Micro simulations on the effects of ageing-related policy measures[1]

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ABSTRACT

In the Netherlands, like in most OECD-countries, the ageing of the population endangers the sustainability of public finances. In this paper a dynamic micro simulation model is used for calculating the financial and economic implications of the ageing problem and the policy measures considered. The model uses micro datasets of all Dutch pensions and pension entitlements. The retirement decision is modelled by using an option value approach.

First, the paper discusses the baseline scenario of unchanged policies. The micro simulation results differ from previous macro CGE results. The state pension costs rise less sharply than the number of pensioners. Also the micro simulation model is used to analyse the redistributive character of the Dutch pension system, both through differences in pension entitlements and through differences in life expectancy, for different subgroups. The retirement decision is analysed with an option value based behavioural model.

Secondly, the paper discusses the effects of five policy measures aimed at reducing the state pension costs and the sustainability gap: abolishment of the partner allowance (a measure that is already decided about), raising the retirement age from 65 to 67 years of age, introduction of a flat rate state pension at the same level as the current pension for partners of a couple, raising the taxation of wealthier pensioners by abolishing their tax exemption and introduction of a flexible retirement window with a high accrual to reward later retirement. For each measure, the budgetary effects, labour participation effects and redistributive effects are quantified and assessed.

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1. Introduction

In the Netherlands, like in most OECD-countries, there is a large discussion on the costs of the ageing population and on the policy measures needed to cope with this development. According to the Netherlands Bureau of Economic Policy Analysis (CPB, 2007), mainly because of the ageing of the population, the gap between government expenditures and revenues is projected to be 2.2% of GDP in 2040. In order to keep Dutch public finances sustainable, additional policy measures are necessary. Moreover, the need for reform has become more apparent because of the current economic crisis, which has tripled the sustainability gap to around 6% of GDP (Gradus et al., 2010).

The dynamic micro simulation model SADNAP (Social Affairs Department of the Netherlands Ageing and Pensions model) is being developed for calculating the financial and economic implications of the ageing problem and of the policy measures considered. A micro simulation model, as compared to macro general equilibrium models, can give more detailed information on the ageing problem and on the redistributive effects of policy options, which can be used in the evaluation of those options. The model uses administrative datasets of all Dutch public pension payments and of all entitlements for public pensions and a large share of entitlements for private pensions.

In a baseline scenario, it is shown that the state pension costs rise less sharply than the number of pensioners because of several changes in the composition of the population of pensioners. The downward influences together amount to 0.3% of GDP (Van Sonsbeek, 2010).

Concerning the policy options, first the abolishment of the partner allowance is discussed. This policy measure was already decided about in 1996, but will be in force from 2015 onwards. In the current political discussion, the major policy direction considered is raising the retirement age. Current government in October 2009 decided to raise the retirement age to 67. This reform is due to be discussed in parliament early 2010. This paper considers as a second measure raising the retirement age to 67 years of age and finds macro results on the reduction of the state pension costs and the sustainability gap, which are in line with earlier macro forecasts by CPB. The third measure considered is raising the taxation of the wealthier pensioners by abolishing their tax exemption. This alternative was favoured by different left-wing parties during the 2006 election campaign and was also proposed in an earlier advice of the Social Economic Council. The fourth measure discussed is introduction of a flat rate state pension at the same level as the

current pension for partners of a couple. This comes down to decreasing the pension for singles from 70% to 50% of the minimum wage. The fifth measure considered is the introduction of a flexible retirement window between 65 and 70 years of age with financial incentives for postponing retirement.

The structure of this paper is as follows. Section 2 briefly overviews the Dutch pension system and the earlier macro forecasts of state pension costs and ageing-related policy measures. Section 3 presents a brief description of the micro simulation model and the data it uses. In section 4, a baseline scenario is presented on the development of the state pension system. Besides the budgetary implications also the redistributive character of the system and the retirement incentives are investigated. Section 5 then describes the model results on budgetary, redistributive and labour participation effects of the policy alternatives. Section 6, finally, contains conclusions and some topics for future research.

2. The Dutch pension system

2.1 Institutional setup

The state pension called AOW (Algemene Ouderdoms Wet) is the first pillar in the Dutch pension scheme, which is based on three pillars. The second pillar consists out of supplementary company or sector pension facilities. Employees are obliged to take part in those second pillar pension programmes. The third pillar contains individual pension saving programmes which are voluntarily to participate in. Unlike the first pillar pensions, both second and third pillar pensions are fully funded. This three pillar model has a long tradition in the Netherlands, and is becoming more and more popular as a transitional system in which a small public PAYG scheme is kept alongside a larger (private) funded scheme (Baroni, 2007).

The Dutch government supplies a state pension called AOW to all persons aged 65 or over when they are entitled. Inhabitants of the Netherlands build up a right to this pension by living or working in the Netherlands while aged between 15 and 65. A right of 2% for the state pension is built up for every year this condition is fulfilled. Part of the population is only partially entitled because they have lived only temporarily in the Netherlands when aged between 15 and 65. The number of incomplete state pensions is rising because of the growing number of immigrants during the last decades.

The state pension scheme aims to provide a basic minimum income guarantee in case of a full entitlement. Therefore the system makes a distinction between partners of a couple and singles. A single gets a benefit of 70 percent of the minimum wage[2] and a partner of a couple gets 50 percent of the minimum wage. Until 2015, pensioners with a (non-working) partner younger than 65 can supplement their state pension of 50 percent with an allowance of another 50 percent to a combined maximum of 100 percent of the minimum wage. Partly entitled persons can lay a claim on social assistance. Social assistance, however, is income and means tested.

The AOW is a pay-as-you-go arrangement, the current population of workers pay for the current population of pensioners. The AOW is financed through a premium paid by these workers. The premium is fixed at a rate of 17.9 percent of the first two tax brackets (the limiting income is approximately € 32,000 in 2009). This premium revenue is not sufficient to cover all AOW costs. The government contributes the part of the AOW costs that is not covered by the premiums. The government contribution is financed by taxes, which are paid by pensioners as well.

2.2 Current situation

The ageing of the population is in particular a complication for the state pension, which is financed through a pay-as-you-go system. In 2009, 2.8 million people were receiving a state pension. The total cost of these pensions in 2009 amounted to € 27.7 billion. Currently, from the total cost of state pensions of € 27.7 billion, about two third comes from premiums and one third from taxes. The AOW expenses are rising sharply because of the ageing of the population whereas the premium income has stabilized. This implicates that the state contribution is rising.

The importance of 2nd and 3rd pillar pensions for the income position of the elderly is growing as more people are saving for such pensions and their average savings are increasing. Per person average 2nd pillar pension savings are almost equal now to the average 1st pillar state pension savings. In the future, it is to be expected that 2nd and 3rd pillar pensions together will provide more than half of the average pension income. Although there are many 2nd pillar pension funds in the Netherlands, each with its own rules on contributions and pensions, broadly speaking one can say that pension funds try to supplement the state pension to a total gross income level of 70% of the final wage. Because pensioners do not have to pay state pension

[2] The gross minimum wage in 2009 amounts to approximately € 18,000 per year. The gross AOW-benefit for a single is approximately € 12,700, the gross AOW-benefit for a couple is approximately € 8,700 for each partner. In net terms this amounts to 70% and 50% of the net minimum wage respectively.

contributions anymore, the net height of their 1st and 2nd pillar pensions together usually comes close to 90% of the final wage. Other income sources, like 3rd pillar pensions can add to this income level.

Recent studies report mixed findings on whether people actually reach their target of a 70% replacement rate (total pension as a percentage of the final wage). In a micro simulation study on the wealth of Dutch pensioners (SZW, 2006) the income position of pensioners is found to improve substantially as a consequence of more 2nd and 3rd pillar pension savings from younger generations. Statistics Netherlands (CBS, 2008) finds that a gross income level of on average 73% of the final wage is to be expected for the cohorts currently saving for their pension. Also in Van Sonsbeek (2010), it is shown that median replacement rates average 73% and are higher for the younger cohorts. However, in this study it is also signalled that replacement rate averages are biased because of high replacement rates for subgroups combining comparatively high pension savings with low current incomes (for example women that changed to working part-time during their career). Men on average only reach a replacement rate of 64%. Euwals, de Mooij and van Vuuren (2009) find that when the consequences of the career average system most pension funds recently switched to are taken into account, the younger generations have lower replacement rates, up to less than 50% for the birth cohorts 1972-1976.

