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The Promise of Defined-Ambition Plans

Lessons for the United States

Netspar

The Promise of Defined-Ambition Plans: Lessons for the United States

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Abstract

This paper explores proposals for defined-ambition plans in Dutch occupational pensions. Firms no longer act as external risk sponsors but continue to provide a distributional platform for pensions, thereby addressing behavioral and agency issues as well as imperfections of insurance and financial markets. Pension entitlements are defined in terms of (deferred) annuities, and participants share the risks of assets and a joint liability pool on the basis of complete contracts. We investigate risk management and valuation of these plans, explore their strengths and weaknesses, and analyze whether such plans hold promise for the United States.

1. Introduction

This paper explores defined-ambition (DA) schemes that provide variable annuities to participants. These schemes are based on occupational pension schemes in the Netherlands in which participants— rather than an external sponsor— bear mismatch risk. These Dutch schemes have evolved from traditional DB (DB) schemes with external risk sponsors. The government of the United Kingdom is looking at DA schemes as one of the ways to strengthen occupational pension provision in the UK (see Department for Work and Pensions, 2013). Also public-sector pension schemes in the United States are considering risk-sharing among participants as a way to reduce the costs and risks for the taxpayers as external risk sponsors (see e.g. Novy-Marx and Rauh, 2013). Our analysis addresses the key issues associated with a move from a DB design towards DA schemes.

The paper is structured as follows.¹ Section 2 describes the Dutch pension system. Section 3 investigates the major strengths of Dutch occupational schemes. Section 4 analyzes the major weaknesses of Dutch occupational systems as revealed by the financial crisis. These weaknesses originate in the legacy of the DB design in terms of (i) communicating and setting risk exposures; (ii) valuing annuities; and (iii) accruing new benefits and determining pension contributions. These weaknesses of Dutch schemes, which were exposed by the financial crisis, led to proposals for DA schemes. Section 5 describes the key features of these schemes. Section 6 describes the current status of the Dutch policy debate on occupational pensions in general and DA schemes in particular. It discusses various obstacles to the actual implementation of DA plans. Section 7 draws lessons for the United States by comparing DA schemes with mainstream defined-contribution (DC) schemes. Section 8 contains conclusions on the promise of DA for the United States, including public sector plans.

2. Dutch occupational pensions

Three-pillar system

The Dutch pension system consists of three pillars. The first is a pay-as-you-go public pension scheme. This Beveridge-type public system provides a uniform, flat pension to all residents at a level that is related to the minimum wage rather than individual earnings. Most other continental EU countries, in contrast, feature Bismarckian earnings-related public pensions. Accordingly, compared to other EU governments, the Dutch government provides only a relatively small part of pension income for workers who earn middle and higher incomes. If these workers want to maintain their standard of living in retirement, they need additional pension provisions. This is where the second pillar of pension provision (i.e. occupational pensions) enters the picture. In contrast to the first pillar, the second pillar is earnings-related, and aims at maintaining the standard of living of middle-class workers during retirement. The third pillar consists of voluntary personal pension provisions, which are tax-favored up to a ceiling. This pillar is especially important for self-employed individuals who lack occupational pension provisions.

¹ The analysis in this paper is descriptive in nature. Bovenberg, Mehlkopf and Van Bilsen (2014) formalize DA schemes, including the market valuation of the variable annuities provided by these schemes.

Occupational pensions

This paper focuses on occupational pension schemes in the second pillar. Occupational pension provisions are typically part of labor contracts, which are negotiated between unions and employers in collective labor agreements. Employees are thus obliged to participate in the negotiated pension scheme. As a result, occupational schemes cover more than 90% of the labor force. These schemes are funded, and the value of assets in the second pillar currently amounts to about 1 trillion Euro (140% of GDP).²

Dutch pension funds are independent trusts with their own governance and administrative structures. The governing board of pension fund traditionally consists of equal representatives of employers and unions— although more recently also retirees and independent specialists can become board members. These representatives act as fiduciary trustees. Industry-wide pension funds arrange pensions for workers in a specific sector of the economy. These sectoral funds own more than two-thirds of the assets in the second pillar, and account for more than 80% of the active participants. A company can opt out of an industry fund only if it offers a better pension plan than the plan offered by the sectoral fund.³ This mandatory participation of firms in sectoral arrangements contributes to the high coverage of occupational pensions in the Netherlands.

Benefit entitlements in terms of annuities....

