will be discussed.

2.3.4 Reforms in unemployment benefit programs

In 2003 it was decided to abolish the follow-up unemployment benefits for the long-term unemployed. The maximum period for unemployment benefits was 5 years and after that it could be extended for another 2.5 years for people older than 57.5 years. The abolishment of this so-called follow-up benefit had as a goal to prevent employers to effectively retire their older workers at the age of 57.5 (Bovenberg & Gradus, 2008). Furthermore as of January 2004, the requirement for an active job search was reinstated and became now also applicable for older workers. This implied that workers older than 57.5 years were no longer exempted and became obliged to report their search behavior to the unemployment office (Bloemen, Lammers, & Hochguertel, 2011). As a result this helped to increase the employment of older workers somewhat. Another remarkable reform measure was the decrease of the duration period of the unemployment benefits. As it was up to a maximum of 5 years, it was shortened to 3 years and 2 months. Even though these measures had some impact on the labor participation of older employees and the eligibility conditions were tightened, the government still found that further reforms were necessary in order to increase both the quality and quantity of the labor force by improving the employability of the workforce (Bovenberg & Gradus, 2008). In need of further reforms the government appointed a committee to look into further reforms in the unemployment benefit programs. The Bakker committee[6] proposed to transit the current unemployment insurance system into a system of work insurance. However, the detailed elaboration of converting the system will not be discussed here further.

[6] Commissie Bakker, Plan van aanpak vervolg advies commissie arbeidsparticipatie, (2008).

2.4 Overview of past and current situation in the Netherlands

As has been discussed in the previous sections, the pension system and various benefit programs in the Netherlands have been reformed over the years. Several committees were installed by the government concerning the labor force participation of older workers. This number had reached dramatically[7] low levels and had to be increased again. Some major reforms have occurred relatively recently, and other reforms still have to be implemented in the upcoming years. As the aim of this research is to find whether the new policy measures that are taken, but yet have to be implemented will have effect on the labor force participation of workers in the age group 55-64 and the possible scenarios, the current situation has to be clear. That is why below, the effects of the reforms that already have been taken will be discussed.

It all started with the high unemployment rates among the youth in the 70s and 80s. Trying to combat this, the Dutch government started implementing several benefit schemes and introduced an early retirement scheme; these schemes provided strong financial incentives, especially for older workers inducing them to retire earlier. The introduction of early retirement schemes as well as disability insurance and unemployment benefits led to a decline in the labor participation of older workers. This decline was also the aim of these schemes as it was necessary to make room for younger more productive workers. Previous research conducted by (Kapteyn & de Vos, 1997; Lindeboom, 1998) showed that the alternative exit routes act as substitutes, which implies that changes in one scheme affect the exit rate into the other schemes. Furthermore, according to Kapteyn and de Vos (1997) the effect of these schemes on one's future benefits if retiring immediately instead of staying one additional year in work is low. This is due to the presence of the high implicit tax rates on working an additional year. These extremely high implicit tax rates, which amounted for most people around the 100%, provided strong incentives to exit the labor market earlier instead of staying an extra year in work (Groot & Heyma, 2004). That explains the enormous leave of older workers out of the labor market.

Due to the aging problem and the rising costs of the public budget, as has been explained in the previous sections, the alternative exit routes have been subject to several regulation changes over the years. The current situation will be used as the starting point for this research, which will be explained in

[7] For male workers in the age group 50-65 the labor force participation rates declined from about 80% in 1960 to only 20% in 1994. And for workers older than 65 years the participation rated decreased from 20% to about 3% in 1985 (Kapteyn & de Vos, 1997).

detail in the next chapter. To be able to find the effects on labor participation of incentives present in the current situation, we first have to give a clear overview of the current situation.

Nowadays, the early retirement scheme is made fiscally unattractive, by abolishing the tax deductibility of the ER premiums for individuals that are younger than 55 years. Furthermore, some pension funds still have pension agreements that allow early retirement with a minimum ER age of 63 years, but this only holds for employees who have paid contributions for 40 years (Oosenbrug, 2006).

Until recently the disability insurance has also widely been used as an exit route out of the labor market. However, the number of DI recipients has declined, since the screening and the application for DI has been sharpened. Furthermore, there are more financial incentives introduced to employers in order to employ more partially disabled workers. These partially disabled workers will also be stimulated to stay in work, since the difference between their wage and DI benefit will be compensated. This is how the DI scheme is regulated at the moment (Bovenberg & Gradus, 2008).

Finally, considering the current situation of the unemployment scheme, the duration of receipt of the unemployment benefits has been reduced. Next to that, the requirement for an active search for (re)employment is introduced for older workers. This makes it harder for them to effectively retire early via this route (Bloemen et al., 2011).

2.5 Policy measures concerning greater labor force participation[8]

The most striking policy measure from the new pension agreement concerns the statutory retirement age. As of the introduction of the pension system in the Netherlands, this has been 65 years. However, this is going to be increased. The agreement states that the statutory retirement age at which you can receive AOW will gradually be increased to 66 years in 2020 and eventually to 67 years in 2025 (Stichting van Arbeid, 2011). However, since this is a much discussed topic at the moment it has recently been revised. As part of the Dutch Stability Program[9] that has been sent to the European commission, the Minister of Finance has decided to reduce the budget deficit to the allowed 3% of GDP. To be able to achieve this, cut backs have to be made which equal € 12 billion. One of the things that will contribute in lowering the budget deficit is a sooner increase of the retirement age. It has been agreed upon that

[8] Memorandum uitwerking pensioenakkoord, Stichting van Arbeid (2011). http://www.stvda.nl/nl/publicaties/nota/2010-2019/2011/20110610.aspx

[9] De Jager J. (2011). Actualisatie stabiliteitsprogramma. http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2012/04/27/actualisatie-stabiliteitsprogramma-nederland.html

the statutory retirement age will start to increase as of January 1 2013 already. As of this date the retirement age will be increased by 1 month. Thereafter it will further be increased and eventually be 66 years in 2019 and eventually 67 in 2023 (Stabiliteitsprogramma Nederland, 2012).

As part of these cut backs, immediate reforms will be enforced. And as a result the measures concerning the yearly 0,6% increase of the AOW and the flexibility option will no longer be implemented. However, these two measures will still be analyzed in this thesis as possible scenarios as they are expected to contribute to increasing labor force participation of older workers.

The state pension (AOW) will be made flexible. The initial proposition was that as of January 2013 it will be possible to delay your AOW benefit up to a maximum of 5 years, or you can choose to still retire earlier. For every year of delaying retirement, the AOW benefit will be increased by 6,5% and lowered if deciding to leave the labor market before the eligibility age (Stichting van Arbeid, 2011). This possibility of delay makes it more attractive to stay longer in work; hence it implies a higher benefit.

Another measure that will be discussed in this thesis is the increase of the AOW benefit by 0,6% per year. This will be done yearly in the period 2013-2028 (Stichting van Arbeid, 2011). This increase will promote the delay of retirement, hence people will work longer since that will imply a higher AOW benefit.

Whether this increase of the AOW benefits and the increase of the statutory retirement age will be sufficient to increase the labor force participation of older workers, some additional measures have been taken by the government to achieve this goal. The low labor participation of older workers is not only due to the financial incentives of the previous schemes, but it is also hard to find a job at an older age. In order to promote this, employers who hire older workers will receive financial advantages. It is important to support employees and employers to achieve sustainable employment i.e. to make it possible for workers to stay longer and healthy in the labor force. That is part of the 'Vitaliteitspakket' as presented by the government in 2011. This package of measures that aims at increasing the labor force participation of older workers will operate from 2013. There are three points of focus in this package of measures; staying longer in work, mobility, and career facilities. The first point, staying longer in work will be achieved through providing bonuses for both employees and employers. There is a 'workbonus employees 61+', which we will also analyze in this thesis, but also a 'workbonus for employers 62+'. These will both promote employment at older ages and besides will encourage employers to hire older employees. Mobility among older workers will be promoted through several measures, such as bonuses.

And the career facilities will among others promote training to make it easier for older workers to be able to work in other jobs as well, if hit by unemployment at an older age.[10] However, these measures will not be modeled in this research, since we focus explicitly on the labor force participation, hence the supply side of the labor market.

[10] Kamp H. (2011). Vitaliteitspakket. http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2011/09/30/kamp-vitaliteitspakket.html

Chapter 3: Data Analysis

3.1 Methodology

The first part of this chapter presents the methodology and the second part contains the data analysis. In the analysis we will measure the effects of the current incentives that are present in the system on the labor force participation rates and thereby model the current situation.

As said in the previous chapter, the financial incentives which were present in the schemes led to an enormous decline of the labor participation rates. Several measures that were taken against this decline were not sufficiently effective. However, in the near future the statutory retirement age will be increased which will make workers stay longer in the labor force. Hence, in order to increase the labor participation rates financial incentives are needed that promote working longer instead of inducing early retirement, as was done in the past. The incentive measures that will be tested here, measure whether individuals will stay longer in the labor force, are expected to have a positive effect, and hence, increase the labor force participation of older workers. But before starting to simulate the effects of the proposed measures in the next chapter, the current situation and the current incentives will be modeled first.

3.1.1 Data

The data for the analysis is coming from the DNB Household Survey (DHS). This is a longitudinal panel survey that was initiated in 1993 and has been conducted on a yearly basis since. It started in 1993 as part of the VSB-CentER savings project and was renamed afterwards into CentER Savings Survey, which eventually became the DNB Household Survey in 2003. The survey is performed among 2000 Dutch households that are part of the CentERpanel.[11] Members of households from the age of 16 on are interviewed in this survey. The DHS is an unique dataset, since it includes information about work, pensions, income, assets, health and economic and psychological aspects, that allows researchers to study economic behavior of individuals. Therefore it is perfectly suitable to use for the analyses in this

[11] The CentERpanel is an important instrument for gathering online data. The panel consists out of 2000 Dutch households, which is a good reflection of the Dutch population. The CentERpanel is part of CentERdata, which is a survey research institute at Tilburg University that is specialized in gathering, analyzing and providing panel data for scientific research.

thesis. Each year of data consists of six different questionnaires, which are respectively about general information about household, household and work, living and mortgages, health and income, ownership and borrowing and psychological concepts.

For the analysis all of the nineteen waves of the DHS that are available at the moment of the analysis will be used, so it covers the period 1993-2011. This 19 years period allows for the construction of a larger sample and, more importantly, covers exactly the period during which the different benefit schemes were reformed in the Netherlands. This allows us to model and study the current situation in the labor market. In the analysis all waves will be pooled together. This can be easily done since both every household and every individual have an identification number which allows for the calculation of an unique identification number that remains the same as long as the individual is participating in the survey. In this way different questionnaires and different years can be linked together into one sample. For our sample we will use three questionnaires in all the waves that contain the necessary variables for our sample. These have the following content: general information about the household, information about work and the household and information about health and income. The questionnaire containing the general information will serve as the base and several variables from the other mentioned questionnaires will be added to this base data set, such as wage income, information about pension funds, and health condition.

The first step of the analysis is preparing the data and creating the sample that will be used for the analysis. The selection criteria for the sample are presented in Table 1. The most important are mentioned here. We will select on gender by including only males. The reason for the male restriction is that the male is often the main wage-earner in the household, whereas the woman often works part-time or takes care of the household. Including women would complicate the analysis since they are often not engaged in a full-time job nor do they have the same work experience and wage profile as men. As a consequence they have accrued pension benefits for a smaller number of years. That is why it is not representative and more complicated to include women in the sample. Thus for the sake of simplicity of the analysis we restrict our sample to working males. Next to that individuals will be selected in the age group 55-64 years. The reasoning behind choosing this specific age group is the large number of exits out of the labor force prior to reaching the retirement age which lead to low participation rates. Therefore, it is interesting to look at this age group and test whether the presented measures will have a positive effect on their participation rates. Furthermore, the sample is conditional on working. This means that the individual has to be engaged in a paid job. Besides these selection

criteria, some background characteristics will be accounted for as well, such as marital status, level of education, family size, and the composition of the household. From 1993 until 2000 the survey has been conducted among two different panels: a high income panel and a representative one. We will use the representative panel, since the sample has to be a good representation of the population, and therefore in these particular years the variable '*panel*' is included. All other background characteristics can be found in Table 1.

At start we found a sizeable number of missing values for the variables health condition and marital status. However, these numbers slightly decreased after repair, since many missing values could be recovered with help of observations from different waves for the same individual. Nevertheless, both variables still contain a sizable number of missing values. Though, we did not leave these observations out since these variables are not directly influencing the estimation of the retirement status. The number of missing values for marital status is especially large in the last four waves, but there is no clear reason for this. We presume that it is due to lower response numbers in the questionnaires that contain the variables marital status and health condition compared to the main questionnaire 'general information about the household'. After all exclusions the final sample size is 2351 observations, which includes 782 different individuals over the waves. The complete list, and description of the variables can be found in the Appendix.