2.3 Macro forecasts

Ageing has been on the political agenda since the 1980's when a government commission (the Drees commission) investigated the consequences of ageing for public finance. This commission reported that the cost of state pensions as a percentage of GDP would rise to somewhere between 7.0% and 8.5% in 2030. This early macro forecast is still reasonably accurate. Many macro analyses followed, their forecasts ranging from 5.4% to 10.0% in 2040 (see for an overview SVB, 2008).

The most recent study was published in the run up to the 2006 general elections. In this study, the Netherlands Bureau of Economic Policy Analyses (Van Ewijk et al., 2006) provided an analysis of ageing and the sustainability of Dutch public finances using the general equilibrium model GAMMA. The authors conclude that if current budgetary arrangements are maintained in the future, the gap between government expenditures and revenues will increase by 3.3% of GDP from a 0.7% surplus to a 2.6% deficit. This so called sustainability gap has a money value of € 15 billion based on the current GDP level. Present budgetary and social security arrangements are

therefore considered to be not sustainable. Sustainability is defined by the authors as satisfying Musgrave's criterion for intergenerational equity (Musgrave, 1986). This criterion implies that the net benefit from the government (relative to their lifetime incomes) is constant for all generations starting from now. According to this criterion, starting from now, all generations should pay the same tax rates and have the same benefit from government expenditures.

According to Van Ewijk et al., the cost of state pensions rise by 4.1% of GDP and the health care costs rise by 4.3% of GDP. These ageing related cost rises are the main causes of the rising government expenditures. The rises are partially compensated because tax revenues on pension income rise by 1.8% of GDP and tax revenues on consumption of the elderly by 2.3% of GDP. However, they do not fully compensate the cost rise, causing a sustainability gap of 2.6%[3] of GDP. Meanwhile the sustainability gap has tripled to around 6% of GDP because of the economic crisis (Gradus et al., 2010).

Van Ewijk et al. calculate the effects of different policy measures on the sustainability gap. Among others they consider raising the retirement age from 65 to 67 years of age and abolishing the tax exemption for pensioners and conclude that both measures reduce the sustainability gap by 0.6%[4]. Both measures were again considered with more or less the same results for the government commission (Advies Commissie Arbeidsparticipatie, 2008) that was to propose policy measures to boost labour participation and that mentioned both as long term solutions to the sustainability problem. In more recent studies, like CPB (2009c) the effect of raising the retirement age to 67 is slightly increased to 0.7%.

2.4 Redistributive characteristics and actuarial fairness of the state pension system

The Dutch state pension scheme can be classified as a 'Beveridge'-style public pension programme (Disney, 2004), characterized by significant departures from actuarial fairness and significant provision of private retirement benefits, as opposed to 'Bismarck'-style public pension programmes, characterized by high 'actuarial fairness' and limited private provision of private retirement benefits. The Dutch scheme, with its flat rate pensions for singles and cohabitants, therefore has a highly intra-generational redistributive character.

[3] In a later study, the authors update their earlier estimates and present a sustainability gap of 2.2% of GDP (CPB, 2007). The decrease is the result of an upward correction as a consequence of newer life expectancy tables from Statistics Netherlands (CBS, 2007) and a downward correction because of improvement of the primary EMU balance from 2006 to 2007 and inclusion of current government's policies.

[4] This reduction is the result of a general equilibrium model and concerns both direct and indirect effects on both expenses (state pension and other benefits) and tax revenues.

Actuarial fairness requires that the present value of lifetime contributions to a scheme equals the present value of lifetime benefits from a scheme. Actuarial fairness so relates to the entire lifetime of contributions and benefits (Queisser and Whitehouse, 2006). The redistributive effects of a scheme can be considered to be the flip side of the actuarial fairness of the scheme. In an actuarially fair scheme, there will be no redistribution, except redistribution through random differences in life expectancy. However, no pension scheme can be considered fully actuarially fair as redistribution effects are inherent to pension systems because of differences in life expectancy between groups and pension schemes providing safety nets to the poor. The Dutch state pension system adds to this different pension levels for singles (70% of the minimum wage) and partners of a couple (each 50% of the minimum wage), causing redistribution from couples to singles.

In this paper intra-generational redistribution is assessed. Besides intra-generational redistribution, also intergenerational redistribution (e.g. from the younger birth cohorts to the older birth cohorts) can be considered, like in Pettersson et al. (2006). This kind of redistribution is particularly important when discussing the intergenerational fairness of policy proposals. For a pension scheme, when comparing the total amount of contributions to the scheme to the total amount of withdrawals from the scheme, internal rates of return can be computed for consecutive birth cohorts in order to assess the intergenerational redistribution. Typically, given their rising life expectancy, benefit withdrawals in a public PAYG system will overcompensate previous contributions for the current cohorts. Current cohorts can be expected to have a positive internal rate of return: they receive better value from the state pension plan than the cohorts that follow. In a micro simulation study of the Canadian Pension Plan, Morrison (2007) shows that all current cohorts have positive internal rates of return. This holds true even for subgroups with lower life expectancies that on an intra-generational basis are subsidizing groups with higher life expectancies. Future extensions of the SADNAP model are planned to allow for analyzing intergenerational redistribution.

3. Model and data

3.1 Model

The use of micro simulation models in policy assessment and evaluation is becoming more widespread (see e.g. Buddelmeyer, Freebairn and Kalb, 2006, and specifically on pension reform Oksanen, 2004 and Stensnes and Stolen, 2007). This paper uses a micro simulation model called SADNAP (Social Affairs Department of the Netherlands Ageing and Pensions model) to analyse the budgetary, redistributive and labour participation effects of policy measures. The model, which is described in Van Sonsbeek (2009), is a dynamic micro simulation model that simulates life paths of a sample of the Dutch population using transition probabilities on demographic events. The model uses administrative datasets on 2006 state pension payments and 2005 state pension and private pension entitlements. The demographic component of the model is aligned with the newest population projection of Statistics Netherlands (CBS, 2009), taking into account the most recent birth and immigration numbers and mortality and emigration rates. The SADNAP model has been modularly designed and its main demographic and budgetary modules have been used in the budget forecasts of the Ministry of Social Affairs and Employment since 2007. Recently the model has been extended with a module modelling the retirement decision. Also differentiation in mortality rates by various characteristics has been introduced, so that the difference in life expectancy between higher and lower incomes, between singles and cohabitants and between natives and immigrants is now accounted for. These extensions are described in detail in Van Sonsbeek (2010).

The main events modelled concern the household and participation status and the retirement decision. The household and participation status are simplified to a binary choice model, allowing the household status to be either single or cohabiting and the participation status to be either participating or non-participating. The retirement decision is modelled by the option value approach first suggested by Stock and Wise (1990), taking into account the individual data on wages, state pension entitlements and private pension entitlements and combining those with individually varied option value parameters (time preference, leisure preference and risk aversion). Also, productivity loss at higher ages and age- and gender specific mortality-, unemployment- and disability rates are taken into account. An overview of the model and its parameters is included in appendix A.

3.2 Data sources

In SADNAP, three micro data sources are used. Statistics Netherlands (CBS) supplies a micro data file on state pension entitlements. This file contains all over 11 million persons aged 15 to 64 who lived in the Netherlands in 2005. The Social Insurance Bank (SVB), the authority that accomplishes the payment of state pensions, supplies a full administrative data file with information on all 2.6 million persons that were receiving state pension in 2006. Recently, Statistics Netherlands has also started providing data on (2nd pillar) company pensions. In 2009, a micro dataset has become available based on data of a representative sample of pension funds including the large pension funds for civil servants and health workers. This file includes individual data on company pension entitlements in 2005 of 53% of the population aged 15-64 and 67% of the Dutch employees. A detailed description of these data sources is presented in the separate paper on the SADNAP model (Van Sonsbeek, 2010).