The occupational plans aim at a specific lifetime income stream during retirement. Indeed, property rights are defined in terms of a (deferred) annuity. Years of service and a reference wage typically determine the benefit entitlement. The reference wage used to be the final wage, but in the last decade most funds have moved to career-average schemes. In these latter schemes, entitlements to deferred annuities accrue based on a percentage of the average wage level during the career. These schemes typically aim at an annuity level of about 75% of average pay (including the flat public benefit) after 40 years of service. The benefit accrual (in terms of annuity level) is uniform across age groups. Hence, if the aim is to provide 75% of average pay after a working career of 40 years, the annual accrual rate is $75\%/40=1.875\%$. The uniform accrual rate of annuity units implies that benefits are backloaded, because the time value of money implies that the value of the (deferred) annuity (as a percentage of the wage) rises with age. Industry funds charge the same premium rate for the annuity units irrespective of age. Hence, firms with a younger workforce subsidize firms with an older workforce.⁴

...with bonus payments

The goal is to index the deferred annuity to the development of contractual wages during the accumulation phase. Some funds aspire to link annuities to the

² See <http://www.statistics.dnb.nl/en/financial-institutions/pension-funds/macro-economic-statistics-pension-funds/index.jsp>

³ In terms of active participants, the most important other type of pension fund is a company pension fund. To provide pension benefits to its workers, a company does not have to set up its own company pension fund but can also contract out its pension scheme to an insurance company.

⁴ The combination of uniform accrual and a uniform contribution rate in industry funds implies that occupational pensions are in effect financed in part on a pay-as-you-go basis, as younger workers subsidize older workers. CPB (2014) estimates that the implicit debt, due to the backloading of benefits is approximately 10% of total assets.

development of contractual wages also during the pay-out phase. Other funds aim to provide cost-of-living adjustments during the decumulation phase.

Payout conditional on performance

The aspired annuity levels are ambitions rather than guarantees. Pension funds aim to index the pension rights, but these bonus payments are conditional on the financial performance of the fund. In fact, not only indexation is conditional on fund performance: also the nominal (or “base”) pension can be cut if the assets of a fund are smaller than the value of the nominal liabilities (i.e. the value of the annuities excluding indexation).⁵ Dutch solvency regulation requires that a funding shortage (calculated on the basis of the value of nominal liabilities) is in expectation resolved within a three-year period. The length of the recovery period has temporarily been increased to five years in the aftermath of the recent financial crisis. In calculating the scope for recovery, funds can use expected returns on assets. Hence, risk premia on risky assets contribute to the potential for recovery. Funds, however, are not allowed to increase mismatch risk if they are in a recovery program.

Nominal liabilities computed with market interest rates

For the purpose of solvency regulations, Dutch pension funds must calculate nominal liabilities on the basis of the term structure of nominal interest rates (based on European swap rates) published by the Dutch Central Bank.⁶ This market-based valuation method, thus assumes that nominal liabilities are guarantees. It was introduced in 2007.⁷ Before 2007, pension funds discounted their liabilities against a fixed discount rate of 4%. The introduction of valuation on the basis of market interest rates did not have a substantial effect on funding rates at the time, as market interest rates were close to 4% in 2007.

3. Strengths of Dutch occupational plans

This section explores the main strengths of Dutch occupational pension schemes compared to mainstream DC schemes.

A. Advanced risk management and protection against behavioral biases

Workers are automatically enrolled in pension plans, thereby reducing marketing and other transaction costs and protecting individuals against myopia and other behavioral biases. Cooperative pension plans allow individuals with scarce cognitive abilities to delegate complex saving, investment, pay-out and insurance decisions to professionals. The plans in fact assist individuals in properly exploiting their long-run investment horizon and in gaining access to complex investment strategies provided by modern financial markets at low costs.

Pension funds manage interest-rate risks and inflation risks so as to realize the ambition to index retirement income to wages and/or prices. Hence, the hedge portfolio is defined in terms of income streams during retirement. Indeed, the main

⁵ Several Dutch pension funds had to cut pensions in payments in nominal terms in April 2013. See section 4.

⁶ <http://www.statistics.dnb.nl/en/financial-markets/interest-rates/index.jsp>

⁷ This valuation method was amended in 2012 with the Ultimate Forward Rate (UFR) methodology to determine discount rates beyond a horizon of 20 years. See section 4.

risks (e.g. investment risk, inflation risk and interest-rate risk) are managed so as to hedge risks on behalf of households while at the same time exploiting the risk premia on various risk factors by optimizing the trade-off between return and risk. This asset-liability management thus results in liability-driven investment. More sophisticated, illiquid and long-term investments by institutional investors stabilize financial markets and facilitate macroeconomic stability.

B. Protection against agency issues

The board of trustees of a pension fund contracts out various financial services to asset managers and other providers of financial services. Accordingly, with the employer as a distribution platform, competition occurs on a wholesale level rather than a retail level. Joining forces in a cooperative pension fund that is run professionally, workers in effect strengthen their buying power in financial markets and markets for financial services, exploits scale economies and helps to discipline commercial financial service providers to act in the interests of pension fund members, who typically lack sufficient expertise to contract complex financial services.