Table 2 presents the number of observations per year[12] that satisfy the sample selection criteria. At the beginning there is a somewhat low number of observations that both satisfies the selected age group and the work criterion. This coincides with the low participation rates of older workers at that time, due to the generous early retirement schemes. After the year 2000 an increase in the number of observations selected in each year (i.e. the number older people in the labor force) can be noticed. This figure is in line with increased overall participation rates of older workers coinciding with the transition of the ER schemes into less generous and actuarially fair schemes which was announced in the late 90s (Oosenbrug, 2006). However, we should be careful with drawing the conclusion that the increased number of observations selected in the sample represents the increased participation rates, solely based on the observations, since the increase can also be random due to the number of observations in the sample of that particular year. However looking at Figure 3, the statement about the increase is confirmed, since we can see a see a clear increase in (sample) participation rates from the year 2000 on.

[12] The waves are indicated and pooled in the sample using year dummies.

Figure 1 also reflects this change, it namely shows the hazard rate of the labor force per year. The hazard rate is the percentage of people that exit the labor force per year. Here this is measured by looking per wave how many individuals have left the labor force from one year to another. These numbers are presented in Figure 1 and are expressed as percentages of the total per year (wave). However, it should be noted that we assume here that we only consider exit from the labor market from one year to another, and we do not distinguish between the various possible exit routes. In Figure 1, a drop in the hazard rate over the years is noticeable. However, a large peak in the number of retirees in the year 1999 is obvious, this might be explained by the fact, as mentioned above, that the government had announced reforms to the ER schemes (Oosenbrug, 2006). These upcoming changes induced people to exit the labor market while they could still benefit from the generous ER schemes. Figure 2 illustrates again the hazard rate, but now with an interval of two years. This because the number of observations per year is relatively low and by pooling two years we obtain more observations. This graph shows a more smooth path of the hazard rate. Nevertheless, it shows the same pattern as the previous figure only more clear; again an evident peak at the end of the 90s and a fall in the beginning of the new decade.

In 2006 it was decided to speed up the transition process of the ER schemes. This again resulted in an increase of older workers in the labor force. Table 2 reflects this change already: the number of older workers selected into the sample increased considerably in the years thereafter. Also Figure 1 and 2 both confirm this change in the labor market, showing lower hazard rates after 2006 compared to the years before and an evident peak at 1999, which supports the evidence such as found by (Oosenbrug, 2006; Groot and Heyma, 2004).

Table 3 presents the descriptive statistics of the key variables (Pevalin & Robson, 2009). We found that the average age of the individuals in the sample is 57.9 years. Furthermore, the largest part of the workforce in our sample has completed a middle form of education.[13] Another interesting outcome is the health of the selected individuals. As has been argued by previous research (Lumsdaine & Mitchell, 1999), bad health has a positive influence on the exit out of the labor force. Together with the low participation rates of older workers, one would expect that a large part of older workers is in bad health. However, we found that most people in this sample, 65%, are in good health, whereas none of them stated to have a very bad health. This result is somewhat striking since you would expect individuals in

[13] The variable 'education' is expressed in three dummy variables and the exact description can be found in the Appendix.

this age group to have more health problems which induces them to leave the labor force prior to reaching the retirement age. However, there might be several reasons for this low number of people with a bad health condition. First of all, it might be that people have a hard time admitting being in a bad health state. Or secondly, due to selectivity problems, someone with bad health has a smaller chance of being in the labor force or a smaller chance of being able to answer the survey. If looking at the household composition we can see that most people, 56%, in the selected age range are living together with their partner without any children living at home, and most of them, 83%, are married.

Besides the descriptive statistics, the composition of the sample is also important. Table 4 shows the median and the 10th and 90th percentiles of some of the key variables. Looking at the percentiles we can see that there is some variety among the selected individuals. The individuals that belong in the lower percentile have different outcomes than the group in the upper 90th percentile. This confirms that there is heterogeneity between the individuals in the sample (Pevalin & Robson, 2009).

As stated previously the number of older workers in the labor force is low, due to their early exit out of the labor market. Figure 3 shows the number of people in the labor force during our entire research period, divided in three age groups. It can be immediately noticed that the solid line that represents the age group '61-64' is the entire research period far below the other two lines representing the other age groups '55-57' and '58-60'. This implies that most people used to retire before or at age 60. The reason for this tendency were the extremely high implicit tax rates on work. Namely, if you decided to stay another year in the labor market after reaching the ER eligibility age[14], this additional year of work was taxed at very high rates. This provided a strong inducement to stop working when reaching the eligibility age (Groot & Heyma, 2004). The implicit tax on work will be explained in more detail further on in this chapter. Figure 4 validates the evidence that very few individuals stayed in the labor market after the age of 60 at the beginning of the 90s. This number stayed very low but eventually started to increase after 2006. Hence, people decided to stay longer in work than in the previous decade. Figure 4 illustrates the average retirement age per year. Again for the sake of simplicity we did not make a distinction between the exit route. In the first ten waves the average retirement age is somewhere around 58 years, which coincides with the ER eligibility age of that time. After 2004 the average retirement age started to increase somewhat, but after 2006 a sharp increase occurs. This could mean that we are moving towards having longer working careers. Nevertheless this should be further increased and people have to be induced to stay even longer in work.

[14] In the beginning of the 90s the average ER eligibility age at most pension funds was between 58- 60 years.

3.1.2 Variables

In the previous section it was mentioned that some variables have a sizable amount of missing values. Variables such as health condition, education, and marital status which are not directly affecting the retirement status in the analysis could be repaired for a large part. This is done with help of observations from earlier waves on the same individuals, since these observations are not likely to change much over the years. However, data on individual earnings, pension benefits, number of years of pension accrual and the number of years in work are completely missing in some waves of the DNB Household Survey or contain a great amount of missing values. Since our sample size is relatively small, due to the focus on a relatively small group, we have to impute and repair this data in order to be able to compute the social security wealth (SSW). However, repairing these variables is somewhat more complicated since these variables change over time and are influenced by several factors. For example one's wage earnings are influenced by his educational level and age. Therefore we will apply a regression imputation method to complete the missing observations (Wooldridge, 2009).

An important aspect in the computation of pension accrual is the number of years of accrual and the number of years in labor. The variable '*jfull*' indicates the number of years in full time work. By applying the method of regression imputation we will impute the missing values. For *'jfull*' we will use '*age*' as the regressor , and the reason for this is that age is often used in literature as a proxy for experience. Closely related to this variable is the variable *'hjpens*' which denotes the number of years of pension accrual. For this approximation the variables *'age'* and '*jfull'* will serve as regressors, since the number of years of accrual depends on one's age and of course the number of working years. Lastly the information on wage earnings has to be completed. By creating and using '*logwage*', which is the natural logarithm of '*wage',* we obviate problems that might occur due to autocorrelation and heteroscedasticity (Wooldridge, 2009). The wage earnings are estimated using '*age'*[15]*,* which serves as a proxy for experience, and the level of education *´lowedu' 'mediumedu'* and *'highedu'*, which is known to be positively related to wage. Knowing the wage in certain years the '*finalwage'* and *'averagewage'* can be predicted. The prediction of the final wage is somewhat comprehensive, using information from previous years by creating lags[16] we predict the future wage path of each individual. The average wage is simply calculated as the average of the wage in all the years the individual has been in the sample. This

[15] The variable age^2 is often used in these types of regression, however in this case it was not significant and is therefore left out.

[16] A lag value is a previous period values that are used in regression equation to predict the current or future value of the explanatory variable.

implies that the same average wage amount is shown in all the years an individual is observed. The reasoning behind this is that the wage of an individual will hardly change in the final years of his career, which will make the average wage stay more or less the same.

Then the amount of accrued pension benefits is missing for most observations in the sample, this can be due to the fact that most individuals lack understanding of pensions or simply because they find it a private matter. Therefore we will try to calculate their accrued pension benefits as precise as possible with help of known information and information obtained from pension funds.

In the Netherlands there are about 460 different pension funds at the moment, which are either firm related or sector related. All are offering a large scope of types of arrangements for their participants and transition arrangements, which makes it very complex. However, the main characteristics of most arrangements are similar, therefore we will apply those in our computations. Until the end of 2003 most arrangements offered by pension funds were so-called final-pay arrangements. This type of arrangement offered a pension benefit that was based on someone's final wage prior to retirement. The ambition of most funds was to provide participants with 70% of their final pay after 40 years of work as net pension benefit, including the AOW benefit as well (Van Duijn, Lindeboom, Lundborg, & Mastrogiacomo, 2009). The percentage that you preserve every year on your pensionable wage [17] for your pension, is called the accrual rate and was mostly $1{,}75\%$ in the final-pay arrangements. The 'franchise'[18] amount differs per year and per pension fund and within the fund a lot of different rules apply to different franchise amounts. Due to lack of adequate information and above all for simplicity reasons, we will use average yearly amounts in the calculations, which can be found in the Appendix.

The drawback of the widely used final-pay arrangements was that it led to discrepancies between high skilled and low skilled workers. Since mostly career makers benefited from a high final wage in this arrangement, the solidarity of the system decreased (Doornik & der Kinderen, 2010). That is why as of 2004 most funds switched to average-pay arrangements, wherein the benefit is based on someone's average wage, accompanied with an increase in the accrual rates. An overview of the accrual for the largest funds in the sample can be found in the Appendix.

[17] The pensionable wage is the part of the wage that you yearly accrue pension on (Bannink & de Vroom, 2007). Further on the pensionable wage will be referred to as the pension base.
[18] The part of the wage sum that is exempted from pension accrual is called the 'franchise' (Bannink, de Vroom, 2007).

With these accrual rates we can compute the occupational pension benefits in the following way (Doornik & der Kinderen, 2010):

1) $(average\ or\ final) wage - franchise = pension\ base$

2) $pension\ benefit\ per\ year = pension\ base * accrual\ rate * number\ of\ years\ pension\ accrual$

To this amount the pension from the first pillar (AOW) has to be added. The amount of AOW is a regulatory standardized amount which is linked to the statutory minimum wage. Every Dutch citizen accrues yearly 2% which implies to 70% of the minimum wage for a single household and 100% for a married household. An overview of the yearly AOW amounts is presented in the Appendix.

3.1.3 Incentive variable

The goal of the analysis is to measure the incentives that are inherent in the first and second pillar of the Dutch pension system. By modeling the measures we aim to find the effect of the plan provisions on the labor force participation of older workers. There are two things that have a strong effect on the retirement decision. Namely, the eligibility age or the early retirement age; the age at which your benefits become available. And secondly, the benefit accrual (Gruber & Wise, 1997). The way in which these two features have effect on the retirement decision will be explained below.

For the modeling of the effects we have to construct an incentive variable which will be the 'accrual' in this analysis. Using the accrual as the incentive variable is the most straight forward method and the least time consuming. The concept of the 'accrual' is designed to capture the effects on the retirement decision if the social security wealth changes. It shows the potential gain of working an additional year. This model allows a flexible specification, and thereby it is not too complex to compute (Stock & Wise, 1988). The downside of this method however is, that it only considers the incentives to work in the next year, and does not consider future years. An alternative model that is forward-looking, is the option value model which takes into consideration the entire stream of future retirement benefits (Stock & Wise, 1988). However, the implementation of this method is far more complex and more time consuming, therefore the 'accrual' will be used here as the incentive variable. Besides in section 3.3.1 there will be empirical evidence provided for the use of the accrual as the incentive variable.

The next step is to compute the social security wealth at each possible retirement date for the observations in the sample. As already said in Chapter 1, the concept of social security wealth (SSW) considers the actuarially discounted sum of one's future benefits (Kapteyn & de Vos, 2007). The reasoning behind the SSW concept is that the retirement decision depends on the evolvement of one's future wealth path if continue to stay in work. Suppose that a given individual is 59 years, what is then the change in SSW if he stays another year in work and thus retires at age 60 instead of 59? Hence, the difference between SSW_t and SSW_{t+1} has to be calculated; this difference is called the accrual (Gruber & Wise, 1997). The accrual has to be compared with the net wage earnings over the year. If the accrual is positive, this means that another year of work adds to the total compensation and thereby it promotes staying longer in the labor force. On the other hand, a negative accrual implies the opposite. It reduces the total compensation and thus discourages continuation in the labor force. The ratio of the accrual and the net wage earnings implies an implicit tax on work if the accrual is negative and

discourages one to continue to supply labor, the opposite is an implicit subsidy on work if the accrual is positive which promotes working longer (Gruber & Wise, 2002). The SSW, the accrual and the implicit tax rate are key elements in the estimation of the retirement probability.

Using the concept of SSW we will first model the situation covering the period 1993-2011, in which we will use the current plan provisions corresponding to this period. In this way we can see what the effect is of the inherent incentives in the system. This will give a good insight in how the situation used to be in the past decade and how it is nowadays. Then the new situations will be simulated using the proposed policy measures in the next chapter. Afterwards the retirement probabilities can be calculated applying a probit regression, which is will explained in the next section.

The SSW will be calculated for each observation in the sample. As we want to get a clear overview of the current incentives we have to incorporate the possibility of early retirement, since that served as a huge incentive for early exit out of the labor market. As said in Chapter 2, early retirement arrangements were since the introduction until the abolition in 2006 widely used in the Netherlands. Generally most funds provided an ER arrangement with an eligibility age between 58-60 years and the benefit ranging from $80\% - 85\%$ of the final wage. The only condition to become eligible was to be 10 years in the same job with the same employer (Doornik, der Kinderen, 2010). Hence, for the sake of simplicity we will make this 10 year criteria assumption in the calculations. Another important thing that has to be noticed is that if one decides to retire prior to his early retirement age, he thereby forfeits his right to early retirement benefits.

