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**Report on the Effect of the Credit Crisis
on the Solvency of Dutch Pension Funds
and its Economic Consequences**



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Introduction

The credit crisis has reduced the funding ratios of Dutch pension funds to a historical minimum. Pension funds now face two challenges. The first is to timely restore funding ratios to safe levels without jeopardizing labour market conditions that also have worsened because of the crisis. The second is to reform schemes such that they are less vulnerable to aggregate shocks in the coming decades in which population ageing is expected to accelerate.

Dual impact of crisis on pension funding

The credit crisis has reduced the funding ratios of Dutch pension funds to a historical minimum. The crisis caused the average funding ratio to decrease substantially from 144% before the crisis to a trough of 92% in the first quarter of 2009. Since then, funding ratios have strongly recovered. The latest official estimate of the average nominal funding ratio pertains to the end of the third quarter 2009 and amounts to 109%. However, new, lower estimates of mortality rates have become available, which imply that life expectancy will increase 1.6 years in 2050.¹ This is likely to depress funding ratios by about 7%-points.²

Figure 1 shows the nominal funding ratio³ of Dutch pension funds in the 1998-2009 period. Figure 2 shows the development of the nominal and real funding ratio⁴ on a quarterly basis during the last few years. The two figures demonstrate that the financial position of pension funds is weak by historical standards. Before the onset of the financial crisis (4th quarter 2007), the average nominal funding ratio was 144%. A buffer of 44% of liabilities looks robust at first sight. However, a nominal funding ratio of 144 percent translates into a real funding ratio of

¹ The latest official estimates for 2050 increase life expectancy for males from 81.5 years to 83.2 years, and life expectancy for females from 84.2 years to 85.5 years.

² The calculation runs as follows. Assume that life expectancy at the age of 65 increases as much as life expectancy at birth. Hence, the most recent estimates of demographic developments imply that average life expectancy will increase from 17.8 years (82.8 - 65) to 19.4 years (84.4 - 65). If it is further assumed that pension benefits grow at 3.2% a year (70%*3.7%+30%*2%), that flows are discounted at a constant rate of 5% a year and if some approximation is allowed, the effect of the increase in life expectancy on pension liabilities amounts to the difference between a discounted sum covering 18 years and a discounted sum covering 19.5 years. The latter can be argued to be close to the simple average of a discounted sum of 19 years and one of 20 years. On that basis, it can be calculated that pension liabilities will increase about 7% on account of the increase in life expectancy discussed above. It will be obvious that this calculation can be refined in several ways. The calculation should therefore be considered as an indication of the order of magnitude rather than as a precise estimate.

³ The nominal funding ratio of a pension fund is defined as financial wealth relative to nominal pension liabilities. The latter are defined as the sum of the nominal pension rights that the participants of the scheme have already accumulated.

⁴ The real funding ratio is defined in a similar way as the nominal funding ratio, but defines liabilities in real terms assuming full indexation to future wage or price increases of the pension rights that participants have already accumulated. The real funding ratio is a more appropriate measure of the financial situation of a pension fund as pension funds in the Netherlands generally aim at full indexation of pensions to wage or price increases even though the promise of pension funds to index pensions is usually conditional on the financial position of the fund.

only 98 percent.⁵ Moreover, funding ratios differed across funds. About 35% of the pension funds exhibited a funding ratio below 130%.⁶ This is close to the level of 125% that the supervisor considers a lower bound for a sound funding ratio for guaranteeing the nominal liabilities of a pension fund with an average investment portfolio (for this regulatory funding level of 125%, see also the section on the *financial assessment framework* below).

Two main factors contributed to the abrupt fall of funding ratios. Obviously, the worldwide collapse of share prices is important. But interest-rate developments played a significant role as well. In particular, the sharp decline of nominal interest rates increased the present value of nominal pension liabilities. This was not compensated by the increase in the value of bonds on the asset side of the balance sheet because the asset side did not match the structure of the nominal liabilities: not only were bond holdings much smaller than nominal pension liabilities, but also the duration of the bonds owned by pension funds was typically substantially shorter than that of pension liabilities.

The increase in the market value of the bond portfolios of pension funds is estimated to have improved the average funding ratio in the period 2007Q4-2009Q3 by 3%-points whereas the increase in the value of nominal liabilities has worsened the funding ratio by 15%-points during that period. These calculations are based on the assumption that bonds have an average duration of 5 years and pension liabilities have an average duration of 15 years. On net, the decline in interest rates reduced the funding ratio by 12%-points. The decline of share prices is estimated to have decreased the funding ratio by 23%-points. Accordingly, about one third of the decline of the funding ratio in the period 2007Q4-2009Q3 is attributed to the interest-rate decline and two thirds to the collapse of share prices.⁷

These numbers apply to the average pension fund. At the level of individual pension funds, the picture can be quite different. Indeed, pension funds differ a lot in terms of their liabilities and their investment policies. Overall, pension funds have substantial investments in stock and real estate markets. Still, the frequency distribution of the share of equity in pension fund's portfolios is quite dispersed with a 10% percentile of 17.6% and a 90% percentile of 46.9%.⁸ Therefore, pension funds differ in their exposure to the stock market. In addition, pension funds

⁵ The nominal funding ratios are taken from the Dutch Central Bank (DNB), the supervisor. We calculated real funding ratios ourselves. The calculations assumed a duration of pension liabilities of 15 years, a nominal interest rate of 4.5%, price inflation of 2%, wage inflation of 3% and weights attached to wage and price inflation of 70% and 30% respectively. The weights attached to wage and price inflation reflect the heterogeneity of pension contracts. Contracts that index pension rights on the basis of the general price development are considered price-indexed; contracts that index pension rights on the basis of the general wage increase, the wage increase in the firm or the wage increase in the industry are all considered as wage-indexed.

⁶ As pension funds with lower funding ratios tend to be relatively small, these funds represent only about 7% of the participants of pension funds.

⁷ Some (not all) pension funds used derivatives to hedge against interest rate risks (see below). Our calculations have not included this element and therefore bias the decomposition of the fall of the average funding ratio. This does not seem to affect the results in a significant way, however.

⁸ Bikker, J., D. Broeders, D. Hollanders and E. Ponds, Pension funds' asset allocation and participant age: a test of the life-cycle model, DNB Working Paper 223, 2009.

differ in their use of derivatives to hedge nominal interest-rate risks. Indeed, some funds deliberately choose not to hedge nominal interest-rate risks in order to protect the participants against inflation risk: they would like to profit from higher nominal interest rates in the event inflation expectations would rise. Indeed, pension funds are torn between managing nominal risks on the one hand and inflation risk on the other hand. As a consequence of different investment and hedging policies, the effect of the crisis on individual funding ratios has been rather heterogeneous.