Besides the micro data sources, a number of macro data sources are used as well. These include the most recent population projection by age, gender and ethnicity by Statistics Netherlands, running from 2008 to 2050, the household projection from Statistics Netherlands, running from 2009 to 2050 and the most recent labour participation rate projection as provided by The Netherlands Bureau of Economic Policy Analysis (CPB, 2009b), also running from 2009 to 2050.

4. Baseline scenario in a micro approach

4.1 State pension costs in the baseline scenario

When pensions stabilize at the current level in real terms, the state pension costs will rise from € 27.7 billion in 2009 to € 50.3 billion in 2040. Like in earlier CPB publications, the year 2040 is focused upon throughout this paper for the long-term effects as around 2040, the ageing in the Netherlands is at its peak. In terms of GDP, assuming that GDP also stabilizes at the current (2009) level of € 573 billion, the state pension costs will rise from 4.8% in 2009 to 8.8% in 2040. The rise is huge, but still somewhat less than expected. When also constant pension costs per pensioner would be assumed, state pension costs would rise to € 51.9 billion in 2040 or 9.1% of current GDP. It appears that the cost per person will decrease over time (apart from increases through indexation). These decreasing cost per person account for a 0.3% of GDP lower state pension cost. The rising share of reduced state pensions because of the rising share of 1st

generation immigrants and the rising labour participation of women account for 0.2% each. The development in the share of singles in the population of pensioners has a small upward effect of 0.1% of GDP in 2040. During the oncoming decades, the share of singles among the pensioners population is decreasing but this trend will be reversed in the future.

4.2 Retirement age in the baseline scenario

In the Netherlands, the first possible retirement age used to be 60 years in many sectors. Since the late 1980's, for most employees a generous early retirement scheme existed that guaranteed an income level of 70-80% of the final wage without loss of pension accruals from 60 years of age onwards. Gradually, the generous early retirement schemes are being replaced by actuarially neutral schemes until, from 2015 onwards almost all schemes will be fully actuarially neutral (see Bovenberg and Gradus, 2008). This will lead to a sharp increase of the effective retirement age. With the option value model that is incorporated in SADNAP a retirement pattern is predicted for a baseline scenario with fully actuarially neutral schemes. This pattern concerns only the population that is still working at 60. At that age, a lot of people are already not available to the workforce anymore. Even according to the newest participation rate forecasts (CPB, 2009b), also in the future at age 60 almost half of the women and 30% of the men will not be participating at the labour market anymore, mainly due to being on benefit and for women also to voluntary unemployment. Of the ones that are still working at 60, about 26% will retire before 65, about 38% at 65 and about 36% past 65. As compared to a scenario with the generous early retirement schemes from the past, the average retirement age of the population still participating at age 60 age increases by 2.5 years.

The baseline projections give a plausible retirement pattern, especially for males, although the number of people working past the age of 65 is larger than currently observed. This may be due to the compulsory dismissal at age 65[5]. As government has meanwhile proposed to abolish this compulsory dismissal, it is to be expected that the number of workers past the age of 65 will grow in the future. The importance of abolishing the compulsory dismissal at age 65 could be substantial in eliminating the 'Age-65-retirement-effect' which explains the high retirement spikes usually found at 65 from the influence of custom or accepted practice (Lumsdaine, Stock and Wise, 1995). In the SADNAP projections, the last possible retirement age is 69. There is a

[5] In the Netherlands almost all collective labour agreements are (temporarily) elevated at 65.
Although dismissal at that particular age is not obliged, in practice the majority of employers lays off its employees at this age. Therefore, from the perspective of employees, this age acts as an age of compulsory dismissal.

substantial spike at this last possible retirement age, caused by people for who financial incentives make working until the last possible retirement age the most attractive option. Although this may from the current viewpoint seem improbable, it should be noted that at the moment already 13% of the men aged 65-74 are participating at the labour market (Monden, 2008), albeit mostly as a self-employed or in smaller part-time jobs.

4.3 Redistribution and actuarial fairness in the baseline scenario

Redistributive effects of the various policy measures are assessed in two ways. These two approaches may lead to different conclusions. Broadly speaking, the second, more detailed approach can be used to explain the results from the first approach.

First, a general inequality indicator, the Gini coefficient, is used to judge whether the policy measure increases or decreases income inequality. The Gini coefficient is computed on the total individual pension income (state pension plus 2nd pillar pension) of all pensioners in 2040. In 2040, The Gini coefficient is 0.291 in the Baseline scenario. By using the 2040 data, the same year is used for the effects on the Gini coefficient as for the budgetary effects. The population of pensioners in 2040 consists of all people that retired between 2006 and 2040, making 2040 the first year having a population of pensioners that almost completely follows from the simulation. This is important because for the people that retired before 2006 the 2nd pillar pension entitlements are not known and for the people retiring past 2040, the 2nd pillar pension entitlement data become less reliable as they are based on the wages of those people in 2005, so when they were still below 30 years of age.

Second, the redistribution within the scheme is investigated in more detail by computing the share of lifetime state pension income taken by different subgroups. The lifetime state pension income is computed by accumulating incomes from the year a person turns 65 until the year a person dies. For this analysis, the 2006-2045 pensioner cohorts (the 1941-1980 birth cohorts) are aggregated. As the simulation runs until 2080, the 2045 pensioner cohort is one of the last cohorts that by 2080 will have almost completely died out. Table 1 shows a subdivision of the accumulated cohorts by subgroup, with the share of each subgroup in the cohorts of pensioners, its share of lifetime state pension income and the ratio between the two.

Table 1: Share of lifetime state pension income compared to share of state pension cohorts

Subgroup	Share of cohorts turning 65	Share of lifetime pension costs	Ratio
By income			
- **1st quintile**	19.4%	15.4%	0.79
- **2nd quintile**	19.8%	18.5%	0.93
- **3rd quintile**	20.0%	19.4%	0.97
- **4th quintile**	20.3%	21.8%	1.08
- **5th quintile**	20.5%	24.9%	1.21
By gender			
- **Women**	49.4%	52.6%	1.06
- **Men**	50.6%	47.4%	0.94
By household status			
- **Singles**	30.6%	34.0%	1.11
- **Cohabitants**	69.4%	66.0%	0.95
By origin			
- **Natives**	73.5%	82.4%	1.12
- **Immigrants**	26.5%	17.6%	0.66

The average lifetime state pension income per person is around € 190,000, with lifetime income per person decreasing for the later cohorts because of the rising number of people with incomplete state pension entitlements. The higher income quintiles receive an above average share of total state pension because of differences in life expectancy. This redistribution through life expectancy is substantial. The 1st income quintile receives more than a third less than the 5th income quintile (a ratio of 0.79 vs. a ratio of 1.21). This is mainly due to the difference in life expectancy, but also to the larger share of incomplete state pensions in the lower income quintiles. Women receive 6% more state pension from the scheme than their share in the cohort would justify. Singles receive 11% more state pension from the scheme than their share in the cohort would justify. This is because the lower life expectancy of singles is overcompensated by their higher state pension. Immigrants receive 34% less state pension from the scheme than their share in the cohort would justify. However, this large difference is in the first place due to immigrants building up less entitlement during their life and only for a smaller part to differences in life expectancy.

5. Policy alternatives

In this section various policy alternatives are discussed. Dutch government in October 2009 decided to raise the retirement age to 67 years[6]. However, many alternatives to raising the retirement age have been considered meanwhile and a final decision still has to take place as the government proposal is still due to be discussed in parliament in 2010.