In the Appendix the method of calculation and all the data used in the calculations of the SSW can be found; such as an overview of the used ER eligibility ages and ER benefits. For the observations with missing pension fund information, we have applied an average ER age and a corresponding benefit level. Furthermore we have used the age, sex specific survival probabilities with a final age of 98 years, provided by Statistics Netherlands (CBS) in the calculations. For projecting the AOW in the future we have assumed a yearly real growth rate of $1{,}5\%$ and we have applied a discount rate of 3% for the computations, which is based on previous research such as (Brugiavini & Peracchi 2003; Coile & Gruber, 2000).

3.2 Incentive variable calculation

By calculating the incentive variables and the SSW we can look at the results and see what was the effect of the incentives provided by the system on the labor force participation.

In Table 5 the medians of the different retirement incentive variables per age group are shown. The median SSW is at age 55 €1.283.747 and falls to €943.564 at age 64. Until the age of 59 the SSW decreased by approximately 5% for every additional year in the labor force. Although you would expect the SSW to increase if you are working an additional year, as this provides you with another year of accumulated pension rights, the net present value of the additional accumulated rights is lower than the contributions paid into the system. Hence it leads to a decrease of the SSW (Kapteyn & de Vos, 1997). At the age 60 there is a slight increase in the SSW noticeable. This increase can be explained by the fact that the widely used ER arrangements in the Netherlands wielded on average an ER eligibility of 60 years for a long time. When becoming eligible for the ER benefits this had a positive impact on your total social security wealth, which explains the increase at age 60. After the age of 60 the median SSW continues to decrease with an extra year due to the fact that you forego a year of ER benefit receipts and besides another year of contributions to the system are paid (Kapteyn & de Vos, 1997). The age pattern shows the effects of an additional year of work. As already explained, a negative accrual implies a disincentive to work whereas a positive accrual implies the opposite. From ages 55 to 57 there is a positive accrual which shows the value of the dropout year provision. Age 58 shows a small but negative accrual which stems with the fact that some pension funds that are present in our sample had an ER eligibility age of 58 years. This negative accrual stimulates people to leave the labor market instead of working another year and forgo the ER benefits. At the age of 59 there is a striking result showing a high positive accrual together with a relatively high implicit subsidy on an additional year of work. This is due to the fact that within one year you will reach the ER eligibility age and thereby become eligible for the generous benefits, which provides a strong incentive. Then after reaching the age of 60 the accrual shows the same pattern as the SSW since we see a decrease in the negative accruals. This means that there is a strong incentive to leave the labor market at that age rather than working another year as already explained. The final column of Table 5 shows the implicit tax rates, which are defined according to literature (Coile & Gruber, 2000) here as the negative of the accrual by the potential wage for that year. It can be seen that there is a high implicit subsidy on work prior to the ER eligibility age and every additional year of work thereafter is being taxed. However, the size of the tax rates here in Table 5, but also in the remaining of the paper, is remarkably different from tax rates from other similar research

such as conducted by Kapteyn & de Vos (1997), which have obtained tax rates around the value of 1. Possible explanations for this large difference between the tax rates is the fact that we do not consider here the effects of other benefit programs such as disability insurance and unemployment benefits, but also other premiums and tax rates, as we solely focus on the pension income and the ER benefits.

To conclude, Table 5 shows the incentives present in the benefit system over the entire period 1993-2011. The general pattern is that there are very strong incentives which are provided by the ER schemes, inducing individuals to retire at the eligibility age, and providing disincentives on work thereafter. Besides the table also supports the previous findings on the presence of heterogeneity in the sample.

In the next subsection we will take a closer look at the research period by dividing into three different periods namely, 1993-2001, 2002-2005 and 2006-2011. Table 6 provides information on the SSW per period; at glance it is noticeable that the SSW increases every period. This obvious increase is due to the yearly inflation, however there are more differences between the three periods, since these were important milestones wherein important transformations were made to the early retirement schemes. By taking a more in depth look per period we can model the changes and get a better understanding of the magnitude of the effects.

3.2.1 Incentive variable calculation period 1993-2001

In this subsection we will take a closer look at the time span 1993-2001 to get a more clear overview of the situation in the labor market at that time with the corresponding incentives. The first column of Table 6 shows the age pattern of the SSW in this period. It shows a fall of the SSW until age 59, which is due to the higher value of the contribution compared to the additional accrued pension rights if working another year. Then both ages 60 and 63 are characterized by an increase in the SSW, which is due to the ER benefits that you could start receiving from these ages on. Then looking at the median accruals presented in Table 7, we can see after age 55 a falling pattern of negative accruals with a maximum at age 58. This finding coincides with the fact that some pension funds had 58 as the ER eligibility age providing an disincentive for work. The most striking evidence we find at age 59 where the accrual is € 56.494. This confirms the fact that the ER eligibility age of 60 years provided a strong evidence to work another year when turning 59 years, hence it implies an enormous subsidy on work at age 59. Afterwards there is still a disincentive to continue work in the next year, since you forgo a year of early retirement benefits and additional contributions that have to be paid into the system. The tax rates in

Table 8 confirm the above results, obvious is the large implicit subsidy on an extra year of work at age 59 as said above. After age 60 there is an implicit tax on an additional year of work.

All in all, we can state that the general pattern in the period 1993-2001 was a decreasing and negative accrual from age 55-59, which was mainly due to the fact that the net present value of additional accrued pension benefits did not outweigh the contributions paid in an additional year. At age 59 there is striking evidence for the presence of an implicit subsidy to stay one more year in work until reaching the ER eligibility age. Afterwards the accrual continues to be negative but the implicit tax on working is larger than at the beginning due to lost ER benefits. Hence, it can be concluded that the incentives that were present in this period had an overall negative effect on work and thereby on the labor force participation.

3.2.2 Incentive variable calculation period 2002-2005

At the beginning of the new decade the government decided to change some features of the ER arrangements. This as a consequence of the negative effect these schemes turned out to have on the labor participation by providing very high replacement rates. As the ER arrangements are financed on a pay-as-you-go base, wherein the working part of the population pays for the retirees, the financing of the scheme was under pressure due to the increasing number of retirees and the aging population. In order to guarantee the financing of the schemes it has been decided to slowly transform the ER arrangements (VUT) into the so-called prepension arrangements (prepensioen regeling). The main difference between the old VUT arrangement and these new arrangements is the way of financing. The prepension arrangements are financed on a funded base, which implies that everyone saves individually for their retirement. Moreover, in these new schemes the early retirement age increased generally to 62 years and the benefits were lowered to about 90% of the average wage (Oosenbrug, 2006).

What the effect of these changes was, can be seen in the results. While looking at the second column of Table 6, we see that median SSW from age 55 to 59 slightly decreases which is caused by the lower net present value of the extra benefits of working one more year are than the contributions. However at age 60 there is already a slight increase to €1.071.748 which becomes higher at age 61 €1.074.155. This further increase of the SSW at age 61 already shows the effect of the fact that most pension funds have increased the ER age. Afterwards the SSW is decreasing due to the benefits that you miss out on continuing to work and thereby the contribution you still have to pay into the system.

The effect of the transformation is also noticeable in the accrual presented in Table 7. By comparing the results of this period to the previous period it is clear that the disincentive for work has decreased somewhat. Whereas in the period 1993-2001 the accrual starts to be negative at age 56 already, implying a high disincentive to work at these ages, in this period there is no longer a disincentive prior to age 58. Another noticeable effect is the positive accrual along with an implicit subsidy at age 59 and 60.

Overall the transformation of the VUT arrangements into the prepension arrangements did have noticeable effect on the incentives and thereby on the participation rates. It resulted in a positive effect in the ages 55-57 since there is no longer a negative accrual there implying a positive effect on work. But also the implicit subsidy at ages 59 and 60 promotes working another year until reaching the ER eligibility age. Hence compared to the situation in the previous period there is a positive effect on work resulting from the reforms.

3.2.3 Incentive variable calculation period 2006-2011

The last period of our sample is the period 2006-2011. This period is an important milestone in the history of the early retirement schemes. As the measures taken in January 2006 will make the existing early retirement schemes soon expire and come to an end. The government decided to change the rules concerning the fiscal support of both the VUT and the prepension arrangements. The once so generous arrangements transformed into more actuarial fair and less generous schemes, which made them both very unattractive. Individuals with age 55 or older kept their accrued rights and could still use the arrangement, however those who were younger than 55 years in 2006 were hurt by this change. Namely, they could still accrue rights via the prepension arrangements but it became fiscally very unattractive to do (Oosenbrug, 2006).

This reform aimed at giving a further positive boost to the labor participation of older workers. The effects are shown in the result tables. By looking at Table 6 we can state that the decreasing pattern of the SSW captures the change of the early retirement possibilities. In comparison to the other two periods it is obvious that there is no longer an incentive to retire early at a certain age, as was previously the case with the increasing SSW at that age. Besides it is noticeable that the decreasing pattern is far more smooth over the years here compared to the previous periods. This reflects the increased actuarial fairness in the system. Figure 5 supports this finding on the increased actuarial fairness by illustrating the SSW paths of the three periods, hence there is an obvious smoother line of decrease in period 2006-2011.

The results of the accruals also present clear evidence for the changes. There is no longer a strong incentive present in the form of a high positive accrual or implicit subsidy, which used to stimulate individuals to work another year, as the generous ER arrangements no longer exist. Furthermore, both the accrual and the implicit tax start to become negative at an older age compared to the other periods, which implies a positive effect on the continuation of work. Besides it interesting to see in Table 8, that the implicit tax on the continuation of work at older ages is much lower here than in the other periods.

3.2.4 Summary incentive variable calculation

Summarizing all the above we can conclude that there have been important adjustments made to the pension system in the Netherlands over the period 1993-2011. The modeling of this period provides evident proof for the existence of the strong financial incentives which induced individuals to retire early. The previous sections have described the three different periods in detail and the corresponding effects. In 2001 the government started to increase the actuarial fairness of the ER schemes, which already resulted in a slight effect. However, the policy measure of 2006 concerning the fiscal support of the early retirement schemes and the shift towards complete actuarial fair schemes was the most important and powerful transformation in this period. Hence we can state that the period before the 2006-reform can be characterized by very generous ER arrangements. Figure 6 presents the accrual incentives of the period before the 2006-reform and the period after. The period before, which is indicated by the solid line, clearly shows extreme incentives at the age of 59 and 60. The large peak at the age of 59 implies the incentive to continue another year in work until the ER eligibility age, and then the steep fall afterwards is the disincentive for another year in the labor force, as you become eligible for the ER benefits. The period after the reform is indicated by the dashed line, and it evidently shows the effect of the reform. Hence, there are no longer explicit incentives at younger ages inducing early retirement due to the transformation into actuarial fair schemes. The effect of this reform was positive in terms of retirement rates and thereby the participation rates of older workers. As can be seen in Figure 7, the retirement probabilities of the period after the reform, indicated by the dashed line, show a more smooth line over the ages. There is a somewhat higher retirement probability noticeable at younger ages which is due to the smoother path of the incentives, but after the age of 60 the retirement rates are lower in comparison with the period before the 2006-reform. Consequently Figure 8 presents the participation rates, obvious is the peak at age 59 in the period before the reform, which is due to the large incentive at that age for another year of work, hence the abolition of ER schemes explains the lower rate at age 59 after the 2006-reform.

Overall we can state that the period after the 2006-reform, the period 2006-2011, is largely corresponding to the situation as it is nowadays. Therefore we will use the situation as it was at the end of this period as the reference point for the simulations in Chapter 4 in order to be able to make well founded comparisons.

3.3.1 Regression framework

Now we have calculated the different incentive variables that influence the decision to retire we will estimate the effect of these incentives on the actual retirement decision. Social security is important for this decision in several ways. In one way it has a wealth effect; this implies that a higher level of SSW stimulates individuals to consume more, resulting from this the consumption of leisure will also increase which promotes early retirement. In the other way, social security has an accrual effect; the decision to stay an additional year in the labor market depends on the increase in retirement wealth (consumption) due to additional accrued benefits, relative to an additional year of leisure (Coile & Gruber, 2000; Ahcan & Polanec, 2008).

To see the described effects on our sample we will perform a probit regression. The choice for a probit regression is made because the dependent variable is dichotomous (Cameron & Trivedi, 2005). The dependent variable here represents the retirement status, this variable can take on value 1 if one is retired and a 0 if working. An calculated incentive variable will be used in this regression as well as other variables, which will be explained next.