Figure 3 displays a histogram specifying how many pension funds faced a decline of their nominal funding ratio of a given size. The average decline was about 33% and a sizeable fraction of pension funds (31%) saw their funding ratios decline between 30 and 40%. But also sizeable are the fractions of pension funds with larger losses (27%) and smaller losses (42%).

Two challenges ahead

Pension funds now face two challenges. First of all, they need to find a way to restore their funding ratios. In the beginning of 2009, the majority of pension funds (about 80%⁹) had to submit a recovery plan to the supervisor (DNB), specifying how they would eliminate underfunding (a funding ratio below 105%) before the end of 2013. In addition, some pension funds¹⁰, although not underfunded, had to hand in a recovery plan specifying how they would eliminate the reserve deficit (*i.e.* a funding ratio below 125%, see also the section on the *financial assessment framework* below) before the end of 2023. The calculations that will be presented below imply that a large fraction of pension funds will fail to meet this funding requirement of 125% if they would apply full indexation and would not raise contributions.

The second challenge is to reform pension schemes in view of the increasing costs of pensions. One major reason for this is the ongoing increase in longevity. Moreover, population ageing raises liabilities compared to the contribution base. To illustrate, pension liabilities in terms of labor income increase from a level of 2.9 in 2009 to a level of 3.7 in 2040. Figure 4 illustrates. This implies that unanticipated shocks in financial markets and longevity require larger changes in pension contributions in order to shield pension rights from these shocks. Guaranteed pension obligations have thus become more expensive in that they result in more volatility in pension contributions.

In addition, a decline in rates of return on financial assets has contributed to the rising costs of pensions along three channels. First of all, interest rates, both short term and long term and both nominal and real, have declined because of the crisis in the short run and because of population ageing in the medium and long run. Second, the Commission on Pension

⁹ About 300 out of 380 pension funds.

¹⁰ About 40 out of 380 pension funds.

Parameters, which advises the government on the values of financial parameters to be used in the financial assessment of pension funds, recommended to employ lower maximum values for expected rates of return than were used in the past, especially for equity. Third, recent experience of the crisis together with the steadily decreasing base of pension contributions may induce pension funds to restructure their portfolios away from equity towards more bonds. Although this may help to reduce the risk of low pension benefits, it raises the pension premium on account of a lower expected portfolio rate of return.

The present paper focuses on the challenge to pension funds to restore their funding ratios. The issue of pension reform against the background of rising costs is interesting as well, but beyond the scope of this paper.

The financial assessment framework

The Dutch supervisory framework aims at keeping funding ratios of pension funds sufficiently high. This helps to protect not only the interests of the retirees, but also those of future generations who would be seriously hurt if pension funds would defer financing of pensions to the future. In practice, the supervisor adopts two minimum boundaries for the nominal funding ratios. The first minimum is 125%. The buffer of 25% should be sufficient to ensure that the funding ratio will fall below 100% only once every 40 years. The minimum funding ratio of 125% is an average across pension funds because it is risk based and thus depends on the portfolio composition of the pension fund. If the funding ratio of a pension fund is below this risk-based minimum funding ratio, i.e. if there is *reserve deficit*, the fund should adopt policies to ensure that it will meet the minimum funding ratio within 15 years time. The second minimum funding ratio is 105%. If the funding ratio of a pension fund falls below 105%, i.e. if a *funding deficit* occurs, the fund is required to formulate a recovery plan that specifies how it will ensure that the level of 105% is restored within 3 years.

The crisis was severe enough to make the second minimum relevant. A large number of pension funds saw their funding ratios decline below the level of 105%. Indeed, about 80% of the 380 pension funds¹¹ had to hand in a recovery plan stipulating how the pension fund expects to eliminate the funding shortfall.¹² In view of the unique character of the crisis, the supervisor extended from 3 to 5 years the period in which the funding ratio should be brought back to the minimum of 105%. Almost all pension funds decided to suspend the indexation of pensions for a number of years. Some of the funds also increased contribution rates. Moreover, in about a

¹¹ Actually, there are currently about 600 pension funds. Only 380 of them are required to regularly report to the supervisor. The others, mostly relatively small pension funds, do not face a reporting requirement, for example because they re-insured their risks with an insurer. These numbers refer to the current year. The number of pension funds has been steadily declining for a number of years.

¹² See also Van Ewijk, C. (2009), Credit Crisis and Dutch Pension Funds: Who Bears the Shock?, *De Economist* 157, pp. 337-351.

quarter of the funds, the sponsor company made a one-off contribution. About 20 pension funds had to announce that they would need to cut the nominal value of the pension liabilities if their funding ratio would not have recovered sufficiently in 2012. It is questionable whether such a write off of nominal rights will materialize. Moreover, the macroeconomic impact of this nominal cut would only be small because the 20 funds involved are only relatively small. Nevertheless, this announcement had quite some impact – also on the current policy discussion in the Netherlands on the future of the pension system. The announced nominal cut made clear that pension funds can not ensure nominal pension rights in all circumstances.

The indexation instrument has become an important steering instrument for pension funds since the beginning of the millennium. In response to the financial distress in the years 2000-2002, funds generally converted final-wage schemes into career-average schemes.¹³ This substantially increased the effectiveness of indexation cuts as an instrument to improve the funding ratio. Whereas under a final-wage scheme incomplete indexation applies only to pension benefits of the retired and inactive participants, under a career-average scheme incomplete indexation applies also to the pension rights of active participants who still contribute to the pension scheme. In the case of the larger pension schemes, so-called "indexation ladders" specify how the degree of indexation depends on the funding ratio. Such indexation ladder typically takes a simple nonlinear form: the degree of indexation is zero below some minimum funding ratio and 100% of wage or price inflation above some maximum funding ratio and increases linearly between this minimum and maximum funding ratio.

The indexation base differs for active members and retirees (inclusive sleeping members). Pension rights of active members are for 10% price-indexed and for 90% wage-indexed, whereas the pension rights of retirees are for 45% price-indexed and for 55% wage-indexed.¹⁴ The calculations below are based on the average of the two types of indexation, which amounts to 30% price indexation and 70% wage indexation.

The indexation ladder applies to two distinct groups, namely active members and retirees. In indexing pension rights, pension funds are allowed to differentiate between these two groups, but not within the groups. However, up to now, only a few pension funds have differentiated the degree of indexation between workers and retirees.

Another effect of the financial distress in the years 2000-2002 has been an increase of pension contribution rates to levels that may be considered actuarially fair. Over the period 1970-2008, the pension contribution rate has increased about 3.7%-points of the wage bill, which amounts to about 40% of the initial premium level (see Figure 5).