5.1 Overview of policy measures

The first measure considered is the abolishment of the partner allowance. This policy change was already decided about in 1996 but will be implemented from 2015 onwards. Therefore, this measure was not yet included in earlier macro forecasts of the Netherlands Bureau of Economic Policy Analysis. A state pensioner qualifies for the partner allowance when he or she has a partner that is younger than 65 that earns not enough income of his own. As a consequence, most of the partner allowance recipients are men turning 65 having a several years younger spouse who is earning no or too little income herself. Therefore the partner allowance implicitly penalizes labour participation of the younger spouses.

The second measure considered is the raising of the retirement age to 67 as current government decided to do. Raising the pension age from 65 to 67 was already considered by some smaller political parties during the 2006 election campaign, but was at that time avoided by the main political parties. Meanwhile, not only the government parties, but also the main liberal opposition party now advocates this measure (CPB, 2009a).

The third measure considered is raising the taxation of pensioners, by eliminating their social security premium exemption. Pensioners do not pay contributions to the pension scheme anymore. This tax exemption allows a reduction in the tax rate of 17.9% points in the first two income tax brackets. This measure, which was favoured by most left-wing parties during the 2006 election campaign, leaves the net state pension unchanged so affects only the people with additional 2nd or 3rd pillar pensions[7].

The fourth measure concerns individualizing the state pension level to 50% of the minimum wage for each pensioner. Currently singles get a higher pension than cohabitants (70% vs. 50% of the minimum wage). This is justifiable from the viewpoint of singles having higher cost

[6] The retirement age will be raised in two steps, first to 66 in 2020 and then to 67 in 2025.
[7] Current government in 2007 decided to slowly phase out a (comparatively small) part of this tax exemption between 2011 and 2030.

of living than cohabitants[8], but not from the perspective of contributions to the scheme. Moreover, 2nd pillar pension funds usually assume their contributors to be single when setting the desired pension height. This results in singles ceteris paribus reaching a higher replacement rate (income from 1st and 2nd pillar pension together as a percentage of the final wage) than partners of a couple. Such an individualization was recently mentioned in Bovenberg and Gradus (2008) but has a far longer history and was previously proposed already by the 1987 Drees commission that advised on how to cope with ageing (SVB, 2008), albeit at a higher level of 60% of the minimum wage for each pensioner, regardless of the marital or cohabiting status.

A final measure described in this chapter is the introduction of a retirement window between 65 and 70 years of age with an accrual rate that is above actuarially neutral level in order to stimulate employees to delay their retirement. This option is suggested by Den Butter and Van Sonsbeek (2008) and can be seen as an adaptation of current government's proposal to introduce a retirement window between 65 and 70 years of age with actuarially neutral adjustments (which is also due to be discussed in parliament in 2010). We assume for this measure an accrual rate of 8% instead of 5% in the government's proposal.

Raising the retirement age and introducing a retirement window can be considered generic measures that affect all persons in the same way, albeit that some will be able to cope with such changes better than others. The other measures are specific measures that affect specific groups and leave others unaffected. Such specific measures fundamentally change the character of the state pension scheme. For example, because abolishing the tax exemption of pensioners affects higher incomes (that contributed more to the scheme) more than lower incomes, actuarial fairness of the scheme is decreased, giving the scheme, in terms of Disney (2004) a more 'Beveridgean' character. On the other hand, both abolishing the partner allowance and decreasing the state pension for singles to the current level for cohabitants increase actuarial fairness and give the scheme, in terms of Disney, a more 'Bismarckian' character.

5.2 Direct budgetary effects

As SADNAP is not an equilibrium model, analysis of the budgetary effects is limited to the direct effects. This underlines the case for combining micro simulation models with macro GE models in order to get an optimal assessment of a measure (see e.g. Peichl, 2008). Direct effects

[8] The state pension aims to provide a basic minimum income guarantee, so a complete state pension entitlement guarantees a net pension that is exactly equal to the social minimum level, which is 70% of the minimum wage for singles and 100% of the minimum wage for a couple.

incorporated in SADNAP include both the expenses (state pensions and social security benefits) and the tax revenues.

All measures are assumed to be in force from 2015 onwards. The abolishment of the partner allowance will be in force from 2015 onwards, as this measure is already decided about. For comparability the other measures follow this scheme. The measures are assumed to affect only the pensioner cohorts of 2015 onwards in order to prevent existing rights to be violated. For abolishing the partner allowance and decreasing the singles pension, this means that all people that turned 65 before 2015 keep their entitlements to the partner allowance and the 70% singles pension respectively. For decreasing the singles pension this implies that the full effect of the measure will only be reached around 2050 when the cohorts that turned 65 before 2015 have died out. On the other hand, raising the retirement age by definition only affects new cohorts and, from the state pension perspective, raising the taxation of pensioners by abolishing their tax exemption has no effect at all as the higher taxation affects only the 2nd pillar pensions.

It is assumed that the retirement age is increased immediately from 65 to 67 in 2015 and that the tax exemption is abolished immediately in 2015 for all. Although, this is technically possible, from a policy viewpoint, this may not be a realistic assumption. Both for raising the retirement age and raising the taxation of pensioners a stepwise approach will be more plausible, like in the government proposal to raise the retirement age in two steps in 2020 and 2025 to 66 and 67 respectively. The financial effects of such a stepwise approach can of course be easily deducted from the tables on the immediate approach. Table 2 summarizes the effects of the different measures in 2040. A detailed table of direct budgetary effects is included in appendix B. Also the structural effect (2050 onwards) is given as decreasing the singles pension will only be fully effective in 2050. For 2040, the effects of the five measures are given as compared to the baseline scenario and to a baseline scenario in which the abolishment of the partner allowance is incorporated. This especially affects the results of raising the retirement age because when the partner allowance starts at a higher retirement age, the costs of the partner allowance will rise as chances of a partner earning enough income decline when that partner is also two years older.

Table 2: Budgetary effects of the policy alternatives

Effects 2040 (%GDP)	Partner allowance	Retirement age 67	Raising taxation	Pension singles 50%	Ret. window Accrual 8%
Compared to baseline					
- **State pension cost (1)**	-0.25	-0.64	+2.37	-1.19	+0.15
- **Other benefits (2)**	+0.02	+0.11	0	+0.10	0
- **Tax revenues (3)**	-0.02	-0.11	+3.35	-0.20	+0.03
- **Net effect (1+2-3)**	-0.20	-0.42	-0.98	-0.89	+0.12
Baseline incl. partner allowance					
- **Net effect (1+2-3)**		-0.50	-0.98	-0.89	+0.12
Structural effect (2050)					
- **Net effect (1+2-3)**		-0.50	-0.85	-1.04	+0.22

Direct budgetary effects of abolishing the partner allowance amount to 0.25% of GDP in 2040. As this measure is already decided about, the effect should in fact be part of a baseline scenario. When added to the decreasing cost per person in the state pension scheme from section 4.1, that reduces the baseline forecast by 0.3% of GDP, a 0.55% reduction of state pension costs can be made as compared to the macro forecast of van Ewijk et al. This compensates the effect of the rising longevity from the most recent population projection that causes a 0.5% of GDP increase in the state pension cost forecast (Van Sonsbeek, 2010).

By far the largest direct budgetary effects can be achieved by reducing the state pension for singles to 50% of the minimum wage and by raising the taxation of pensioners. Individualization of the pension levels reduces the state pension cost by 1.19% of GDP in 2040 and by 1.38% in 2050 when the full effect of this measure is reached. The cost of social assistance will go up, but as most people, also most singles, have adequate 2nd pillar pension savings or personal wealth, no social assistance can be claimed by most. When also lower tax revenues are taken into account, a net effect of 1.04% of GDP results.