Explanatory variables

We have calculated the level of SSW, the accrual and the tax/subsidy rate as the incentive variables. However, which one of these does best in explaining the probability on retirement? Previous research, such as performed by (Brugiavini & Peracchi, 2003; Kapteyn & de Vos, 2004), used both the t-values and the pseudo R2[19] to indicate the explanatory power of the incentive variables. Therefore we will apply the same method here to show which incentive variable has the largest explanatory power. Table 9 shows some simplified specifications including only the incentive variable in the regression. In this way we can see the explanatory effect of each of the incentive variables. In the case of only including the accrual in the probit the value of the pseudo $R2$ is $0{,}0034$. In case of using the SSW and the implicit tax,

[19] This value implies the McFadden's pseudo R-squared (R2). Since in probit regression there is no equivalent to the R-squared from OLS regression (Cameron & Trivedi, 2005).

we find a pseudo $R2$ value of $0{,}0000$ and $0{,}0032$ respectively. The numbers in parentheses show the pseudo $R2$ in case if adding the variable '*age'* to the regression as well, since age explains a large part of the probability of retirement. Both specifications show the same ranking with the accrual as the best having the largest pseudo $R2$. Furthermore, if comparing Table 9 with Table 10, which presents the coefficients of the complete regression, we see that the SSW coefficient changes the most whereas the other only slightly change. The coefficient of the SSW is much larger and differently signed in Table 10. This is because the SSW is very sensitive to adding other variables to the regression implying the large change of the coefficient after the regression. Table 10, indicates also the t-values corresponding to the different incentive variables, and these also confirm the above that the accrual and tax are better to use as incentives. Overall, we can conclude that the accrual will serve as the best incentive to include in the regression in this situation.

Besides the accrual we will include '*age'* and '*age2'* since these are explaining a large part of the variation. These will be included instead of age dummies, since including age dummies turned out to result in a quite low pseudo $R2$ value compared to the specifications if including '*age'* or *'age2'*. Next to that a dummy variable with information whether someone is married will be included. The reason for this is the fact that the retirement decision is often influenced by having a spouse or not (Lumsdaine & Mitchell, 1999). And finally current earnings will be included which is denoted by '*earnings'* and the square denoted by '*earnings2'*.

3.3.2 Results

As already said Table 10 contains the results from running different probit regressions using the SSW, the accrual, and the tax rate as incentive variable respectively. Every column show the coefficient and standard error. The number in square brackets denotes the calculated marginal effect of the incentive variable, which is different from the usual OLS regression where the coefficients already show the marginal effect. This marginal effect implies a percentage point change in the probability of retirement if the SSW changes by €10.000, and the accrual by €1.000. Hence, the results from Table 10 state that an €10.000 increase in SSW increases the retirement probability by 0,212 percentage point. An €1.000 increases in the accrual implies a 0,0802 percentage point decrease in the retirement probability.

Furthermore looking at the coefficients we find that the accrual is negatively signed as you would expect, since a higher accrual decreases the probability of retirement (Coile & Gruber, 2000). Hence the results show that there is a significant impact of the one-year accrual and the level of SSW on the retirement decision.

The coefficients of the other explanatory variables are also listed in Table 10, however it should be noted that we will only discuss the results of the regression using the accrual as incentive. To start with *age*, we can see that the age profile has a negative relation for the linear effect and a positive for the quadratic effect. This means that at some point the positive quadratic effect starts to outweigh the negative linear effect implying an increase in the retirement probability. Hence, solving for this relation[20] we find that this will be around the age of 55 which is true as this is the start age in our sample. Furthermore, as the coefficient of '*age'* is negatively signed it has a negative effect on the retirement probability, thus as one would expect, the chance of retirement increases by age. The fact whether someone has a spouse denoted by the variable '*married'* states a negative effect as well, implying a higher retirement probability if married. And lastly the current earnings, these are also negatively related to the outcome variable. This means that higher earnings increase the probability of retirement, although it is a very small effect if comparing to the other variables.

Another thing that is often considered to be important and related to the retirement decision is one's health condition. However we have not included this as one the control variables in the regression due to the sizable amount of missing values. Nevertheless we want to shortly discuss the impact of including

[20] Solving this relation implies solving for the minimum of the polynomial function. Using the coefficients from Table 11 and taking the first derivative we have to solve the following equation: $-1{,}760 + 0{,}016\ x\ 2\ x\ age = 0$

health information in the estimation. Health is measured as the self-reported health condition ranging from bad health to excellent health, which will be included as dummy variables. As one would expect it has a positive effect, since being in better health lowers the probability of retirement. However we should note that in case of self-reported health this might be endogenous to the retirement decision, for example workers justify retirement by stating being in bad health (Coile & Gruber, 2000). Hence we can conclude that the exclusion of the health condition is not biasing the estimates in the regression.

Chapter 4: Policy simulations

4.1 Policy simulations

The modeling of the incentives that were present in the pension scheme gave an overview of the effects on the labor force participation of older workers. As already said in Chapter 2, the early retirement schemes offered very generous benefits which provided an enormous incentive to retire before reaching the retirement age. These incentives were clearly shown by the results from the analysis of the period 1993-2011. Even the magnitude of the incentives changed clearly in the results, due to reforms in the system. The changes in the ER schemes were the first steps towards attaining higher labor force participation rates among older workers, which has been a problem for years and has become even a bigger problem nowadays. Therefore the government has planned some new measures and changes aiming at a higher labor participation and especially among older workers. In this chapter policy simulations will be performed incorporating these new measures to see what incentive effect they will have, and eventually test whether they will increase the labor force participation.

The measures that will be tested are the following:

- The statutory retirement age will be increased; to 66 in 2019 and 67 in 2023.
- The state pension (AOW) will increase from 2013-2028 by $0{,}6\%$ per year
- The state pension (AOW) will become flexible; meaning that people could choose to delay their retirement for up to 5 years, delaying implies a yearly increase of $6{,}5\%$ of your pension and vice versa.
- Workbonus; individuals who continue to work will receive a 'bonus' from age 61-64 if still in the labor force.

By calculating the new incentives using the new measures we can model the effect and see whether the probability of retirement has decreased compared to the baseline case.

4.1.1 Baseline situation

In order to simulate the effects of the proposed measures on the retirement probability it should be compared to the current state or baseline to see whether it will increase or decrease. In the previous chapter we have modeled and shown the incentives that were present in the Netherlands over the period 1993-2011, to which we referred as the current situation. However, using the results of this entire period as baseline is not well-founded to do, as the results comprise the effects of previous policy changes as well. Therefore it is difficult to measure solely the magnitude of the effect of the new measures. Hence, it should be compared to the nowadays state allowing for a good approximation of the effect. As said in the previous chapter the final period 2006-2011 is to a large extent similar to the current state. Therefore, we have modeled the current state for the entire sample assuming the situation as it was in this period. However, it should be noted that there still exist some though limited possibilities to enjoy early retirement which differ per pension fund and are subject to a lot of conditions which will make the calculations very difficult. Therefore it is decided not to account for these and assume no early retirement possibilities.

Thus from now on we will we use baseline or current state in the analysis referring to the nowadays situation unless stated otherwise.

The results of the baseline state are presented in Table 11. The main difference between these baseline results and the results from Table 5 can be seen around the early retirement age. The accrual at age 59 in Table 5 is clearly high inducing another year of work, as it comprises the incentives of the ER schemes as it covers the entire period, whereas in Table 11 the accrual level at age 59 no longer expresses an incentive. Hence, in order to simulate solely the effect of the measures it should be compared to the baseline instead of to the entire period 1993-2011.

4.2.1 Increase statutory retirement age

The statutory retirement age has to be increased since the pay-as-you-go element in the first pillar of the pension system is otherwise becoming unsustainable. Nowadays one working individual pays for two retirees, whereas this will be doubled to four retirees in the upcoming years. The increased aging along with the low participation rates of older workers intensifies the problem (Bovenberg & Gradus, 2008). Therefore it is necessary for workers to work until an older age in order to maintain the sustainability of the system.

The most straightforward measure concerning this problem is the increase of the statutory retirement age.[21] From the introduction of the pension system in 1957, the retirement age has been 65 years. But due to inevitable circumstances it will be raised gradually, first to 66 years and eventually to 67 years. We will simulate both scenarios with a retirement age of 66 and 67 respectively, though we will take a rise in the normal retirement age and will not account for a gradual rise.

Table 12 shows the outcomes of the incentives calculated incorporating the new policy measures. The SSW amounts and thereby the wealth effect are lower for all ages in comparison with the baseline results in Table 11. This is due to the increased retirement age which implies a smaller amount of years left to enjoy your benefits and another year of contributions. The next column contains the accrual results and as can be seen these have remained constant in this new simulated state. On one hand this can be explained by the method of calculation of the SSW, as it is beyond the scope of this paper to model every detail of the system we have focused solely on the pension income and besides we did not account for any possible early retirement opportunities after the official abolition in 2006. And on the other hand, the only variable that changes in the calculation is the year of receipt of the AOW benefits and there is no large financial benefit provided as was the case with the ER benefits, which contributes significantly to the level of the SSW. However, at age 64 there is a difference noticeable showing an accrual of $€ - 6.580$ compared to $€ - 21.716$ in the baseline. This implies that the disincentive for another year of work has become much smaller or put it differently there is a small incentive created by the measure inducing individuals more to stay another year in work. Hence this suggests a small but positive effect on the labor force participation in particular at older ages close to the retirement age.

[21] Note that the term statutory retirement age here is used in the meaning as the eligibility age for the AOW, the first pillar pension. The eligibility age for the occupational pensions we assume here to stay at 65 and we do not apply the increase to these.

The next column presents the implicit tax rates calculated with the new measures. If comparing with the base case tax rates from Table 11, we see the same pattern as with the accruals. Over the ages the tax rate did not change, which is due to the constant level of the accruals as explained above. Then at the age of 64 there is no longer a high incentive to leave the labor market as another year of work is still implicitly taxed but at a much lower rate. This indicates a positive effect on the continuation of work and supports the above accrual effect results.

The results for the other scenario applying a retirement age of 67 years show almost the same results as the results from the 66 years scenario. The accrual effects and the tax rates are the same as they remained constant. As said above the only aspect that changes is the year of receipt of the AOW and thereby the amount of AOW benefits changes proportionally whereas everything else is considered equal. This additional increase of the retirement age implies another year of benefit cut resulting in lower SSW values for all ages compared to the previous simulation and the base line results. All in all, by looking solely at the incentive calculations in Table 12 we can conclude that there is a rather small effect arising from the policy measures which is mainly at later ages before the statutory retirement age.

If looking at Table 13 we can see the retirement probabilities averaged by age per state. The first column expresses the probit chances corresponding to the baseline state, these are calculated using the results obtained in Table 11 using the accrual as the incentive variable. The retirement rates are relatively high and especially from the age of 60 on it increases at a somewhat higher rate, which can be explained by the fact that the retirement probability increases with age.

Then the next two columns present the results of the policy simulations with the one-year and two-year increase of the retirement age respectively. For the simulation of the policy measures we have applied the SSW as the incentive measure, due to fact that the accrual remains constant in the modeling of the scenarios, consequently the retirement probabilities show differences in comparison to the baseline. The simulation applying 66 years as retirement age indicates a pattern with generally lower retirement rates, except for the ages 57-59 where the retirement probabilities are slightly higher. There are several explanations possible for these higher rates, such as the increased actuarial fairness in the system. As the generous ER schemes no longer exist, the exit rates over all the ages are more smooth in comparison to the increasing rates in the baseline case. Figure 9 illustrates this difference between the increasing form of the baseline situation and the lower more smooth pattern resulting from the results assuming an increased retirement age. Another reason for the greater retirement rates might be the

composition of the sample, as the number of observations in the ages 55-60 is sizeable larger than the in subsequent age groups.

Figure 10 shows the effects of the increased retirement age from another perspective, namely it shows the labor participation rates per age. The participation rates are expressed as the probability that a worker of a certain age will still be working at age 64. Hence it is clear from the graph that with the increased retirement age the rates for every age are higher and especially at later ages.

Stemming from the above simulations the general conclusion is that the policy measures do have a positive effect on the participation rates although the effect is rather small. More detailed we can conclude that there is a decreasing wealth effect and a predominant constant accrual effect. As described by Coile and Gruber (2000), a higher level of SSW stimulates individuals to consume more and thereby consume also more leisure, which promoted early retirement. However, lower values of SSW imply lower consumption levels in general, hence it suggests a positive effect on the retirement probability. The accrual effect is in the end slightly positive due to the effect at age 64. Besides due to the increased actuarial fairness in the system the retirement rates are smoothed over the ages showing lower exit rates especially at later ages, which implies a positive on the labor force participation.

4.2.2 Yearly increase AOW

The second policy measure that we will simulate here is a yearly increase of the AOW benefits by $0{,}6\%$, which will be on top of the regular yearly increase. This yearly increase is in real terms which means that it is raised after indexation occurs. The aim of this raise goes along with the long-term goal of increasing the labor force participation of older workers (Stichting van Arbeid, 2011). It is intended to compensate for the later receipt of the AOW through increased benefits and thereby providing an extra stimulus for individuals to stay in work longer. However we presume that the effect of this increase will not have a large effect per se. Therefore we will simulate this increase both with the normal retirement age and the increased retirement age to get a better insight in the effect on itself.

Table 14 shows the incentive variables of this simulation using age 65 and 66 as retirement ages respectively. The reason for not simulating this measure with 67 years as retirement age is that the effect of an additional increase of the retirement age is of such small size that it would not show any significant differences. Simulating this policy measure applying the normal retirement age of 65 years, results in a positive wealth effect, which can be seen by the higher SSW values over all the ages. Looking

at the second and third column, which are showing the accrual and tax rate respectively, it can be seen that there is an increase in the negative accrual at age 64 and the rest has remained constant, the same pattern holds for the tax rates. This difference from the baseline implies that there is a stronger incentive to leave the labor market at age 64 then before, which is due to the fact that the statutory retirement age is 65 years, but also due to the increase of the SSW.