¹³ Although the second pillar is very heterogeneous (in terms of size, type of pension contract, type of indexation, status (company pension fund or sectoral pension fund)), many pension funds implemented similar policy changes.

¹⁴ Pension contracts that index pension rights on the basis of the general price development are considered as price-indexed and all contracts that index pension rights on the basis of the general wage increase, the wage increase in the firm or the wage increase in the industry are considered as wage-indexed. The figures cited here are based on statistics published by DNB.

As a result of the increased exposure of participants to risks, pension funds can nowadays be viewed as hybrid DB-DC plans.¹⁵

Baseline simulation

How pension funds will recover from the shock of the credit crisis depends on a number of factors. In particular, developments in financial markets are relevant. Against that background, pension funds face major policy choices concerning the instruments to be used for bringing funding ratios back to levels that correspond with the ambition of full indexation of pension rights. A number of simulations explore these choices and their consequences for the participants of pension funds and the Dutch economy. These simulations focus on the following alternatives for restoring a real funding rate of 100% (which corresponds with a nominal funding ratio of 145%, close to the average before-crisis level at the end of 2007): increasing contribution rates, raising the pension entitlement age, and cutting (the indexation of) pensions. Each of these policy alternatives is expressed relative to a baseline in which pension funds employ no instrument at all to foster recovery. Hence, in the baseline, contribution rates and retirement age are kept at their initial, pre-crisis levels, while pension rights are fully indexed to wage and price inflation.¹⁶ This baseline thus neglects the indexation ladder that many pension funds employ to relate the rate of indexation to the funding ratio.

The outcome of the baseline simulation depends crucially on what is assumed for the economic environment. Appendix 1 summarizes our assumptions on the most important parameter values. Obviously, this scenario will eventually turn out to be too optimistic or too pessimistic. Indeed, in the aftermath of an unprecedented financial crisis, the uncertainties surrounding future economic developments are larger than usual.

Not all pension funds are hurt in the same degree by the credit crisis. Indeed, some funds chose to hedge the nominal interest-rate risks, while others chose other strategies. Moreover, funds differed in terms of their funding ratios already before the onset of the crisis. To account for this heterogeneity, baselines have been constructed for five pension funds, ranked according to the after-crisis funding ratios. In these funding ratios, the five pension funds are representative of the five classes that are defined on the basis of funding ratios. Table 1 shows that more than half of the pension liabilities are covered by pension funds with a funding ratio in between 100 and 110%.¹⁷ Apart from these funding ratios, the simulated pension funds are identical. Funds are thus assumed not to differ in other aspects (portfolio, age structure of

¹⁵ For a description of Dutch pension funds, see Bovenberg, L. and T. Nijman (2009), *Developments in Pension Reform: The Case of Dutch Stand-Alone Collective Pension Schemes*, *International Tax and Public Finance* 16, pp. 443-467.

¹⁶ The calculations abstract from the fact that pension funds are not allowed to index as long as the funding ratio is below 105%. Since pension funds with a funding level below 105% account only for about 8% of financial assets, this assumption is hardly relevant at the aggregate level.

¹⁷ The distributions in terms of participants may be expected to be quite similar to that in terms of liabilities.

participants, etc.). Table 2 shows the expected development of the funding ratio for these five typical pension funds. The table demonstrates that 4 out of these 5 pension funds are expected to meet the minimum reserve requirement of a nominal funding ratio of at least 105% by the end of 2013. The same holds true two years earlier. This suggests that, with the benefit of hindsight, the relaxation of the criterion by the supervisor to lengthen the short-term recovery period up from 3 to 5 years will probably not turn out to be relevant. Things change fundamentally when one looks at the nominal funding ratios after 15 years. If pension funds apply full indexation of pensions to wage and price inflation and do not raise contributions, only one of the five pension funds is expected to meet a real funding ratio of 100%, which corresponds to a nominal funding rate of about 145%. As this pension fund covers only about 5% of the participants, about 95% of the participants in pension schemes can expect to face higher contributions or lower indexation if pension funds aim at achieving full funding of their pension obligations in 15 years time.

These calculations rely heavily on the assumed rates of return on capital markets. If equity markets will recover more quickly and equity will earn a nominal rate of return that exceeds the assumed 6.5% a year, funding ratios will develop more favorably. What rate of return would be needed in order to ensure that on average funding ratios of pension funds will be 145% after 15 years time? Our calculations show that an additional annual 1.4%-point rate of return would be needed over a period of 15 years. Under the assumption that pension funds invest half their financial wealth in equity and that risk-free bonds earn a nominal interest rate of 3.5% a year, the equity rate of return would have to amount to 9.3% a year for a period of fifteen years. Although such a high rate of return is certainly not impossible,¹⁸ it is questionable whether relying on capital markets is a sensible strategy.

Policies to restore solvency ratios

How can pension funds restore their funding ratios to a 100% real funding ratio within 15 years time?¹⁹ Several alternative policies will be considered. As a benchmark, a scenario will be considered in which an indexation ladder is applied. This scenario reflects current policies. Subsequently, a number of more hypothetical policy scenarios will be considered that help to compare different policy strategies. First, two options of raising contribution rates will be investigated, one on employees and another one on employers. Then cutting the indexation of pensions will be explored. One scenario reduces indexation over a period of 15 years, another

¹⁸ Formally, assuming that the real equity rate of return is lognormally distributed, that the rate of return on equity has a mean of 4.5% a year and a standard deviation of 16.2% a year and that annual increments to the value of equity are uncorrelated, it can be calculated that there is 38% probability that the annual equity rate of return will be 9.3% or higher 15 years long.

¹⁹ For a similar analysis, see Van Ewijk, C. (2009), Credit Crisis and Dutch Pension Funds: Who Bears the Shock?, *De Economist* 157, pp. 337-351.

scenario applies a once-only write-off on nominal pension rights. Finally, the effects of raising the retirement age will be discussed. Again, two scenarios will be studied, one in which a reduced build-up of pension rights is accommodated with unchanged contribution rates for 15 years, and another one that also writes off on the pension rights of members. For all policy alternatives the discussion will include the time path of recovery as well as the redistributive consequences for different generations of participants. The scenarios have in common that they achieve recovery of full funding in 15 years time. Hence, they all distribute a loss of household wealth of basically about 175 billion euros.²⁰ The loss will be larger in those scenarios that reduce employment. Furthermore, a second difference between different scenarios is that they allocate the loss of private wealth differently over time.

The discussion will first focus on direct effects on the funding ratio and net benefits. Next, macroeconomic effects will be considered. Details about the model that is used to make the calculations can be found in Appendix 2.