Abolishing the tax exemption of pensioners actually increases state pension costs as the state pension is linked on a net basis to the social minimum income so that a removal of the tax exemption would increase state pensions on a gross basis, yielding the same net disposable state pension income as before (OECD, 2008). The gain from this measure of course comes from the tax revenues that rise faster than the pension expenses. The direct net effect of this measure (0.98% of GDP in 2040 and 0.85% in 2050) is slightly larger than mentioned in previous studies, probably because future pension wealth increases for new cohorts of pensioners. However, it

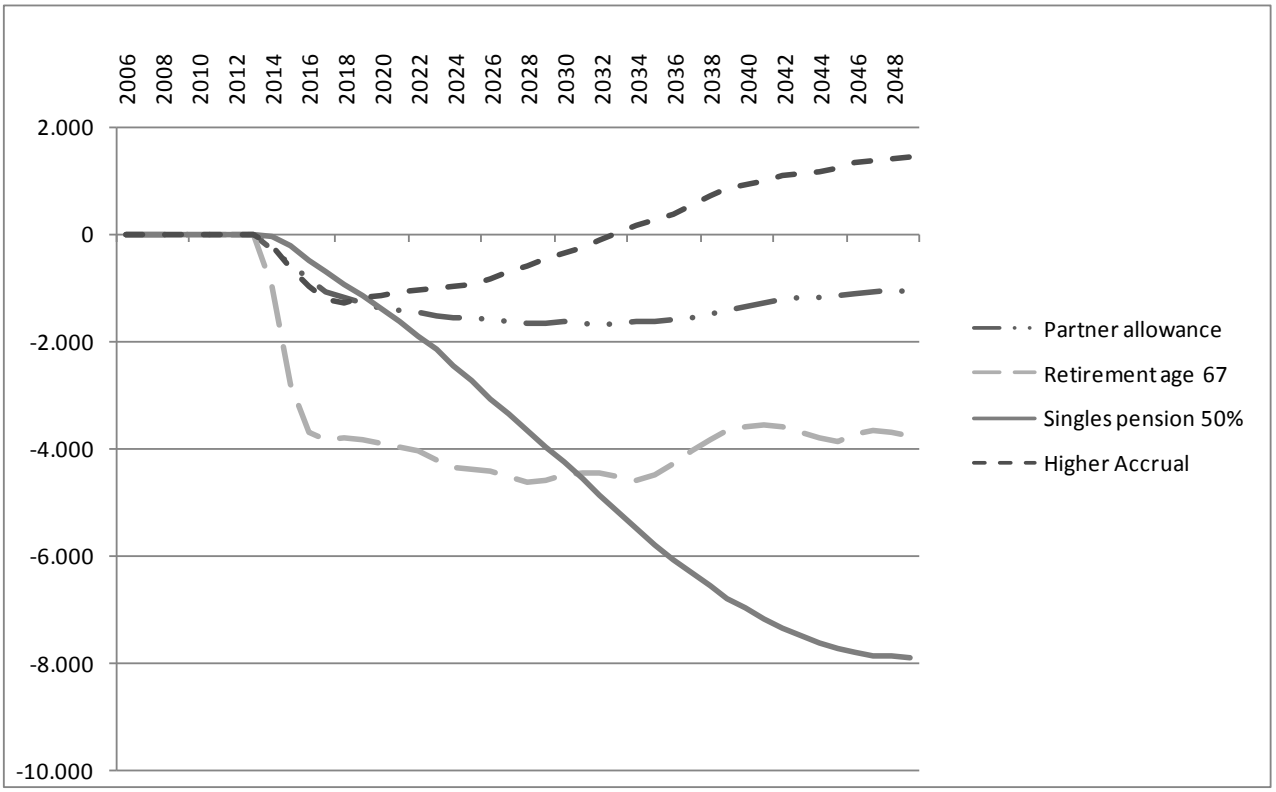
should be noted that according to general equilibrium model analysis like from De Hek and Van Erp (2009) a negative effect on labour supply is to be expected as individuals supply less labour over their lifetime and the reduction in labour supply and the participation rate is widespread across the different ages.

Raising the retirement age decreases state pension costs by 0.72% of GDP in 2040. However, the costs of the partner allowances go up by 0.08%. Also expenses on other social benefits (mainly disability, unemployment, social assistance and survivor's pensions) will go up as people that are on one of those benefits at age 64 will most probably use that benefit for two years more. However, this leakage rate decreases over time because of the decreasing disability rates that resulted from the 2006 reform of the DI scheme (see Van Sonsbeek and Gradus, 2006). Tax revenues decrease only slightly as people that are working or on benefit at 65 and 66 will also pay taxes. The net direct effect is about half of that of reducing the singles pension: 0.42% when the partner allowance is kept and 0.50% when the partner allowance is abolished.

Introducing a retirement window with a high accrual increases state pension costs for two reasons. In the first place, state pension costs rise because of adverse selection: people with longer life expectancies are more likely to delay their pension. Evidence for adverse selection comes from recent studies by Finkelstein and Poterba (2004) and Kühntopf and Tivig (2008). In the second place, the high accrual rate means that lifetime state pension expenses rise for all people delaying their retirement. State pension costs go up by 0.12% of GDP in 2040 and 0.22% of GDP in 2050.

Figure 1 shows how the year-by-year savings on state pension expenses of the four policy measures build up over time (we abstract from abolishing the tax exemption as state pension costs are not affected). This concerns the total savings on state pension expenses of a measure as compared to the baseline scenario excluding abolishment of the partner allowance.

Figure 1: Year-by-year savings of policy measures (€ 1 million)



Savings of abolishing the partner allowance quickly rise till € 1.7 billion until around 2030, but decrease over time as labour participation of women increases and cohorts of new pensioners are growing smaller. Savings of raising the retirement age rise very quickly to a structural level of around € 4 billion. When the size of the pensioner cohorts grows smaller after 2036, the savings decrease. Savings of decreasing the singles pension increase slowly to a structural level of around € 8 billion, which is reached around 2050 because all pensioners from before 2015 are assumed to be not affected by this measure. Introducing a retirement window with a high accrual first causes savings because early cohorts start delaying their pension. However, as soon as they start claiming their higher state pension, savings disappear and turn negative eventually from 2034 onwards. The balance is in particular negative around 2050 when the ageing of the population got past its top. At that time the size of the new cohorts, part of which is delaying the state pension, is decreasing, while the larger cohorts that delayed the state pension in the past still have to be paid higher state pensions.

5.3 Labour participation effects

Labour participation effects are measured by the effect on the effective retirement age of the people that are still working at age 60. Their retirement age is forecasted by the option value model described in section 3.1. Again it should be noted, that effects on participation over the

lifetime are not taken into account, nor are effects on the participation of other household members. Table 3 summarizes the effects on the distribution of retirement ages of the various policy measures. It should be noted that the baseline scenario is the current situation of unchanged policies. This does not fully represent current retirement patterns as until recently generous early retirement schemes were in force, that are slowly being phased out. Therefore an additional benchmark scenario is added with generous early retirement schemes for most of the population like existed during the 1990's.

Table 3: Effect on retirement age of the policy alternatives

Retirement age	Generous ERS	Baseline	Partner allowance	Ret. age 67	Raising taxation	Singles 50%	Accrual 8%
Not participating at 60	43	43	43	43	43	43	43
Between 60 and 64	39	15	15	15	14	15	15
At 65	7	22	19	5	22	21	19
Past 65	11	20	23	37	20	21	24
Average (conditional on working at 60)	62.8	65.2	65.3	65.8	65.3	65.3	65.5
Δ Baseline (months)	-29		1	7	0	1	3

Raising the retirement age till 67 causes the largest positive effect on the retirement age, increasing it by 7 months. This corresponds with a literature overview by CPB (2008) in which effects from raising the retirement age on the effective retirement age are mentioned ranging from about 10% (2 months) from several ex-ante evaluations to 50% (1 year) from an ex-post evaluation by Mastrobuoni (2006). The higher ex-post effect was explained by the new retirement age becoming the new social-cultural norm, which cannot be captured in the option value model. An increase of the effective retirement age will also increase tax revenues. The effect of raising the taxation of pensioners and decreasing the pension of singles on the retirement age is very small. Moreover, it should be kept in mind that raising the taxation of pensioners has a negative effect on labour supply over the lifetime. The small effect on the retirement age by the large decrease of the pension of singles can be explained by the comparatively small number of people immediately affected (at age 65, about 20% of men and 30% of women are single) whereas when raising the retirement age to 67 the complete cohorts of 65 and 66 years old are affected. The effect of abolishing the partner allowance on the retirement age is also small, but may become more substantial when taking into account that an

important additional effect on labour participation may occur through the participation decision of the younger partner. Abolishing the partner allowance also has an immediate effect on a comparatively large part of the cohort. Introducing a retirement window with a high accrual substantially boosts labour participation. The increase is half of the increase when raising the retirement age. This confirms findings from the US by Pingle (2006) who shows a strong correlation between the accrual and the use of delaying retirement and from Vonkova and Van Soest (2009) who find similar results from stated preference surveys in the Netherlands. However, all effects of new policy measures are minor as compared to the huge change in retirement behaviour and increase of the average retirement age (almost 2.5 years) caused by abolishing the generous early retirement schemes.