The next simulation presents the increased AOW benefits in combination with a higher retirement age. The corresponding results provide lower SSW amounts compared to the baseline. This is due to the benefit cut effect, as a consequence of the increased retirement age, being larger than the yearly $0{,}6\%$ benefit increase. Hence, this implies that the $0{,}6\%$ benefit raise along with an increased retirement age has a stronger wealth effect which is beneficial for the goal of increasing participation. Furthermore, both the accrual and tax rates are again constant except for age 64, where there is an incentive to stay in work, but this is mainly due to the effect of the increased retirement age. Applying these incentive results we obtain the retirement probabilities which are presented in Table 13. It is noticeable that the situation with the normal retirement age of 65 years, has almost the exact same retirement probably outcome as the baseline. This confirms our predictions that the effect on itself is very small sized, as it is hardly noticeable. In case of the retirement age of 66 years we obtain lower retirement probabilities, however these are induced by the increased retirement age.

Summarizing the above findings, it is clear that the effect of increasing the AOW benefits by $0{,}6\%$ on a yearly basis does not provide a sizeable incentive inducing individuals to stay longer in the labor force. However if combining this measure with a retirement age of 66 years it shows effect compared to the baseline, but still very small of size and mainly due to the raise of the retirement age. Hence, this policy measure provides some additional AOW income but due to the small magnitude is does not provide an incentive to induce worker to work longer.

4.2.3 Flexible AOW

This policy measure implies a flexible state pension (AOW), by allowing for the possibility of delaying your AOW receipt once reaching the statutory retirement age. Hence, it gives you the option of starting to claim your state pension at an older age. For every year you decide to delay the receipt you are rewarded a $6{,}5\%$ increase of your benefits, with a maximum of delaying 5 years (Stichting van Arbeid, 2011). This relatively high reward might seem as attractive at first, however there are some flaws both in the method of calculation and the policy measure which makes the simulation difficult.

First of all, the applied method by calculating the accruals does not work in this situation. Because it excludes the possibility for someone to work beyond the retirement age and thereby benefit from the $6{,}5\%$ increase in the benefits. Secondly, the policy measure itself is also weak as it is only attractive for those who have already decided to work until the age of 65. Moreover, the question arises how to keep individuals until age 65 in the labor force in order to become qualified for the delay option if they are already induced to retire earlier. Hence, the policy measure is only interesting for the survivors, those working until the age of 65. These two weaknesses together make the simulation of this policy measure complicated using the presented model, therefore it has been decided not to simulate this measure but rather present the expected effects in a descriptive way.

The flexibility option of the AOW is expected to have a positive effect on the SSW and thereby also on the accruals. However, in order for this policy measure to be effective an additional measure is needed somewhere around the age of 62. There is an incentive needed to stay in work at least until the age of 65. For example one could decrease the contributions proportionally for someone who is planning to retire after the age of 65, in this way it is more actuarially fair. Unfortunately, the drawback is that you can never be sure whether someone will actually stay in the labor force until that age.

All in all, we can conclude that it is a measure that provides a quit generous increase in the benefits if you decide to delay the receipt for the maximum period, thereby providing an incentive. However, it will only be fully used and be effective if indeed individuals stay longer in the labor force until the age of 65.

4.2.4 Workbonus

As has been said in the previous section, an incentive is needed for individuals younger than 65 years to stimulate them to stay active in the labor market. Therefore the Dutch government introduced in 2009 the so-called 'work on bonus' in Dutch called the 'doorwerkbonus'. Although it is called a bonus, it is a fiscal measure that provides a tax reduction which is dependent on your income. The bonus starts from age 62 and the amount increases thereafter and decreases after the age of 65. This was an attractive measure and it covered a large part of the labor force since it covers individuals with an income between $€9.295 - €57.166$. However as of January 2013 this will be abolished and there will be a new similar measure operative.

This new measure which is called the 'workbonus' and, in Dutch 'werkbonus', is especially targeting older workers with a low income. In order to become eligible for this bonus your income has to be in the range $€17.139 - €33.326$[22] and you have to be 61 years. The amount of the bonus is also income dependent, but it does not increase with age.

Prior to the simulation we expect that this measure will be effective, however the group that is qualified for this bonus is relatively small which will probably have consequences for the magnitude of the simulated effect. We expect that the effect will be positive and thereby lead to an increase of the amount of survivors, the ones whom continue to work until the age of 65, and consequently making the flexible AOW policy measure more interesting for a larger group of individuals.

Table 15 shows the results of the new calculated incentive variables for this situation. The first column presenting the SSW incentives shows that the amounts did not change until the age of 60, but this is obvious as the measure applies to age 61 and higher, but from then on it shows changes in comparison to the baseline state. From here the SSW amounts are higher which is ascribable to the bonus. The accruals also show a positive effect, which is already noticeable at the age of 60 where the negative accrual decreased from $€ - 3.004$ in the base situation, to $€ - 1.859$ in the new situation. This implies that this policy measure provides an incentive since it induces workers to stay another year in work until the age of 61 when you will start receiving the workbonus. The other accruals are also showing lower amounts until the age of 63, compared to the results in Table 11. This implies a positive effect on

[22] The workbonus is calculated in the following way:
1) $Income\ is\ €17.139 - €19.041, workbonus\ is\ 57{,}763\%\ x\ (income - €17.139)$
2) $Income\ is\ €19.041 - €22.852, workbonus\ is\ €1.100$
3) $Income\ is\ €22.852 - €33.326, workbonus\ is\ €1.100 - 10{,}502\%\ x\ (income - €22.852)$

another year of work. Finally, the last column containing the implicit tax rates, supports the pattern of the accruals.

The incentive results already are implying positive effect of this measure, however what will the effect be on the retirement probability and thereby on the participation rates? Table 13 presents these results in the last column. It can be noticed that until the age of 60, which is the point where the incentive kicks in, the hazard rates are somewhat higher than in the baseline situation. This is due to the calculation method which smoothes the probabilities over all the ages, hence an decrease at later ages implies a small increase here at younger ages. As already said, from the age of 60 on the retirement hazards are lower in comparison to the baseline, which is the desirable effect . If interpreting the results the other way around, by expressing the participation rates, as shown in Figure 11, we find support on the previous findings on the lower retirement probabilities implying higher participation rates.

Overall, we can conclude that the workbonus is a good measure as it provides an incentive at age 60 to continue another year in work and from then on you will receive the bonus for every additional year in work. On the other hand, as it targets mainly low income workers it provides a compensation for their social security wealth, which makes it possible for them to retire before the retirement age if needed without decreasing the financial wealth, as low income workers are often engaging in psychical exhausting jobs.

4.3 Concluding remarks

The simulated policy measures were beforehand expected to have a positive effect on the retirement decision and thereby on the participation rates. As we have already described and explained the results we will discuss here more the magnitudes of the effects and the consequences.

To start with the first simulation with the increased retirement age to 66 years and 67 years respectively, these results clearly show a predominant positive effect as the hazard rates are more smooth over all the ages implying no longer peaks at certain ages. Especially older ages are characterized by a large effect as the participation rates increase reaching higher levels, as can be seen in Figure 11. However, the additional increase to 67 years does not provoke a further increase of the participation. As we can see in Figure 11, the participation rates are slightly higher or the same compared to the effect caused by the increase to 66 years. These outcomes suggest that in the future the increase of the statutory retirement age will have a positive effect on the participation, but mainly for older workers. It should be noted, that if the individual early retirement possibilities remain to exist, there should be stronger financial incentives provided at the beginning of the 60s to assure that people will stay until the statutory retirement age in the labor force. The $0{,}6\%$ increase in the AOW results in a very small but plausible effect. The measure on itself is not forceful, but in combination with other more powerful measures we presume that it will intensify the effect.

As already said, there is an incentive needed at an earlier age inducing more individuals to stay in the labor market until the retirement age, such incentive is provided by the workbonus measure. However this measure is only applicable to a specific group within a certain income range which consequently results in a lower magnitude of the effect. For those outside this group there might be also a measure needed in the future, since it is never certain how thing will evolve in the future. A possible reason for this is to obtain more survivors in order to make the flexibility measure more attractive for a larger target group. The flexibility measure introducing the possibility of delay of the AOW receipt is presumed to be very generous implying a strong incentive once reaching the retirement age and deciding to delay.

To conclude we can state that although the simulated measures are not of the same magnitude or all maximally effective, they will provide incentives for individuals to stay longer in the labor force. However these incentive are not of the size as they were with the embedded incentives of the early retirement arrangements, which was shown in Figure 8, but that does not mean that they will not be purposeful.

Furthermore, by looking at the results we believe that the expected high increase of the burden which lies on the working population, which is one working paying for two retirees and expected to be one working paying for four retirees, will not be that extreme. Since the post-policy results show overall lower amounts of SSW compared to the baseline, it implies that for all ages there is on average a smaller amount of wealth available. This results in a smaller burden on the working part who are paying for the AOW of the current retirees and thereby providing a positive effect towards the sustainability of the system. Besides the simulated measures the government focuses also on two other aspects concerning creating greater labor force participation, namely increasing mobility and career facilities. However these are hard to measure in financial terms. Nevertheless, we expect that along with the other effects of the financial incentives there will be better circumstances created for older workers such as in case of dismiss by providing retraining but also stimulating employers to hire older workers, all this will contribute also to increasing participation of older workers.

Chapter 5: Conclusions

5.1 Summary

At the beginning of this paper the situation as occurred in the 80s and 90s in the Netherlands is described. In order to create more jobs for young employees, older workers were often induced or forced to leave the labor market years before the statutory retirement age of 65 years. This was done via various exit possibilities such as disability insurance, unemployment benefits, and the most popular the early retirement benefits. However, these generous programs had a drawback as they started to have an undesirable effect on the labor force participation rates of older employees. Along with the increased life expectancy and the sustainability of the system it is needed to induce workers to stay longer in the labor force. The first step towards attaining higher participation rates that is worth mentioning was the transformation of the early retirement schemes. As modeled in Chapter 3, the effect of increasing the actuarial fairness of the ER schemes and the eventual abolition provided positive effects on the participation rates which are clearly shown stepwise in Table 7. After that in Chapter 4 the various policy measures are simulated which are expected to have a positive effect on the participation. The ones simulated are: increase of the retirement age, $0{,}6\%$ yearly increase of AOW benefit, and the workbonus. The results show that these policy measures indeed have positive effect on the participation rates through wealth and accrual effects.

5.2 Conclusion and recommendations

As previous research already concluded, social security and thereby the embedded incentives in the system are of great importance in studying the retirement decision (Coile & Gruber, 2000). The incentives provided by the generous early retirement programs in the Netherlands led to extreme drops in the labor force participation rates, especially among older workers in the age range 55-65. The government tries to combat this problem as the problem has become greater due to the aging of the population. There is an entire package of measures announced which goal it is to attain higher labor participation rates by having individuals work longer. The financial incentives resulting from these measures are therefore expected to have the opposite effect as the incentives provided by the generous benefit schemes which induced individuals to retire early.

In our analysis we used the data from the DNB Household Survey to find evidence for the proposed effects of the measures and show supporting evidence for the existence of incentives embedded in the system and their influence on the retirement probability. In the modeling of the current situation we indeed find supporting evidence for the existence of strong incentives, which were mainly provided by the early retirement arrangements applying to the second pillar of the pension system. Furthermore in terms of best explanatory incentive measure for the retirement decision this shows to be the accrual. As the accrual is the least sensitive for the inclusion of other variables and has the largest explanatory power. However, due to fact that the accrual rates remained constant in the simulations due to modeling characteristics and the nature of the policy measure, we have decided to use the SSW as incentive variable in the regression in order to explain future effects. Next to that there is support for the use of the one-year accrual as we find significant impact on the retirement decision.

The simulated incentives have a modest effect on the retirement decision. The measures such as the increase of the retirement age and the yearly raise of the AOW do no inhibit such strong incentives as in case with private pension incentives. Besides it is a tradeoff between giving up another year of leisure, if staying in work and thereby having less years left to enjoy your accumulated wealth, and another year of contributions that have to be paid into the system. And with the additional contributions having a higher net present value in comparison with the additional accumulated pension rights. Hence, this implies an overall decreasing wealth effect.

Furthermore, the results suggest that there should be more incentive that promotes longer work at younger ages and mainly at age 62, since at this age there is still the possibility to retire early at some pension funds. This in order to induce people to work until the retirement age, creating more survivors in order for some of the policies to be more effective. Policies such as the flexible AOW measure will become interesting for a lot more individuals if there is a greater amount of survivors. These incentives do not only have to be in financial terms such as the workbonus, but also other policies concerning the mobility and career facilities of older workers can contribute to this, by creating re-entry opportunities for older workers who involuntarily have to leave the labor market.