The current policy rules scenario

A first scenario assumes that pension funds do not reform their policies, but do apply an indexation ladder policy. The indexation ladder that is more or less representative for funds in second-pillar schemes today is one that specifies that there will be no indexation of pension rights if the funding ratio is below 105% and that there will be full indexation if the funding ratio is 130% or higher. For a funding ratio in between 105 and 130%, indexation is only partial.²¹

Table 3 summarizes the likely effects of such a scenario. On average, relying on the indexation ladder alone is not sufficient however to achieve full funding of pension liabilities in 15 years time. Over the 15-year recovery period, the indexation cuts sum up to about 5%, so a person who is not too old and suffers from indexation cuts over the recovery period, will loose about 5% of the purchasing power of his pensions on account of indexation cuts. On top of reduced indexation, the pension contribution rate needs to increase 3.1%-points to achieve the goal of full funding.

The immediate write off scenario

Another policy instrument is to reduce the nominal value of pension rights. Table 4 shows that an immediate write-off of 17.5% of pension rights is sufficient to bring back the funding ratio back to the 145% level in 15 years time.

²⁰ This figure is calculated by multiplying $(145-109)/145$ with 700 billion euros.

²¹ The degree of indexation is $(x-105)/25$ if the funding ratio lies between 105% and 130% and if x measures the funding ratio.

The employee contribution scenario

Contributions to supplementary pension schemes are paid in the Netherlands by employees and employers in the proportion 1:2. In this exercise it is assumed that employees alone make up for the increase in contributions. Table 5 shows the likely effects of such a policy change. The contribution rate, 12.4% initially, would need to be increased up to 17.0% for a period of 15 years. This amounts to an increase of 4.6%-points. This increase is sizeable. It is even larger than the increase in the beginning of the millennium, whereas now contribution rates are initially much higher than at that time. That this number is so large relates to the size of the pension contribution base, which has shrunk and will shrink even more in the future because of population ageing (see Figure 4).

The employer contribution scenario

An alternative to this policy change is to raise the contributions paid by employers. The direct effects of these are very similar to those of the previous policy reform. Table 6 summarizes the likely effects.

The reduced indexation scenario

As an alternative to raising contribution rates, one could cut the indexation of pensions. The reduced indexation applies to both pension benefits and pension rights, reflecting the current career-average nature of the typical Dutch pension contract. Although the Dutch Pension law does not oblige pension funds to apply indexation cuts uniformly to workers (pension rights) and retirees (pension benefits), only a few funds have distinguished between the two in applying indexation cuts; the large majority has until now treated workers and retirees alike.

Table 7 shows the results. The indexation of pensions and pension rights amounts to 1.53% a year and this figure applies to all years in the projection period. Since 2010 and 2011 feature low rates of price and wage inflation, this implies that the indexation cut is zero on average in the first two years.²² From 2012 onwards, full indexation amounts to an increase of pensions of 3.2% a year, so that then indexation is cut with about 1.7%-points. Over the 15-year recovery period, the indexation cuts sum up to the same 17.5% as in the immediate write off scenario, so a person who is not too old and suffers from indexation cuts 15 years long, loses about 17.5% of the purchasing power of his pension.

²² Alternatively, it could have been assumed that the indexation cut rather than the amount of indexation is the same in all 15 years. This would have resulted in a slightly different pattern of indexation cuts over the 15 year period, but would not have changed the cumulative amount of indexation after 15 years.

The retirement age scenario

The scenario that raises the pension entitlement age is set up on the basis of the same methodology as applied in other scenarios, namely that a nominal funding ratio of 145% will be achieved in 15 years time. This is achieved by permanently lowering the pension buildup rates right away in 2010, leaving pension contribution rates unadjusted for 15 years. After 15 years, the pension contribution rates are reduced to the level that corresponds with the new build-up rate. Hence, the scenario involves an implicit tax on labor income that is levied for 15 years.

The calculation in Table 8 shows that an increase in the retirement age of 4 years is sufficient: from 65 to 69.

The hybrid: retirement age / write off scenario

The last scenario combines an increase of the pension entitlement age with an immediate write-off on already accumulated pension rights. This scenario spreads the burden of the recovery of funding ratios over more generations. Indeed, older generations who are spared in the retirement age scenario, contribute under the present scenario by writing off on the value of their pension rights.

If the pension entitlement age is increased 2 years rather than 4 years as in the retirement age scenario, an immediate write-off on pension rights of 8.2% is necessary to achieve a 145% funding ratio in 15 years time. Table 9 shows the effects of this combination of an increase of the pension eligibility age and a write off on accumulated pension rights.

Discussion

Intergenerational incidence

Figure 6 displays the generational effects of the policy scenarios that have been presented above. It shows that different scenarios affect active and retired generations very differently. Figure 6 shows that the scenarios can be classified into three groups. The first group consists of the employee contribution scenario and the retirement age scenario.²³ These scenarios impose the burden of financing the recovery of funding ratios exclusively upon working generations. Already retired generations remain unaffected when measures are taken that increase the wedge between contributions and accumulated rights, whereas future generations remain unaffected because reforms are defined such as that full funding is achieved by 2024.

The second group consists of the reduced indexation scenario and the immediate write off scenario. These scenarios affect both working and retired generations; effectively, young

²³ As the generational accounts of the employer contribution scenario are equal to those of the employee contribution scenario, they are not included in Figure 6.

working generations are spared since they have not lived long enough to accumulate substantial pension rights. Still, the two scenarios affect different generations. Indeed, in case of a write off on existing rights, in particular older generations are hurt who have accumulated large pension rights. In case of an indexation cut that lasts for 15 years, the focus shifts towards younger generations who will accumulate pension rights for 15 years or more.

The current policy rules scenario and the hybrid: retirement age / write off scenario form the third group of scenarios. These scenarios combine elements of the other scenarios. This is reflected in Figure 6: these two scenarios spread the burden of financing the pension fund deficits more over different generations. From the angle of generational equity, one might conclude that these two scenarios are more favorable than the other four scenarios.

Private consumption

The different scenarios share certain common elements. The most important one is rooted in the recovery of the nominal funding ratio. In all scenarios, measures are taken to get the average funding ratio back to the 145% level in 15 years time. In all scenarios this reduces private consumption for several years.

The strength of the private consumption response differs importantly between different scenarios, however. In particular in case of an immediate write off on nominal pension rights, consumption declines sharply by 0.9% in 2010 and by 1.5% in 2013 on account of an immediate cut in pension incomes. There is a similar response of consumption to an increase of contributions paid by workers, although the key mechanism is now that workers' net wage income is lowered. Net wage income is reduced because gross wages are typically set in multi year wage agreements. In 2024, private consumption declines with more than one percent in both scenarios.