5.4 Redistributive effects

The Gini coefficients of the different policy measures are presented in table 4. The abolishment of the partner allowance and the raising of the retirement age affect the Gini coefficient only marginally. Raising the taxation of the wealthier pensioners of course decreases income inequality. The Gini coefficient decreases by over 2 percentage points. Decreasing the pension of singles to 50% increases income inequality by 1.5 percentage point. When comparing state pensions only, one would expect the income inequality to decrease because the difference between singles and couples is levelled out. However, singles have a lower 2nd pillar pension (about € 2,000 on average) which mitigates the difference in state pension level. When state pension levels are equalised, the difference between singles and cohabitants in 2nd pillar pensions becomes larger than their difference in total pensions was in the baseline. Introducing the retirement window with a high accrual also increases income inequality as higher incomes with longer life expectancy are more likely to delay their retirement.

Table 4: Effect on income inequality of the policy alternatives

	Baseline	Partner allowance	Retirement age 67	Raising taxation	Pension singles 50%	Ret. window Accrual 8%
Gini coefficient	0.291	0.293	0.291	0.268	0.306	0.297
Difference		+0.002	0	-0.023	+0.015	+0.006

In table 5, the ratio of the share of lifetime state pension income and the share of the cohorts turning 65 is presented. The policy alternatives can be compared to the baseline which was

already presented in table 3. Raising the taxation of the wealthier pensioners has no effect on the state pension level, so has no effect on this ratio as only the redistribution within the state pension scheme is analysed. The table gives the redistributive effects of the measures when they have reached their full effect so the transition period that plays an important role with some measures has no influence on the results.

Table 5: Effect of the policy alternatives on share of lifetime state pension income compared to share of state pension cohorts

Subgroup	Baseline	Partner allowance	Retirement age 67	Raising taxation	Pension singles 50%	Ret. window Accrual 8%
By income						
- **1st quintile**	0.79	0.79	0.78	0.79	0.78	0.79
- **2nd quintile**	0.93	0.93	0.93	0.93	0.94	0.93
- **3rd quintile**	0.97	0.97	0.97	0.97	0.97	0.97
- **4th quintile**	1.08	1.07	1.08	1.08	1.07	1.08
- **5th quintile**	1.21	1.22	1.23	1.21	1.22	1.22
By gender						
- **Women**	1.06	1.09	1.06	1.06	1.03	1.07
- **Men**	0.94	0.91	0.94	0.94	0.97	0.94
By household status						
- **Singles**	1.11	1.14	1.09	1.11	0.85	1.11
- **Cohabitants**	0.95	0.94	0.96	0.95	1.08	0.95
By origin						
- **Natives**	1.12	1.12	1.13	1.12	1.12	1.12
- **Immigrants**	0.66	0.66	0.65	0.66	0.66	0.66

The different measures have little effect on the share of lifetime state pension income taken by different income quintiles and by natives vs. immigrants. Raising the retirement age to 67, decreasing the singles pension and introducing a retirement window with a high accrual all slightly increase the share of lifetime state pension taken by the higher incomes because of their higher life expectancy. Abolishing the partner allowance increases the share of pension income taken by women (ratio of 1.09 vs. 1.06) as mostly men are receiving partner allowances because they usually turn 65 first and have a higher chance of a non-working partner. Of course, abolishing the partner allowance also increases the share of lifetime pension income taken by singles (ratio of 1.14 vs. 1.11). Reduction of the singles pension to 50% does exactly the opposite

and has very large redistributive effects. Because of their lower life expectancy, singles take a smaller share of lifetime pension income than partners of a couple when their pension levels are equal (ratio of 0.85 vs. 1.11). It is worth noting that by combining abolishment of the partner allowance and reduction of the singles pension their redistributive effects are mitigated somewhat, which can make this combination a more acceptable option from a policy point of view. This can be even more so when such a combination of measures is combined with the retirement window between 65 and 70 with a high accrual, which allows both singles and partners of a couple to actuarially increase their pension to a higher level. Singles may make more use of such an opportunity than couples because of the importance of the social network belonging to their work. Moreover, it is known from Coile (2004) that husbands' and wives' retirement behaviour is influenced not only by their own financial incentives but also by spill over effects from their spouses' incentives so that financial incentives may be less effective for couples than for singles.

5.5 Assessment of the policy alternatives

Table 6 summarizes the effects on different indicators for the four policy alternatives. Actuarial fairness is not yet quantified with an indicator, but a qualitative analysis can be made.

Table 6: Overall assessment of the policy alternatives

Measure	Partner allowance	Retirement age 67	Raising taxation	Pension singles 50%	Ret. window Accrual 8%
Budgetary effect (Δ % of GDP)	-0.2	-0.5	-0.9	-1.0	+0.2
Behavioural effect (Δ ret. age, months)	1	7	0	1	3
Redistributive effect (Δ Gini coefficient)	+0.002	0	-0.023	+0.015	+0.006
Effect on actuarial fairness	+	0	-	+	0

From a budgetary point of view, reducing the pension for singles and raising the taxation of pensioners have the largest direct effect (1.0% and 0.9% of GDP respectively). However, both measures have only limited effect on labour participation as the retirement age is only marginally affected. Moreover, both measures have large implications for income inequality and actuarial fairness. Raising the taxation by abolishing the tax exemption for pensioners decreases the Gini coefficient by over 2 percentage points but makes the system less actuarially fair. Reducing the singles pension increases the Gini coefficient by 1.5 percentage points but makes the system

actuarially fairer. Also, it should be noted that raising taxation has negative indirect effects on labour supply reducing the sustainability effect.

Raising the retirement age has a direct budgetary effect that is only half of the abovementioned measures. However, this alternative has the largest effect on labour participation as the retirement age is expected to rise by 7 months. Because such an increase in labour participation will increase tax revenues, indirect budgetary effects will decrease the difference with the other measures. Raising the retirement age has no redistributive effects, which can make the measure politically more attractive in a coalition government. Introducing a retirement window with a high accrual has labour participation effects half the size of raising the retirement age but increases state pension costs by 0.2% of GDP. Abolishing the partner allowance has smaller but still substantial effects on both the government budget and labour participation. This holds true especially when one takes into account the indirect effect of this measure on the labour participation of the younger partners that is not part of this analysis. As redistributive effects are minor and actuarial fairness of the scheme improves, this seems to be the one no regret measure.

6. Conclusions and topics for future research

The ageing of the population jeopardises the sustainability of public finances in the Netherlands. Most political parties propose policy measures to restrain the sharp increase in pension costs. The policy measures considered in this paper are abolishment of the partner allowance, raising the retirement age from 65 to 67, decreasing the pension of singles from 70% to 50%, raising the taxation of wealthier pensioners and introduction of a flexible retirement window with financial incentives for postponing retirement.

The micro simulation model SADNAP is used to calculate both the cost of the state pensions and the consequences of the policy alternatives for the income distribution and the retirement decision of pensioners. The redistributive character of the Dutch state pension system can be assessed, taking into account differences in life expectancy between higher and lower incomes, women and men, cohabitants and singles and between natives and immigrants. The retirement decision is modelled based on the Stock and Wise option value approach, allowing for individual variation in the main option value parameters in order to make use of the added value of micro simulation. Therefore a broader judgment of policy alternatives can be made.