According to the findings we can state that the labor force participation rates are likely to increase as a result of the policy measures. On average it implies a slight decrease of the participation rates at younger ages (55-59) and a large increase at older ages (60-64), as shown in Figure 10 and Figure 11. Furthermore the burden of the pay-as-you-go financing will not increase extremely as suggested by Bovenberg and Gradus (2008), if the labor market evolves according to the predicted trend in this paper.

Moreover interesting findings suggest that there is focus needed on the ages prior to the retirement age for other policies, such as the flexibility option of the AOW, to be optimally effective and might become necessary as the early retirement possibilities remain to exist, and thereby have a large effect on the retirement decision.

5.2 Future research

Even there has already been an extensive amount of research conducted in this field, there is still need for further research. There is strong evidence on the existence of embedded incentives in the pension system and also the impact of these on the retirement decision. For future research we recommend careful use of the DNB Household Survey, as it contains a lot of missing and inadequate information concerning pensions. However in the field of research it mainly considers the supply side of the labor market whereas the demand side can also be influenced by incentives. This might be interesting to investigate more in depth and to see what the effect of these demand side incentives is. Another interesting topic might the modeling of possible measures that provide incentives at younger ages inducing individuals to stay until the retirement age and then enjoy benefits if delaying the receipt. Furthermore, it might be useful to look at the other non-financial measures that are mentioned as well in this paper. Although these cannot be modeled in financial terms, it might be possible through alterative modeling to get an insight what the effect will be.

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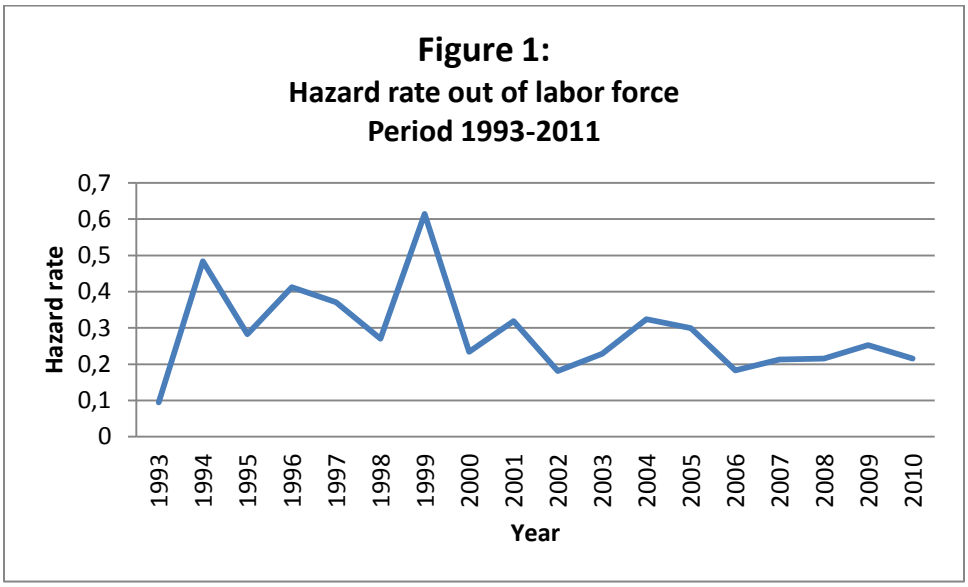
Figure 1:
Hazard rate out of labor force
Period 1993-2011
Hazard rate
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

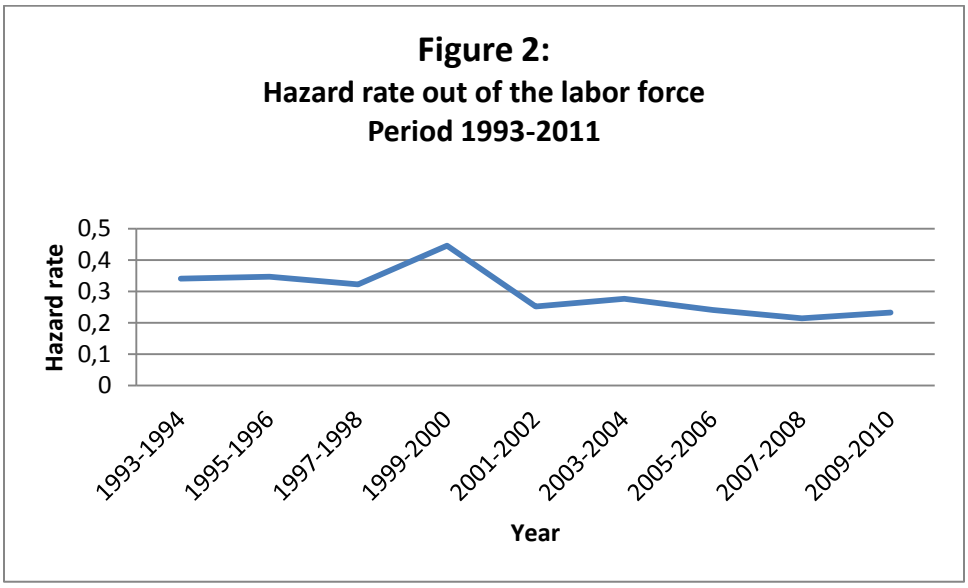
Figure 2:
Hazard rate out of the labor force
Period 1993-2011
Hazard rate
0,5
0,4
0,3
0,2
0,1
0
1993-1994
1995-1996
1997-1998
1999-2000
2001-2002
2003-2004
2005-2006
2007-2008
2009-2010
Year

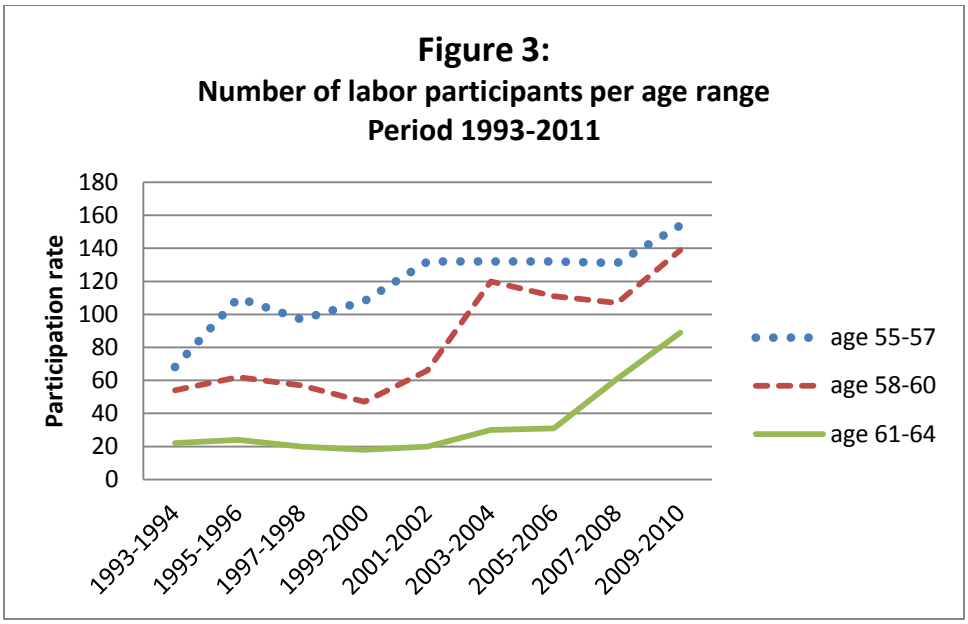
Figure 3:
Number of labor participants per age range
Period 1993-2011
Participation rate
180
160
140
120
100
80
60
40
20
0
1993-1994
1995-1996
1997-1998
1999-2000
2001-2002
2003-2004
2005-2006
2007-2008
2009-2010
age 55-57
age 58-60
age 61-64

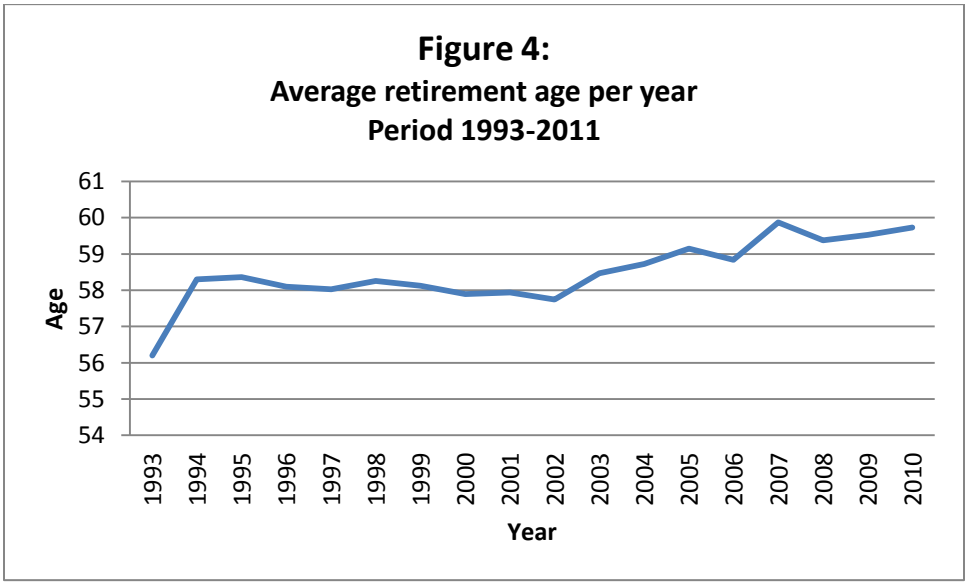
Figure 4:
Average retirement age per year
Period 1993-2011
Age
61
60
59
58
57
56
55
54
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