If employers rather than workers are stuck with the higher contributions, the initial decline of consumption will be weaker than in the employee contribution scenario. Indeed, the reduction will be 0.2% in 2010 only rising to 1.2% in 2013. One reason is that an increase in the employers' contribution will raise costs and the price of exports in the short-run, which in turn leads to lower net exports. GDP thus falls more on account of lower exports and less on account of lower consumption than in the employee contribution scenario. A second reason is that an increase in contributions paid by employers will, more than an increase in the contributions by workers, fall on the income from capital which is partly owned by non-residents. This means that part of the decline of consumption is exported abroad. These differences are temporary however. After some years, wages are sufficiently flexible to let the employee and employer contribution scenarios converge.

The reduced indexation scenario, in which the indexation of pension rights is cut for 15 years, has very little effect on consumption in the short-run. This is because pension incomes

are only reduced gradually over time. As a consequence the full impact on private consumption is only felt when pension incomes deviate significantly from the baseline path.

It is useful to compare the retirement age scenario with the employee contribution scenario. Recall that in the retirement age scenario, the accumulation rate of pension rights per hour of work is reduced from 2010 onwards. In order to achieve a recovery of the funding ratio, the pension contribution rate is left unchanged for 15 years, however. The retirement age scenario thus increases the wedge between pension rights and pension contributions for 15 years, just like in the employee contribution scenario. Different from the employee contribution scenario is that myopic households tend to not take into account the lower build up of pension rights. An increase of the pension entitlement age will thus avoid the negative consumption effects that the increase of employee contributions will bring about. In the longer run, myopia does not play a role and the two scenarios will be similar. In both scenarios consumption declines in the long run; in case of the employee contribution scenario on account of higher pension contributions and in case of the retirement age scenario on account of lower pension incomes.

The two other scenarios, the conditional indexation scenario and the hybrid scenario, integrate the scenarios described above and do not deserve further discussion.

Labor market and GDP

All the scenarios considered have labor market consequences. A number of scenarios weaken the incentives for households to supply labor. In particular, in the scenarios that raise contribution rates, the wedge between pension rights and contributions is increased and this induces workers in the long run to spend less time on the labor market. In the short run there are additional labor market effects. The large fall in GDP in the employer contribution scenario leads to high unemployment for several years. This reduces labor supply by 0.3% in 2013 through a discouraged worker effect. The same mechanism applies in the employee contribution scenario, although the effects are somewhat smaller due to the smaller decline in GDP.

The scenarios that include a write off on already accumulated pension rights have smaller labor supply effects. Indeed, writing off on the value of already accumulated pension rights does not change the wedge between future pension rights and pension contributions and therefore does not change the incentives to supply labor. On account of a decline in household wealth, the immediate write off scenario does depress private consumption however, which translates into lower demand for labor and an increase in unemployment in the short run.

The unemployment effect in the scenarios that reduce labor demand may not persist for 15 years. A fall of effective demand on account of lower private consumption will not only initially depress output, but also reduce the prices of goods and services. This will bring about an increase in exports and lower imports and through these channels weaken the output response to the policy reform. It may take some time to achieve full absorption of the decline of

consumption by higher net exports, so the hike of unemployment will typically disappear only relatively slowly.

In the scenario in which employers face higher contributions, wage costs for employers will go up, reducing labor demand and increasing unemployment. Gradually, wages will adjust downwards, increasing labor demand and reducing labor supply until a new equilibrium is achieved. Again, the effect on unemployment will disappear after some time.

It has been argued that the retirement age scenario is in some aspects similar to the employee contribution scenario: both scenarios increase the wedge between pension rights and pension contributions for 15 years. Different from the employee contribution scenario is that myopic households tend to not take into account the lower build up of pension rights attached to labor supply in their labor supply decision making. An increase of the pension entitlement age will thus avoid the negative labor market consequences that the increase of employee contributions will bring about.

Under a different set of assumptions, the retirement age scenario might have been different from the employee contribution scenario. In particular, should the increase of the second-pillar retirement age by pension funds find its roots in an increase of the first-pillar retirement age by the government, as is currently discussed in the Netherlands, labor supply may increase. A higher retirement age may change people's preferences towards later exit from the labor market, in particular after some time. The higher labor market participation would increase household wealth and mitigate the decline of private consumption.

Qualifications

The calculations have assumed that labor supply is driven by the wedge between pension rights and pension contributions; changes in private wealth have been assumed to have no impact on labor supply decisions. This conforms to empirical studies on labor supply, although the issue cannot be said to be settled. Should a (negative) wealth effect on labor supply be accounted for, the scenarios discussed above would look less dramatic. In all cases, the recovery of the funding ratio implies a loss of private wealth which would raise labor supply. This would increase labor income, add to household wealth and mitigate the decline of consumption (and labor demand).

The calculations presented here assume that consumption is driven by income rather than household wealth in the short run and by household wealth only in the long run. To the extent that both short-term and long-term consumption are driven by income and wealth effects, our calculations exaggerate the differences between the short run and the long run. It is difficult to assess the numerical relevance of this aspect, however. The same holds true with respect to our assumption that substitution effects in labor supply are assumed negligible in the short run but important in the longer run.

Another qualification relates to the scenarios that include an immediate write-off of pension rights. Implementing such a reform could make participants increasingly aware of the uncertainties involved and have implications for consumption that exceed those that can be calculated on basis of wealth and income factors. In particular if participants are unaware of the uncertainties surrounding pension benefits, which seems to be the case to some extent in the Netherlands, writing off a large fraction of accumulated pension rights could make households decide to boost their savings and reduce their consumption.

An effect on which there is little empirical information is the so-called framing effect in case of an increase of the retirement age. There is little information both about the size of this effect and the amount of time it takes to become operational. It will be clear that the more effective is an increase of the pension entitlement age in increasing labor market participation, the more favorable will be the macroeconomic effects of such a scenario.

Our calculations abstracted from multiplier effects that operate through the government budget. In all scenarios, economic activity is reduced, at least from some years. The erosion of tax bases requires the government to increase some tax rate in order to close the government budget. It will be clear that this can reinforce the adverse effects on output and labor markets. The Netherlands do not feature such debt policies which is the reason that the calculations omit this effect. It will be clear that this delays the adverse effects from closing the government budget to the future, however.

Conclusions

The financial situation of Dutch pension funds is unique by historical standards. Abnormally high returns on equity markets would help funds to recover fast, but relying on such returns is a risky strategy. Different policy instruments are available to help restoring funding ratios, but all have their drawbacks. They put the burden of recovery too much upon certain cohorts, worsen the performance of labor markets or induce a consumption decline at the time the economy is recovering from the recession that followed the financial crisis.

Population ageing increases the price of guaranteed pensions in the sense that it makes pension contributions more volatile. This is one of the reasons that the credit crisis had such a large impact. In order to make pension schemes less vulnerable to future shocks, they should be made less generous. This could be achieved by delaying the pension entitlement age, by linking the entitlement age to life expectancy or by indexing pensions to price inflation rather than wage inflation, as recently proposed by the Commission on the Future of Supplementary Pension Schemes in the Netherlands.