In the baseline scenario, by using the micro instead of the macro approach, it is shown that the state pension costs rise less sharply then the number of pensioners. This compensates for the increasing longevity from recent population forecasts.

Assessing the policy measures, from a budgetary point of view, reducing the pension for singles and raising the taxation of pensioners appear to have the largest direct effect, 1.0% and 0.9% of GDP respectively. However, both measures have large and opposite implications for income inequality and actuarial fairness. From a labour participation point of view, raising the retirement age has the largest effect, increasing effective retirement age by 7 months. This measure has no redistributive effects. Its direct budgetary effects are 0.5% of GDP, half of that of the aforementioned measures. Abolishing the partner allowance has smaller but still substantial effects on both the government budget and labour participation. As also actuarial fairness of the scheme improves without causing redistributive side effects this seems to be the one no regret measure. Introducing a retirement window with a high accrual has substantial labour participation effects, as retirement age increases by 3 months, but increases state pension expenses in the long run.

Future research on the model will focus on improving the model by using more recent datasets and estimating the option value parameters using consecutive datasets. The model will be extended in order to assess the actuarial fairness of the scheme and of the policy alternatives. This among others requires construction of life paths for all future pensioners by backwards simulating the participation and cohabiting “careers” of the starting population. Finally, in the ageing discussion the distribution of wealth over the generations is also important. In the future, the model can be further extended, enabling a comparison of the expected future wealth of generations currently contributing to the wealth of the generations currently using the pensions. However, these intergenerational analyses are very complicated and still underdeveloped.

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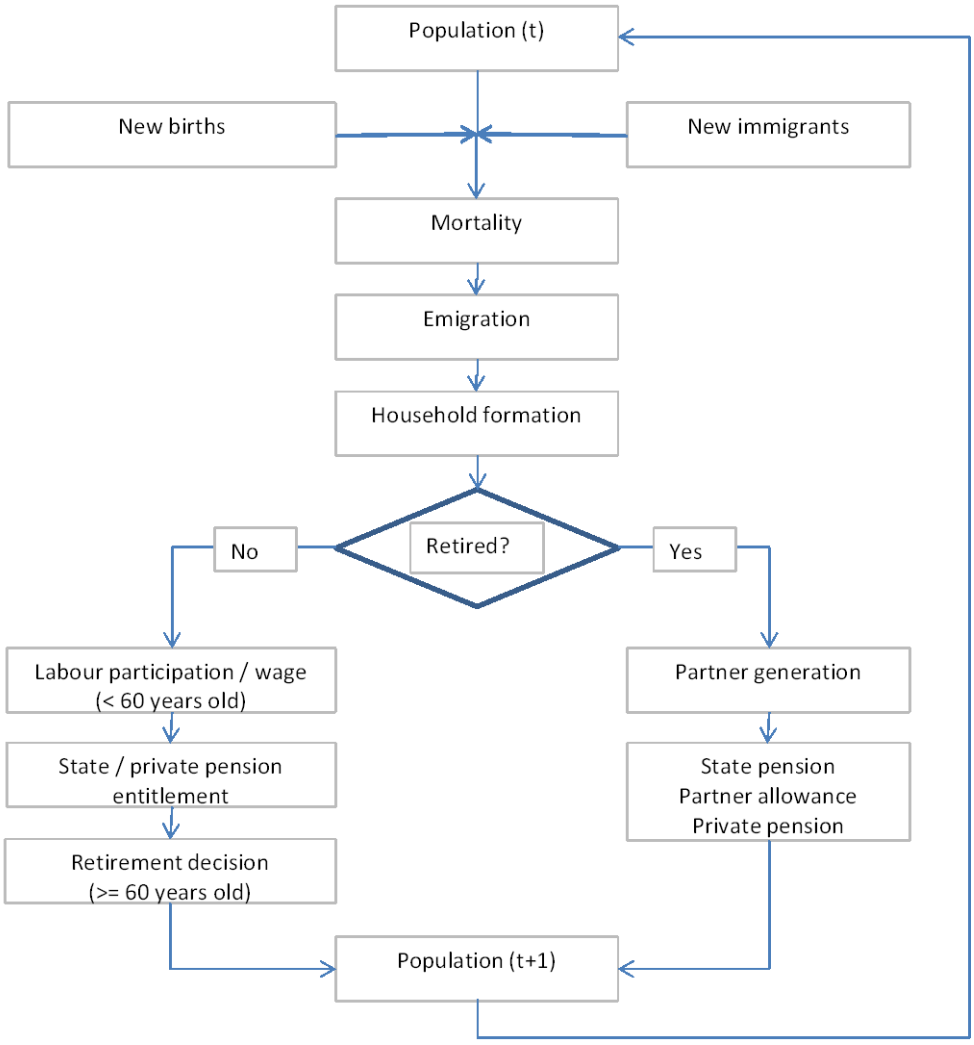
Appendix A: The SADNAP Model

The dynamic micro simulation model SADNAP is being developed for calculating the financial and economic implications of the ageing problem and of the policy measures considered. The model uses administrative datasets on state pension payments, state pension entitlements and private pension entitlements. Life paths are constructed for a sample of the Dutch population, including immigration and emigration, household formation and labour participation. The retirement decision is modelled based on the Stock and Wise option value approach, allowing for individual variation in the main option value parameters in order to make use of the added value of micro simulation. The flow diagram of the SADNAP model is given in figure 2.

Figure 2: Flow diagram SADNAP model



Before the simulation starts, a base data file is created out of three different data sources that give a representative sample of the Dutch population in the base year (2006). Aggregate CBS data on the population aged 0-15 years are used in the base year. For the population aged 15-64 years, micro datasets from CBS on state pension entitlements and private pension entitlements are used. Finally a micro dataset from SVB on state pension payments is used for the population aged 65 and over.

For each simulation year, records for the new births and the new immigrants are added, based on the most recent population projection of CBS. When applying the mortality rates and emigration rates as derived from the same CBS population projection, an accurate population forecast results. Stocks, flows and rates from the CBS are available until 2050. After 2050, the 2050 numbers are kept constant. Mortality rates are differentiated by well known risk factors for life expectancy such as gender, income, marital status and ethnic background. Also remigration is modelled by differentiating the emigration rates of immigrants and natives. This is important because immigrants have a much higher emigration rate than natives so by not allowing for remigration, the share of immigrants in the population will be overestimated. Finally, also former emigrants can claim state pension. Since emigration is modelled, all future pensioners who live in the Netherlands in the base year, but will emigrate in the future, are captured. People aged between 15 and 64 in the base year who built up state pension entitlements in the Netherlands in the past but emigrated before the base year are added in a separate module.

From the databases of pension entitlements and pension payments, the household status of all individuals aged 15 and over is known for the base year. SADNAP distinguishes between singles and cohabitants only. Age and gender dependent transition probabilities are used to determine whether singles remain single or start cohabitating and whether cohabitants become single or stay together. The transition probabilities are derived from the age- and gender specific household forecast from CBS. SADNAP follows a simple approach, in which the important characteristics of the partner are determined as soon as those characteristics become relevant for the model calculations. In the ageing calculations the gender, age and participation status of the partner are the most important characteristics. The gender of the partner is assumed always to be the opposite of the gender of the other partner. From the dataset of state pension payments, detailed information on the age difference between partners of a couple is available. Given the gender and age of a partner, the corresponding participation rate can be derived from the age and gender specific participation estimates from CPB.

From the database of pension entitlements, also the labour market status of all individuals aged 15 to 64 is known. Participation in SADNAP is a binary state. Participants can be either employees or self-employed. Non-participants can be either studying, receiving a benefit, early retired or non-participating at all. In SADNAP, age and gender dependent transition probabilities are used to determine whether participants remain participating or become non-participants and vice versa. The transition probabilities can be derived from the age- and gender specific forecast of participation rates from CPB.