Figure 5:
Social Security Wealth per period

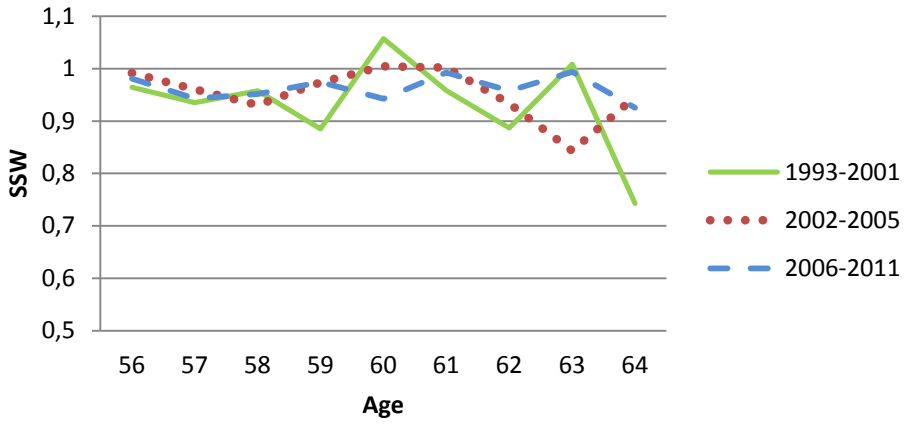

Figure 6:
Accrual incentives before and after 2006-reform

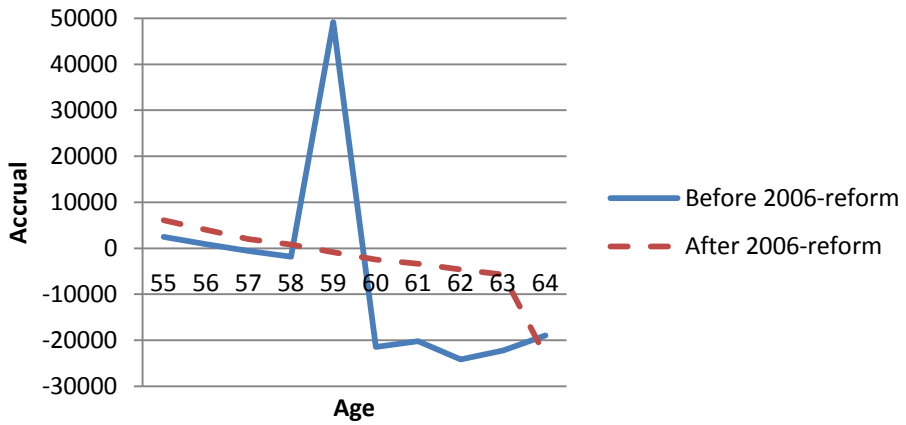

Figure 7:
Retirement probabilities before and after 2006-reform

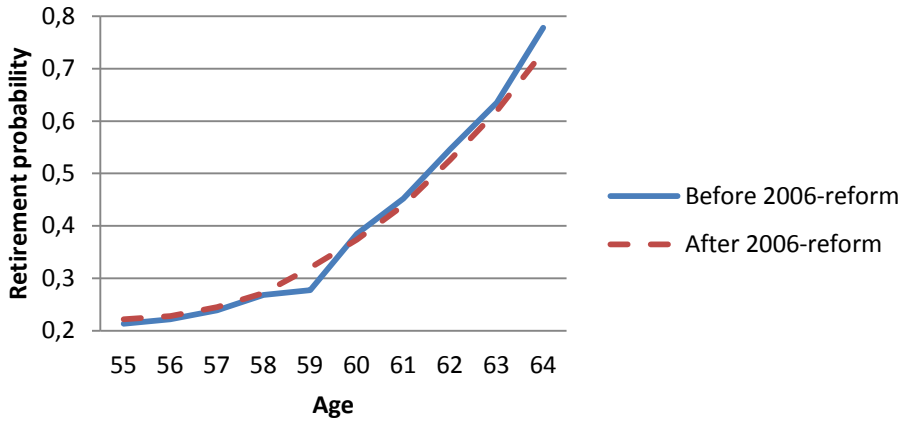

Figure 8:
Participation rates before and after 2006-reform

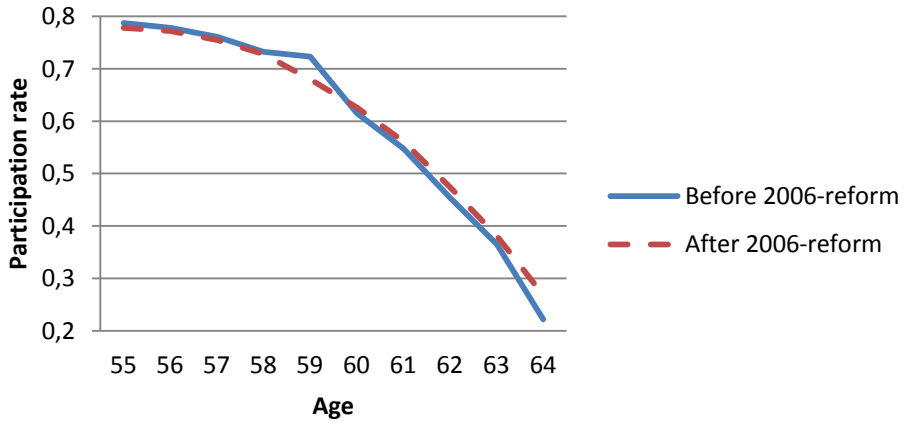

Figure 9:
Hazard rate out of labor force simulation 1
Increased retirement age

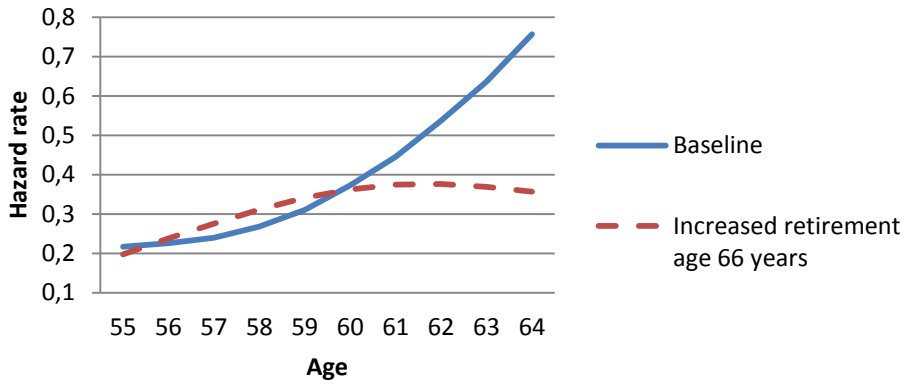

Figure 10:
Participation rates simulation 1
Increased retirement age

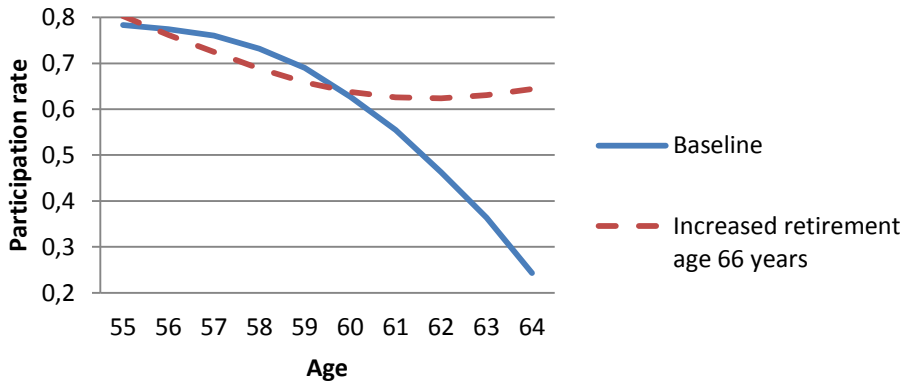

Figure 11:
Particiaption rates per age group simulations

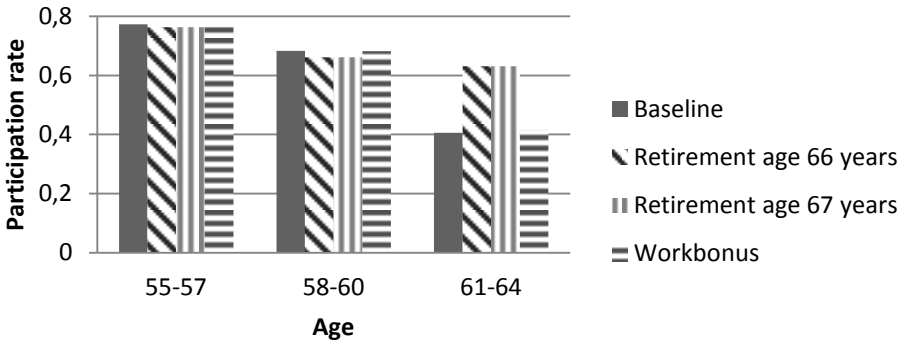

Table 1:

Sample for analysis

Category	Number of observations	number of observations lost	Missing value
Men Age 55-64, 1993-2011	6016		
Keep if working		3174	
Keep if panel representative		312	
Keep if head of household		135	
Keep if diploma (1993,1994)		44	
Education	2351		
Healh condition	1960		391
Marital status	1987		364
Household composition	2346		5
Family size	2351		
Total	**2351**		

Notes:

1) The number of observations presents the number of pooled observations over all the waves together NxT.

2) The number of observations lost through the exclusion.

3) The number of missing values that variable contains.

Table 2:

Number of observations per year	
1993	53
1994	91
1995	99
1996	97
1997	89
1998	85
1999	96
2000	77
2001	113
2002	105
2003	140
2004	142
2005	137
2006	137
2007	141
2008	158
2009	178
2010	204
2011	209
Total	**2351**

Notes:
1)The number of observations per wave that satisfy the sample selection criteria.

Table 3:
Summary statistics

Variable	Mean	Standard Deviation
Age	57,93	2,35
Married	0,833	0,373
Educ: low	0,089	0,285
Educ: medium	0,507	0,5
Educ: high	0,383	0,486
Health: excellent	0,176	0,381
Health: good	0,649	0,477
Health: ok	0,158	0,365
Health: poor	0,016	0,127
Health: bad	0	0
Family size	2,376	0,979
Householdcomp: alone	0,118	0,322
Householdcomp: with partner, no children	0,566	0,496
Householdcomp: with partner and children	0,285	0,451
Householdcomp: no partner with children	0,013	0,114
Householdcomp: other situation	0,017	0,128
Number of Observations	**2351**	

Notes:
1) Calculations of summary statistics from all the waves of the data as described in the text.

Table 4:
Summary statistics detail

Variable	median	10%	90%
age	58	55	61
marstatus	1	1	3
educ	5	3	7
health	2	1	3
householdcomp	2	1	3
famsize	2	1	4
earnings	40910	27227	62299

Notes:
1) Detailed information on the variables showing the median, 10^{th} and 90^{th} percentile.

Table 5:

Incentives by age

Age	Obs	SSW Median	Accrual Median	10th %	90th %	Std. Dev.	Implicit tax/subsidy
55	420	1283647	3905	-1054	9914	25128	-0,1046
56	383	1251294	2434	-3084	6726	27728	-0,0626
57	349	1179519	919	-3831	4853	25159	-0,0245
58	309	1127244	-30	-5164	3912	30959	0,0006
59	275	1082249	16845	-2053	91174	43467	-0,4605
60	244	1092061	-2908	-27049	47133	38655	0,0610
61	167	1068105	-4061	-24698	89739	45076	0,0863
62	102	1027467	-7760	-36167	92418	50392	0,1338
63	64	1010944	-7180	-26218	113272	58185	0,1693
64	38	943564	-21716	-28021	66719	38558	0,4761

Notes:

1)The social security wealth (SSW) is the stream of all future benefits, assuming that the individual is working until the beginning of age X and assuming a real discount rate of 3% and applying age and sex specific survival probabilities (Kohnz & Schnabel, 2002). The Appendix contains a more detailed explanation of the calculations.

2) The accrual at age X, which is the change in the SSW if working an additional year, and thereby deciding to retire at age $X + 1$instead of at age X.

3) The implicit tax/subsidy at age X, which is the ratio between the accrual and the earnings if continue another year in work.

Table 6:

Social security wealth by age and period

Age	SSW		
	1993-2001	2002-2005	2006-2011
55	1214058	1236408	1439002
56	1170785	1226047	1411496
57	1094640	1177239	1330998
58	1048660	1095515	1266561
59	928300	1066862	1233991
60	981405	1071748	1162660
61	940454	1074155	1153826
62	833938	1002628	1104819
63	840745	845728	1098089
64	624487	800643	1016056

Notes:

1)The median SSW at age X, per period. For a detailed description see Table 5.

2) The SSW is expressed in Euro's.

Table 7:
Accrual by age and period

Age	Accrual		
	1993-2001	2002-2005	2006-2011
55	1717	4239	6059
56	-58	1665	3984
57	-1541	120	2010
58	-2765	-795	805
59	56494	29151	-890
60	-23667	4268	-2442
61	-22718	-374	-3377
62	-21205	-36563	-4621
63	-20524	-26167	-5759
64	-18316	-21880	-23417

Notes:
1) The median accrual at age X, per period.
2) The accrual is expressed in Euro's.

Table 8:
Implicit rates

Age	Tax/ Subsidy		
	1993-2001	2002-2005	2006-2011
55	0,0535	0,0953	0,1378
56	-0,0014	0,0498	0,0899
57	-0,0385	0,0042	0,046
58	-0,0704	-0,0163	0,0199
59	1,5699	0,6399	-0,0166
60	-0,5909	0,1019	-0,0545
61	-0,5512	-0,0077	-0,0794
62	-0,5533	-0,9001	-0,1095
63	-0,5537	-0,8331	-0,135
64	-0,4173	-0,7562	-0,5003

Notes:
1) The implicit tax/subsidy rates at age X, per period.
2) The rates are denoted as the ratio between the negative of the accrual and the earnings in the upcoming year if continue in work. Hence, it is calculated as: $implicit\ tax = -\frac{accrual}{earnings}$.

Table 9:

Incentive variable specification

Variable	Coefficient	Std.Error	Pseudo R2
Accrual	-2,49E-06	7,98E-07	0,0034
			(0,0417)
SSW	-2,62E-08	7,82E-08	0
			(0,0405)
Tax	-0,10897	0,037203	0,0032
			(0,0408)

Notes:

1) Coefficient and standard error of the incentive variable obtained by probit using the '*incentive'* variable as the only explanatory variable in the regression.

2) Pseudo $R2$ resulting from the estimated probit regression.

3) The term in parentheses implies the pseudo $R2$ estimated by probit using the '*incentive'* variable and the variable '*age'* as explanatory variables in the regression.

Table 10:

Retirement probits with retirement incentives

Variable	Coefficient	Std.Error	Coefficient	Std.Error	Coefficient	Std.Error
	Accrual		SSW		Tax	
Incentive	-2,36E-06	8,20E-07	6,26E-07	1,54E-07	-0,077	0,037
	(0,004)		(0)		(0,04)	
Age	-1,760	0,556	-1,685	0,556	-1,728	0,558
	(0,002)		(0,002)		(0,002)	
Age2	0,016	0,005	0,016	0,005	0,016	0,005
	(0,001)		(0,001)		(0,001)	
Married	-0,346	0,059	-0,411	0,061	-0,350	0,059
	(0)		(0)		(0)	
Earnings	-2,18E-06	5,40E-06	0,000	6,04E-06	-3,26E-06	5,36E-06
	(0,686)		(0,014)		(0,543)	
Earnings2	4,33E-11	4,48E-11	5,61E-11	4,31E-11	4,70E-11	4,44E-11
	(0,334)		(0,193)		(0,289)	
Marginal increase	[-8,02E-07]		[2,12E-07]		[0,026]	
Pseudo R2	0,059		0,062		0,058	
Number obs.	**2351**		**2351**		**2351**	

Notes:

1) The coefficients and standard errors estimated by the probit regression, using all the listed variables as explanatory variables and the retirement status as dependent variable.

2) The number in parentheses denotes the t-values corresponding to the variables.

3) The marginal increase, denoted in square brackets, implies the marginal probability effect.

Table 11:

Incentives by age baseline

Age	SSW median	Accrual median	Implicit tax/ subsidy
55	1283647	3905	-0,1046
56	1251294	2434	-0,0625
57	1179519	914	-0,0241
58	1123337	-30	0,0006
59	1082249	-1488	0,0317
60	1074618	-3004	0,0626
61	1052972	-4078	0,0902
62	1026289	-5778	0,1252
63	1010944	-6082	0,1487
64	943564	-21716	0,4761

Notes:

1) The median values of the incentive variables are presented which are estimated using the period 2006-2011 as the reference point for the baseline.