Appendix 1 The values of key parameters

Our calculations assume a rate of price inflation rate equal to 1.4% in the years 2010 and 2011 and equal to 2.0% in the period from 2012. The rate of nominal wage growth equals 2.4% in the first two years and 3.7% in the year 2012 and thereafter. The nominal risk-free interest rate equals 2.9% in the period 2010-2011 and 3.5% in the year 2012 and thereafter. The calculations assume an equity premium of 3%-points over the whole period; hence, the calculations adopt a 6.5% nominal equity rate of return from 2012 onwards. The portfolios of pension funds have equal shares of equity and bonds.²⁴ Pensions and pension rights are indexed to a basket of wage and price inflation, with weights equal to 70 and 30% respectively.

A long-term real risk-free interest rate of 1.5% a year is a little below the historical average of 2.1%.²⁵ This can be motivated by the prospect of population ageing which is generally expected to decrease interest rates. An equity premium of 3.0% is in line with the literature.²⁶ Although the projection is lower than the world historical average of 4.2%, our assumption matches the idea that the future equity premium will be below its historical counterpart. Dimson et al. (2009) put forward several arguments for this assumption, among which is the difference between the concepts of excess return (an ex post measure) and equity premium (an ex ante measure) and the increased diversification of equity risks.

Appendix 2 The model

The model adopted in this analysis is very stylized. At the heart of the model is the accumulation equation for the financial wealth of the pension fund. This equation relates policy measures to the time path of the funding ratio. As the analysis distinguishes between five funds that differ (only) in their initial funding ratio, there are five of such accumulation equations.

The model relates private consumption to changes in pension income (in the short run) and in household wealth (in the long run). It relates labor supply in the short run to unemployment on account of a discouraged worker effect. The long-run labor supply effect relates to wages net of pension contributions and inclusive the build-up of pension rights. Labor demand and thus unemployment are driven by labor costs, defined as wages inclusive of employer pension contributions. Wages are sticky in the short run, but fully flexible in the long run. Hence, the

²⁴ The largest pension fund in the Netherlands, ABP, has an investment in equity (including hedge funds, private equity and real estate) that is about 45% of financial wealth. The corresponding figure for bonds and mortgages is 38% (source: FD, January 22, 2010). The second largest pension fund in the Netherlands, PfiZW, invests also about 45% of its financial wealth in equity (including real estate and infrastructure) and about 39% in bonds (source: Jaarbericht 2008).

²⁵ J.Y. Campbell and L.M. Viceira, 2002, Strategic Asset Allocation, Clarendon Lectures in Economics, Oxford University Press, Oxford.

²⁶ Dimson, Marsh and Staunton, 2009, Keeping Faith with Stocks, in Credit Suisse Global Investment Returns Yearbook 2009.

incidence of employee and employer contributions to the pension scheme is on workers only in the long run.

The model is non-stochastic. Hence, it cannot be used for welfare analysis. The model is appropriate when it comes to sketching the effects of different policy measures upon the performance of pension funds and upon macroeconomic variables, however.

The net benefit effects for generations are calculated on the basis of the outcomes for the pension fund. Net benefits sum effects on pension contributions and on pensions, using the portfolio rate of return as discount rate. They can be interpreted as generational accounts, not for the public sector, but for the sector of funds that govern supplementary pensions.

Figure 1 Nominal funding ratio (annual data)

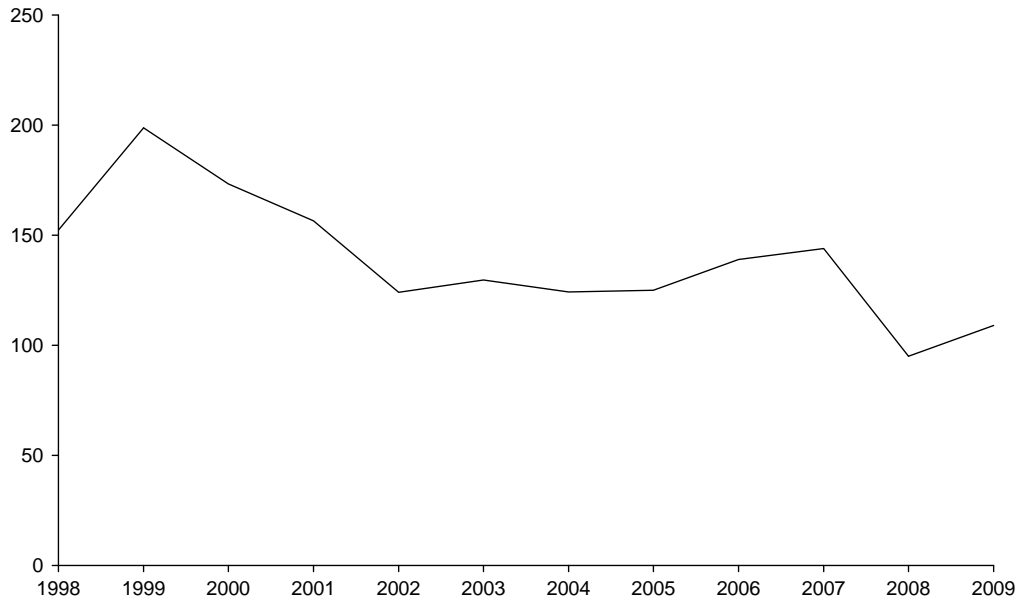


Figure Error! No text of specified style in document..1 Real and nominal funding ratio (quarterly data)