As soon as people turn 60 and still are participating on the labour market, an option value calculation is made in order to determine the optimal retirement age. This calculation is based on individual labour income and retirement income, generic age- and gender-specific survival, disability and unemployment rates and individually varied option value parameters (time preference, leisure preference and risk aversion). Also an assumption of (individually varied) yearly wage decrease due to productivity loss at higher ages is used. The mean values and distributions used for the option value parameters are based on extensive literature review as described in Van Sonsbeek (2010).

At the end of the loop financial implications are assessed. Individuals that are retired can get a state pension, a partner allowance and a private pension. Individuals that are not retired can increase their state pension entitlements and their private pension entitlements. Table 7 gives an overview of the parameters used in the model.

Table 7: Parameters SADNAP model

Parameter	Specificity	Mean value	Distribution	Based on
Option value parameters				
- **k (leisure preference)**		2.0	U (1 , 3)	See Van Sonsbeek (2010)
- **ρ (time preference)**		0.17	0 U(0 , 0.05) U(0.05 , 0.1) U(0.1 , 0.2) U(0.2 , 1.0)	See Van Sonsbeek (2010)
- **γ (risk aversion)**		0.7	U(0.5 , 0.9)	See Van Sonsbeek (2010)
- **τ (wage decrease)**		0.045	U(0 , 0.09)	See Van Sonsbeek (2010)
- **p(s|t) (survival rates given age 60)**	Age Gender			CBS (2009)
- **p(u|t) (unemployment rates given age 60)**	Age Gender			CBS (2008)
- **p(d|t) (disability rates given age 60)**	Age Gender			CBS (2008)
Demographic parameters				
- **P_m(t) (mortality rates)**	Age Gender Income Coh. Status Ethnicity			CBS (2009) et al. See Van Sonsbeek (2009)
- **P_e(t) (emigration rates)**	Age Gender Ethnicity			CBS (2009)
- **P_c/P_s (cohabiting/single base year)**	Age Gender			CBS (2009)
- **P_{cs}(t) (partnership dissolution)**	Age Gender			CBS (2009)
- **P_{sc}(t) (partnership formation)**	Age Gender			CBS (2009)
Labour market parameters				
- **P_p/P_n (participating/non-participating base year)**	Age Gender			CPB (2009)
- **P_{pn}(t) (labour market exit)**	Age Gender			CPB (2009)
- **P_{np}(t) (labour market entrance)**	Age Gender			CPB (2009)

Appendix B: Direct budgetary effects

	Baseline		Partner allowance		Retirement age		Singles pension		Tax exemption		Higher Accrual	
	mln. € 2009	%GDP 2009	mln. € 2009	%GDP 2009	mln. € 2009	%GDP 2009	mln. € 2009	%GDP 2009	mln. € 2009	%GDP 2009	mln. € 2009	%GDP 2009
State pension expenses												
2009	27765	4,85%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2010	28532	4,98%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2011	29559	5,16%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2012	30651	5,35%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2013	31591	5,51%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2014	32419	5,66%	0	0,00%	0	0,00%	0	0,00%	0	0,00%	0	0,00%
2015	33199	5,79%	-259	-0,05%	-962	-0,17%	-25	0,00%	8956	1,56%	-221	-0,04%
2016	33860	5,91%	-554	-0,10%	-2788	-0,49%	-219	-0,04%	9135	1,59%	-619	-0,11%
2017	34578	6,04%	-831	-0,15%	-3701	-0,65%	-489	-0,09%	9329	1,63%	-953	-0,17%
2018	35390	6,18%	-1074	-0,19%	-3817	-0,67%	-700	-0,12%	9548	1,67%	-1219	-0,21%
2019	36144	6,31%	-1169	-0,20%	-3810	-0,66%	-918	-0,16%	9751	1,70%	-1280	-0,22%
2020	36919	6,44%	-1257	-0,22%	-3811	-0,67%	-1146	-0,20%	9960	1,74%	-1187	-0,21%
2021	37730	6,59%	-1358	-0,24%	-3904	-0,68%	-1385	-0,24%	10179	1,78%	-1136	-0,20%
2022	38526	6,72%	-1407	-0,25%	-3965	-0,69%	-1629	-0,28%	10394	1,81%	-1081	-0,19%
2023	39401	6,88%	-1440	-0,25%	-4041	-0,71%	-1887	-0,33%	10630	1,86%	-1041	-0,18%
2024	40314	7,04%	-1504	-0,26%	-4191	-0,73%	-2159	-0,38%	10876	1,90%	-1016	-0,18%
2025	41177	7,19%	-1555	-0,27%	-4348	-0,76%	-2442	-0,43%	11109	1,94%	-978	-0,17%
2026	42023	7,34%	-1557	-0,27%	-4382	-0,76%	-2741	-0,48%	11337	1,98%	-925	-0,16%
2027	42896	7,49%	-1578	-0,28%	-4415	-0,77%	-3058	-0,53%	11573	2,02%	-815	-0,14%
2028	43795	7,64%	-1618	-0,28%	-4534	-0,79%	-3364	-0,59%	11815	2,06%	-705	-0,12%
2029	44703	7,80%	-1654	-0,29%	-4622	-0,81%	-3663	-0,64%	12060	2,10%	-589	-0,10%
2030	45513	7,94%	-1647	-0,29%	-4583	-0,80%	-3963	-0,69%	12279	2,14%	-457	-0,08%
2031	46178	8,06%	-1611	-0,28%	-4481	-0,78%	-4257	-0,74%	12458	2,17%	-345	-0,06%
2032	46895	8,19%	-1650	-0,29%	-4449	-0,78%	-4551	-0,79%	12651	2,21%	-254	-0,04%
2033	47647	8,32%	-1684	-0,29%	-4461	-0,78%	-4856	-0,85%	12854	2,24%	-120	-0,02%
2034	48354	8,44%	-1659	-0,29%	-4530	-0,79%	-5175	-0,90%	13045	2,28%	44	0,01%
2035	48993	8,55%	-1630	-0,28%	-4581	-0,80%	-5488	-0,96%	13217	2,31%	160	0,03%
2036	49548	8,65%	-1617	-0,28%	-4478	-0,78%	-5790	-1,01%	13367	2,33%	264	0,05%
2037	49933	8,72%	-1591	-0,28%	-4263	-0,74%	-6076	-1,06%	13471	2,35%	387	0,07%
2038	50141	8,75%	-1542	-0,27%	-4040	-0,71%	-6331	-1,10%	13527	2,36%	543	0,09%
2039	50272	8,77%	-1478	-0,26%	-3826	-0,67%	-6576	-1,15%	13562	2,37%	705	0,12%
2040	50277	8,78%	-1409	-0,25%	-3666	-0,64%	-6798	-1,19%	13564	2,37%	842	0,15%
2041	50210	8,76%	-1353	-0,24%	-3590	-0,63%	-6983	-1,22%	13546	2,36%	920	0,16%
2042	50110	8,75%	-1276	-0,22%	-3547	-0,62%	-7176	-1,25%	13519	2,36%	984	0,17%
2043	49977	8,72%	-1210	-0,21%	-3572	-0,62%	-7349	-1,28%	13483	2,35%	1089	0,19%
2044	49842	8,70%	-1176	-0,21%	-3674	-0,64%	-7493	-1,31%	13447	2,35%	1129	0,20%
2045	49756	8,68%	-1160	-0,20%	-3808	-0,66%	-7626	-1,33%	13423	2,34%	1158	0,20%
2046	49608	8,66%	-1148	-0,20%	-3848	-0,67%	-7735	-1,35%	13383	2,34%	1248	0,22%
2047	49311	8,61%	-1095	-0,19%	-3722	-0,65%	-7817	-1,36%	13303	2,32%	1329	0,23%
2048	48966	8,55%	-1054	-0,18%	-3658	-0,64%	-7861	-1,37%	13210	2,31%	1384	0,24%
2049	48649	8,49%	-1045	-0,18%	-3694	-0,64%	-7894	-1,38%	13125	2,29%	1412	0,25%
2050	48337	8,44%	-1064	-0,19%	-3772	-0,66%	-7912	-1,38%	13040	2,28%	1445	0,25%