2) SSW and accrual values are expressed in Euro's.

Table 12:

Simulation 1 Incentives by age

	Retirement age 66			Retirement age 67		
Age	SSW median	Accrual median	Implicit tax/subsidy	SSW median	Accrual median	Implicit tax/subsidy
55	1260094	3905	0,1046	1240168	3905	-0,1046
56	1233783	2434	0,0625	1214634	2434	-0,0625
57	1156911	914	0,0241	1134197	914	-0,0241
58	1102810	-30	-0,0007	1081748	-30	0,0006
59	1062655	-1488	-0,0317	1042834	-1488	0,0317
60	1057846	-3004	-0,0626	1037836	-3004	0,0626
61	1033072	-4078	-0,0902	1014163	-4078	0,0902
62	1009530	-5778	-0,1252	991305	-5778	0,1252
63	995282	-6082	-0,1487	979668	-6082	0,1487
64	928382	-6580	-0,1664	912206	-6580	0,1664

Notes:

1) Simulated values of the retirement incentives averaged by age and expressed as medians, assuming a retirement age of 66 years.

2) Simulated values of the retirement incentives averaged by age and expressed as medians, assuming a retirement age of 67 years.

3) SSW and accrual values are expressed in Euro's.

Table 13:

Policy simulations

		Post-policy hazard rate				
Age	Baseline	Ret.age 66	Ret.age 67	Ret.age 65+0,6 AOW	Ret.age 66+0,6 AOW	Workbonus
55	0,216	0,197	0,197	0,232	0,197	0,232
56	0,226	0,283	0,238	0,232	0,239	0,232
57	0,240	0,275	0,275	0,244	0,275	0,244
58	0,268	0,311	0,311	0,271	0,311	0,271
59	0,310	0,342	0,341	0,314	0,341	0,314
60	0,373	0,362	0,362	0,371	0,363	0,370
61	0,445	0,374	0,374	0,444	0,374	0,444
62	0,538	0,376	0,376	0,529	0,376	0,529
63	0,636	0,369	0,369	0,628	0,369	0,628
64	0,757	0,356	0,356	0,740	0,356	0,739

Notes:

1)Retirement probabilities for the baseline situation, which are estimated by probit using the results obtained in Table 11.

2) Retirement probabilities obtained after policy simulations, estimated by probit using the results from Table 12, 14 and 15 respectively.

3) For calculating the retirement probabilities in the baseline we have applied the accrual as the incentive variable and in the other situations the SSW served as incentive, due to constant values of the accrual.

Table 14:

Simulation 2 Incentives by age

	0,6 yearly increase AOW with ret. age 65			0,6 yearly increase AOW with ret. age 66		
Age	SSW median	Accrual median	Implicit tax/subsidy	SSW median	Accrual median	Implicit tax/subsidy
55	1286925	3905	-0,1046	1263860	3905	-0,1046
56	1253977	2434	-0,0625	1235802	2434	-0,0625
57	1182910	914	-0,0241	1160776	914	-0,0241
58	1126562	-30	0,0006	1105912	-30	0,0006
59	1085854	-1488	0,0317	1065610	-1488	0,0317
60	1077092	-3004	0,0626	1060697	-3004	0,0626
61	1056396	-4078	0,0902	1036384	-4078	0,0902
62	1028946	-5778	0,1252	1012426	-5778	0,1252
63	1014060	-6082	0,1487	997853	-6082	0,1487
64	946100	-21778	0,4773	931234	-6580	0,1664

Notes:

1) Simulated values of the retirement incentives averaged by age and expressed as medians.

2) SSW and accrual values are expressed in Euro's.

Table 15:

Simulation 3 Incentives by age

Age	SSW median	Workbonus Accrual median	Implicit tax/subsidy
55	1283647	3905	-0,1046
56	1251294	2434	-0,0625
57	1179519	914	-0,0241
58	1123337	-30	0,0006
59	1082249	-1488	0,0317
60	1074618	-1859	0,0409
61	1054094	-2916	0,0645
62	1028531	-4608	0,1008
63	1014304	-9443	0,225
64	943564	-21716	0,4761

Notes:

1) Simulated values of the retirement incentives averaged by age and expressed as medians.

2) SSW and accrual values are expressed in Euro's.

Appendix 1: List of variables

Variable	***Description***
Sex	Gender of the respondent, male if sex=1
Year	Indicator of the year of the corresponding wave
Age	Age of the respondent, generated by the year minus the year of birth
Work	Respondent is in the labor force, work=1 since other answers are dropped
Famsize	The number of the household members
Householdcomp	The household composition; expressed in five dummy variables
Alone	*ALONE=1 if the answer is* *1: living alone*
Withpartnernokids	*WITHPARTNERNOKIDS=1 if the answer is* *2: living together with partner without children*
Withpartnerandkids	*WITHPARTNERANDKIDS=1 if the answer is* *3: living together with partner and with children*
Nopartnerwithkids	*NOPARTNERWITHKIDS=1 if the answer is* *4: living without partner but with children*
Othersit	*OTHERSIT=1 if the answer is* *5: other living situation*
Health	The general health condition of the respondent; expressed in five dummy variables
Excellent	*EXCELLENT=1 if the answer is* *1: in excellent health condition*
Good	*GOOD=1 if the answer is* *2: in good health condition*
Ok	*OK=1 if the answer is* *3: fair health condition*
Poor	*POOR=1 if the answer is* *4: not so good health*
Bad	*BAD=1 if the answer is* *5: bad health*
Education	The highest level of education of the respondent that is completed, expressed in three dummy variables
Lowedu (1993-2001)	Lowedu=1 if the answer is 1. Kindergarten/ primary education 2. Continued primary education (VGLO) or elementary secondary education (LAVO) 3. Continued special (low)level education (MLK, VSO, LOM), secondary education (MAVO/ MULO) 10. Special (low) education
Lowedu (2002-2011)	Lowedu=1 if the answer is 1. Continued special education 2. Kindergarten/ primary education
Mediumedu (1993-2001)	Mediumedu=1 if the answer is 4. Pre-university education (HAVO, VWO, Atheneum, Gymnasium, HBS, MMS, Lyceum) 5. Junior vocational training (e.g. LTS, LEAO, Lagere Land-en Tuinbouwschool)

	6. Senior vocational training (e.g. MTS, MEAO, Middelbare Land-en Tuinbouwschool) 11. Vocational training through apprentice system (leerlingwezen)
Mediumedu (2002-2011)	Mediumedu=1 if the answer is 3. VMBO 4. HAVO/ VWO
Highedu (1993-2001)	Highedu=1 if answer is 7. Vocational colleges (e.g. HTS, HEAO, opleidingen MO-akten) 8. Vocational colleges 2nd tier (e.g. accountant NIVRA, actuaries, opleidingen MO-B-akten) 9. University education
Highedu (2002-2011)	Highedu=1 if the answer is 6. Vocational colleges 7. University education
Marstatus	Marital status of respondent, married if maritalstatus=1
Panel	Panel to which respondent belongs to, representative if panel=1
Jfull	Number of year engaged in a full-time job
Hjpens	Number of years pension benefits accrued
Euroloon	The wage of the respondent presented in Euro's
Pfonds1/pfonds	Indicates the pension fund in which the respondent is participating
Logwage	The natural logarithm of the wage
Lwforc1-lwforc10	Predictions of the future wage path per year ahead
Finalwage	The finalwage of the respondent expressed as natural logarithm
Finalwageeu	The finalwage of the respondent expressed in Euro's
Avgwage	The average wage of the respondent
Pensionbase	The amount of the wage on which pension is accrued
Pensionbenefit	The amount of pensionbenefit one has accrued at that time
AOW	The amount of AOW benefits
Totpenbenefit	Total pension benefits and AOW
SSWt	Discounted value future pension benefit streams at age t
SSWt1	Discounted value future pension benefit streams at age $t+1$
SSW55-SSW64	SSW values averaged by age
Accrual	Difference between SSWt1 and SSWt
Accrual 55-Accrual64	Accrual rates averaged by age
Retirementstatus	Retirement status, retired if retirementstatus==1 and working if retirementstatus=0
Tax	Implicit tax/subsidy
Tax55-Tax64	Tax rates averaged by age
Earnings2	Square of the earnings (earnings denoted by euroloon)
Age2	Square of age

Appendix 2: Accrual rates per pension fund

Pension Fund	Period	Arrangement	Accrual Rate
ABP	1993-2003	Final-pay	1.75
	2004-2005	Average-pay	1.9 participants born in 1964 or after 1.8 participants born between 1954-1963 1.75 participants born in 1953 or before
	2006-2011	Average-pay	1.75 participants born before 1953 2.05 other participants
PGGM	1993-2003	Final-pay	1.75
	2004-2005	Average-pay	1.75
	2006-2011	Average-pay	2.05
Metaal&Techniek	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
Bouwnijverheid	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Metalelectro	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.2
Detailhandel	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	1.85
Grafische bedrijven	1993-2003	Final-pay	1.55
	2004-2011	Average-pay	1.75
Spoorweg pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
ABN Amro pensioenfonds	1993-2003	Final-pay	1.75
	2004-2005	Average-pay	1.75
	2006-2011	Average-pay	2.15
KPN pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Philips pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	1.85
Beroepsvervoer over de weg pensioen	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.05
Akzo Pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Ahold pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Landbouw pensioenfonds	1993-2003	Final-pay	1.75

	2004-2011	Average-pay	2.0
Rabobank pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Horeca pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	1.75
Schildersbedrijven pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
Woningcorporaties pensioenfonds	1993-2011	Average-pay	2.25
Shell pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
Corus pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.2
Unilever pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
STORK pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
DSM pensioenfonds	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.0
Pensioenfonds schoonmaak en glazenwassersbedrijf	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.05
Pensioenfonds werk en integratie	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	1.75
Pensioenfonds levensmiddelenbedrijf	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Pensioenfonds meubelindustrie	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	2.25
Pensioenfonds wonen	1993-2003	Final-pay	1.75
	2004-2011	Average-pay	1.8

Appendix 3: Yearly AOW benefit and franchise amounts

Year	AOW	Franchise
1993	Married: €11.410 Single: €8.240	€ 11.163
1994	Married: €11.236 Single: €8.080	€ 11.163
1995	Married: €11.474 Single: € 8.239	€ 11.163
1996	Married: 11.746 Single: €8.448	€ 11.299
1997	Married: €12.317 Single: €8.865	€ 11.481
1998	Married: €12.943 Single: €9.420	€ 11.753
1999	Married: €13.380 Single: €9.680	€ 12.116
2000	Married: €13.791 Single: €9.932	€ 12.434
2001	Married: €14.447 Single: €10.476	€ 12.887
2002	Married: €15.099 Single: €10.952	€ 10.785
2003	Married: €15.699 Single: €11.409	€ 11.213
2004	Married: €15.913 Single: €11.581	€ 11.366
2005	Married: €15.896 Single: €11.611	€ 11.355
2006	Married: €16.193 Single: €11.831	€ 11.567
2007	Married: €16.621 Single: €12.126	€ 11.873
2008	Married: €17.093 Single: €12.462	€ 12.209
2009	Married: €17.451 Single: €12.701	€ 12.466
2010	Married: €17.742 Single: €12.899	€ 12.674
2011	Married: €18.057 Single: €13.116	€ 12.898

Appendix 4: Calculation method SSW

The calculation of the SSW is done according to the formula which is presented by (Ahcan & Polanec, 2008; Brugiavini & Peracchi, 2002; Kohnz & Schnabel, 2002).

Social security wealth can be defined as the expected discounted value of all the future streams of pension benefits of an individual. Then the SSW of a worker at age a in case of retirement at age $h \geq a$ can be defined as:

$$SSW_h = \sum_{s=h+1}^{T} \rho(s) B_h(s)$$

The formula states that the left-hand side shows the SSW value, whereas the right-hand side is the discounted value of the sum of future benefits. The term $\rho(s)$ is the discount factor that is used, which depends on the discount rate and the survival probability of the individual at age s, conditional of being alive at age a. The term $B_h(s)$ is the pension benefit expected at age s if the worker retires at age h. And the last term T stands for a certain age of death of the individual.

Appendix 5: Early retirement arrangements per pension fund

Pension fund	***Period***	***Eligibility age***	***Replacement rate***
ABP	1993-2001	60	80% final wage
	2002-2005	60	70% average wage
		61	90% average wage
		62	120% average wage
PGGM	1993-2001	60	72% final wage
	2002-2005	60	70% average wage
		61	90% average wage
		62	120% average wage
Bouwnijverheid	1993-2005	60	80% final wage
Metaal & Techniek	1993-2001	60	85% final wage
	2002-2005	58	43% average wage
		59	54% average wage
		60	68% average wage
		61	85% average wage
		62	113% average wage
Metalelektro	1993-2001	58	80% final wage
	2002-2005	60	80% final wage
Grafische bedrijven	1993-2005	62	80% final wage
Detailhandel	1993-2005	60	80% final wage
ABN	1993-2005	61	80% final wage
Spoorweg pensioen	1993-1999	61	80% final wage
	2000-2005	62	80% final wage
Average	1993-2001	60	80% final wage
	2002-2005	60	70% average wage
		61	85% average wage
		62	110% average wage