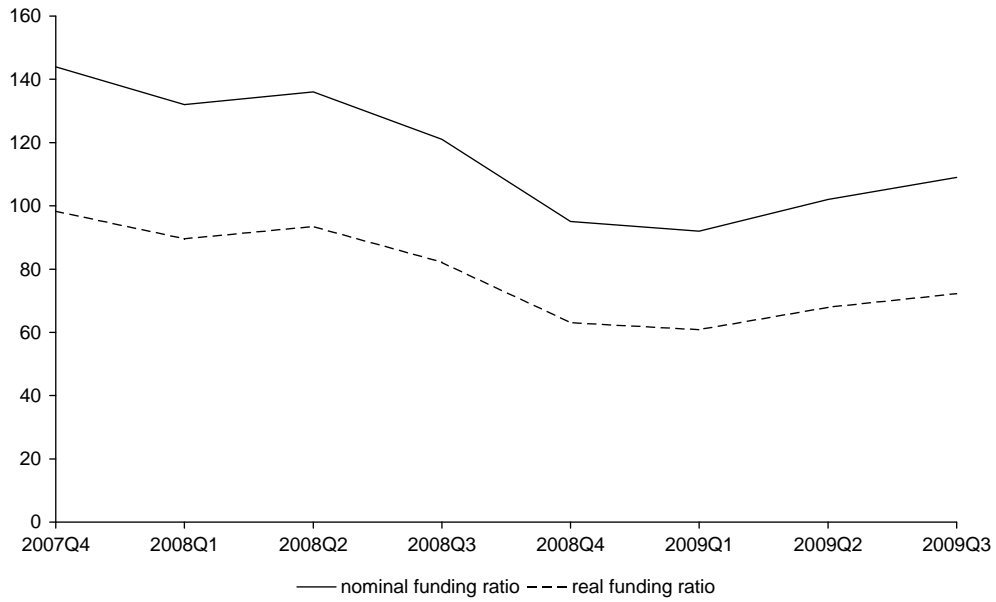


Figure 3 Histogram

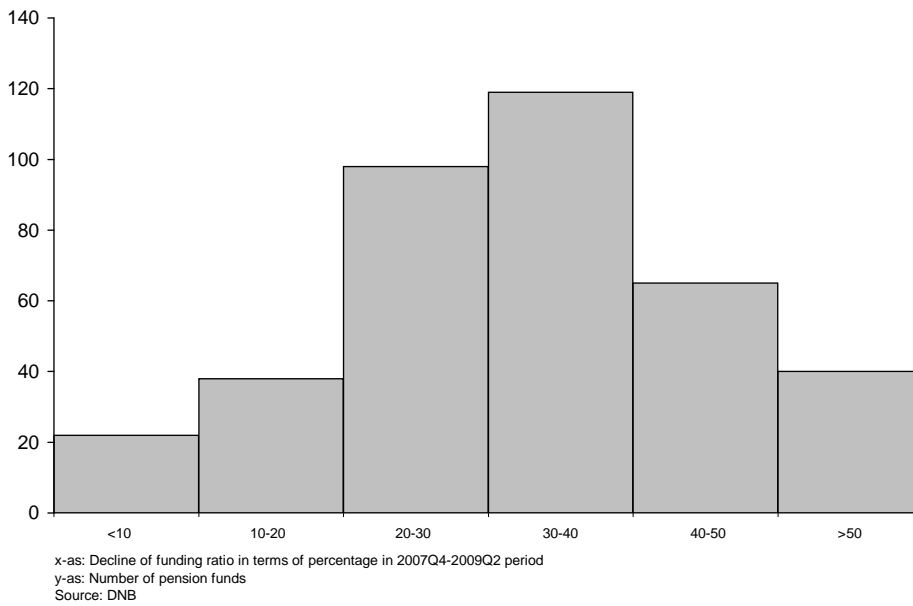


Figure 4 Aggregate pension liabilities relative to aggregate wage income

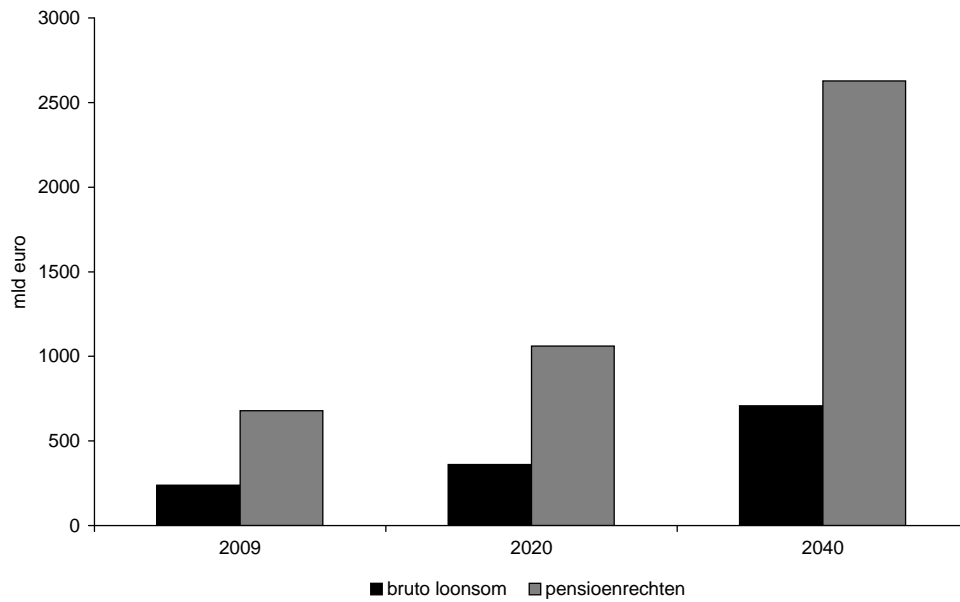


Figure 5 Pension contribution rate 1970-2008 (% of gross wage income)

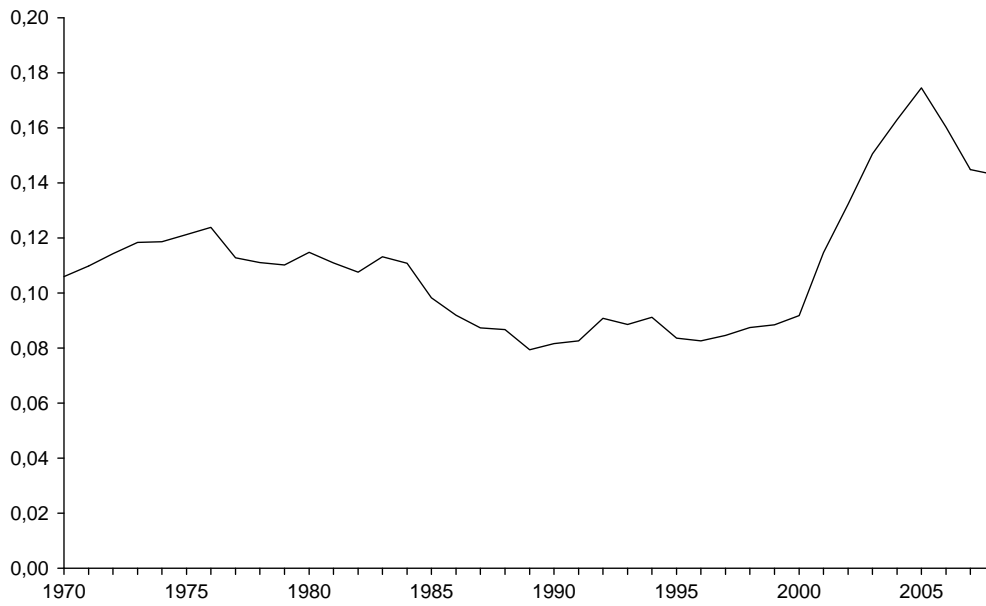


Table 1 Funding ratios, numbers of pension funds, pension liabilities

End of 2009Q3	Number of pension funds	Pension liabilities (billions of euros)
Group 1 (<100)	41	46.4
Group 2 (100-110)	150	357.5
Group 3 (110-120)	115	118.4
Group 4 (120-130)	35	37.2
Group 5 (>130)	39	31.5
Total	380	591.0

Source: DNB

Table 2 Funding ratios, full indexation scenario

End of year	2009	2010	2011	2013	2015	2024
Group 1 (<100)	95	97	98	100	101	101
Group 2 (100-110)	105	107	109	111	112	113
Group 3 (110-120)	115	117	119	122	122	125
Group 4 (120-130)	125	127	129	132	133	138
Group 5 (>130)	135	138	140	143	144	150
Average	109	111	113	115	116	118

Table 3 Current policy rules scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	3.1	3.1	3.1	3.1	3.1
Indexation cuts (% pension rights)	-	1.1	1.1	0.9	0.4	0.0
Funding ratio (end of year)	109	114	118	125	130	145

Table 4 Immediate write off scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	0.0	0.0	0.0	0.0	0.0
Indexation cuts (% pension rights)	-	17.5	0.0	0.0	0.0	0.0
Funding ratio (end of year)	109	135	137	140	141	145

Table 5 Employee contribution scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	4.6	4.6	4.6	4.6	4.6
Indexation cuts (% pension rights)	-	0.0	0.0	0.0	0.0	0.0
Funding ratio (end of year)	109	113	116	122	126	145

Table 6 Employer contribution scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	4.6	4.6	4.6	4.6	4.6
Indexation cuts (% pension rights)	-	0.0	0.0	0.0	0.0	0.0
Funding ratio (end of year)	109	113	116	122	126	145

Table 7 Reduced indexation scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	0.0	0.0	0.0	0.0	0.0
Indexation cuts (% pension rights)	-	-0.2	0.2	0.9	1.7	1.7
Funding ratio (end of year)	109	111	113	117	121	145

Table 8 Retirement age scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	0.0	0.0	0.0	0.0	0.0
Indexation cuts (% pension rights)	-	0.0	0.0	0.0	0.0	0.0
Funding ratio (end of year)	109	112	115	121	124	144

Table 9 Hybrid: retirement age/write off scenario

	2009	2010	2011	2013	2015	2024
Increase contribution (% wages)	-	0.0	0.0	0.0	0.0	0.0
Indexation cuts (% pension rights)	-	8.2	0.0	0.0	0.0	0.0
Funding ratio (end of year)	109	122	125	129	132	145

Table 10 Current policy rules scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	-0.5	-0.9	-1.1	-1.1
GDP (%)	-0.1	-0.3	-0.5	-0.1
Labor supply (%)	0.0	-0.1	-0.2	-0.2
Unemployment (% level)	0.0	0.1	0.2	0.0

Table 11 Immediate write off scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	-0.9	-1.3	-1.5	-1.2
GDP (%)	-0.3	-0.4	-0.5	0.0
Labor supply (%)	0.0	0.0	-0.1	0.0
Unemployment (% level)	0.1	0.2	0.2	0.0

Table 12 Employee contribution scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	-0.8	-1.4	-1.5	-1.1
GDP (%)	-0.2	-0.5	-0.8	-0.3
Labor supply (%)	0.0	-0.1	-0.4	-0.3
Unemployment (% level)	0.1	0.2	0.3	0.0

Table 13 Employer contribution scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	- 0.2	- 0.2	- 1.2	- 1.1
GDP (%)	- 0.3	- 0.6	- 1.4	- 0.3
Labor supply (%)	- 0.1	- 0.2	- 0.3	- 0.3
Unemployment (% level)	0.5	0.7	1.0	0.0

Table 14 Reduced indexation scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	0.0	0.0	- 0.1	- 1.2
GDP (%)	0.0	0.0	0.0	0.0
Labor supply (%)	0.0	0.0	0.0	0.0
Unemployment (% level)	0.0	0.0	0.0	0.0

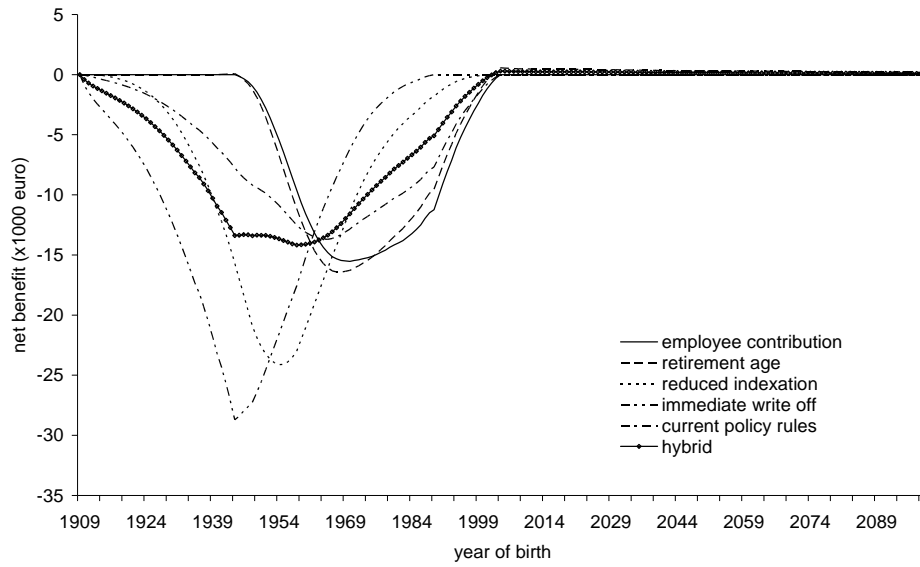
Table 15 Retirement age scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	0.0	0.0	- 0.1	- 1.2
GDP (%)	0.0	0.0	0.0	0.0
Labor supply (%)	0.0	0.0	0.0	0.0
Unemployment (% level)	0.0	0.0	0.0	0.0

Table 16 Hybrid: retirement age/write off scenario, macroeconomic effects

	2010	2011	2013	2024
Private consumption (%)	- 0.5	- 0.7	- 1.8	- 1.2
GDP (%)	- 0.2	- 0.2	- 0.3	0.0
Labor supply (%)	0.0	0.0	- 0.1	0.0
Unemployment (% level)	0.1	0.1	0.1	0.0

Figure 6 Generational accounts



Note: Figure 6 displays net benefits per capita for all cohorts. The surfaces defined by the four curves and the x-axis are unequal. This is due to the fact that different generations have different size.