C. Pooling of idiosyncratic longevity risk and completion of financial markets

In addition to addressing agency and governance issues, pension funds reduce selection in longevity insurance through forced risk pooling. This facilitates the pooling of idiosyncratic longevity risk, thereby reducing the costs of lifetime income streams. Collective risk-pooling not only combats selection in insurance of idiosyncratic longevity risk but also allows members to trade in pension funds systematic risks that are not (yet) traded in financial markets. In particular, young members can share in systematic longevity risks faced by older cohorts. To illustrate, if these cohorts live longer than expected, the resulting lower funding rate affects the indexation quality of the deferred annuities of the younger cohorts. Moreover, by linking pension benefits to the wages of workers, pension funds allow retirees to share in the wage risks of workers.⁸

⁸ In principle, one can share financial-market shocks not only between currently living generations but also with generations that are not yet participating in the pension scheme. From an ex-ante point of view, this intergenerational trade is actually welfare improving. In practice, however, the scope for this risk-sharing is limited by the ability to commit generations to the contract (see Bovenberg and Mehlkopf, 2014). As a result, the welfare gain associated with risk-sharing with future participants is rather limited in Dutch occupational pension schemes (see Boelaars et al., 2014).

4. Weaknesses of Dutch occupational plans

This section explores the major weaknesses of Dutch occupational pension plans. These weaknesses, which were exposed by the financial crisis, are related to the legacy of a DB design with external risk sponsors.

The first weakness involves the risk profiles of retirement income. In particular, investment policies of the funds do not originate in explicit desired risk profiles for participants. Pension contracts also do not allow for much scope for tailoring the risk profile to the needs of each generation.

The second main weakness concerns the valuation of pension rights, which is still based on pension guarantees— even though pension funds in fact offer variable annuities whose value depends on the investment policy, funding rates and the rules for distributing surpluses and deficits.

This section investigates how the ambiguity surrounding risk profiles and valuation gives rise to intergenerational conflicts about the investment profile and the distribution of the assets.

A. Ambiguous risk profiles and liabilities for communication and investment

Lack of risk-bearing capital

With a rising ratio of pensioners to workers as a result of aging and the maturation of the schemes, pension liabilities have increased compared to the premium base. As a direct consequence, large changes in contributions are required to absorb the risk of mismatch between assets and liabilities. Indeed, for many companies, the risks of their DB pension schemes have started to dominate those of the core business. These companies therefore no longer want to underwrite the risks of their pension funds. Another reason why contributions can no longer absorb shocks is that contribution rates to occupational pensions have reached rather high levels due to low interest rates, increased longevity and additional recovery contributions aimed at reducing funding shortages (see Figure 1). Moreover, volatile contributions that are inversely related to the funding rates of pension funds impact the economy in a procyclical fashion. As a result of these developments, employers and workers supply less risk-bearing capital to pension funds in the form of contributions that stabilize funding rates. Accordingly, participants must supply more risk-bearing capital through pension rights that absorb mismatch on the balance sheet of pension funds. Participants rather than contributors have in fact become the residual risk bearers of pension funds.

Substantial mismatch risk due to macroeconomic shocks ...

The increased financial risks on the balance sheet of pension funds became apparent during the financial crisis, which gave rise to substantial mismatch between the development of assets and liabilities. Figure 2 displays the development of the average nominal funding rate of Dutch pension funds during the last 25 years.⁹

⁹ Nominal liabilities in Figure 2 are calculated on the basis of the term structure of interest rates, also before 2007 when pension funds in fact still employed a fixed discount rate of 4% to compute their liabilities.

Before the onset of the financial crisis in 2007, the average nominal funding rate amounted to about 145%. The financial crisis in 2008 caused the average nominal funding ratio to decrease substantially from 145% before the crisis to a trough of about 90% in the first quarter of 2009 and the summer of 2012.

Three main factors have contributed to the fall of funding rates since 2007. First of all, in combination with the use of the term structure of nominal interest rates to compute the value of nominal liabilities, the sharp decline in nominal interest rates during the financial crisis raised the present value of nominal pension liabilities. Indeed, most of the decline in the funding rate between 2007 and 2011 can be attributed to lower nominal interest rates. The second factor behind the drop in funding rates is lower mortality. Following major healthcare reforms in 2001, mortality rates of retirees dropped more substantially than anticipated earlier. Upward revisions of life expectancy have depressed average funding rates by about 5 %-points. The final factor affecting funding rates involves the asset side of the balance sheet. In particular, the worldwide collapse of share prices in the immediate aftermath of the financial crisis reduced asset values.

...but also investment policies of funds in terms of interest rate risk...

The rise in liabilities as a result of lower interest rates was not sufficiently compensated by the increase in the value of bonds (or interest derivatives) on the asset side of the balance sheet, as funds did not fully hedge nominal interest-rate risk that resulted from the move to employ nominal interest rates to compute liabilities in 2007. Dutch pension funds, on average, hedge only around 45% of the nominal interest rate risk on their liabilities through positions in nominal bonds and interest derivatives. Substantial heterogeneity exists in the degree to which funds have hedged interest-rate risks. Indeed, funds differ in how they define their liabilities for their own risk-management purposes, even though the public supervisor uses the construct of nominal guaranteed liabilities to compute the funding rate. In particular, in the face of fluctuating (wage)inflation expectations, funds must choose which kind of income liability to hedge: nominal pension income or (wage)indexed pension income. In particular, short-term debt instruments allow funds to take advantage of rising nominal interest rates if (wage) inflation expectations increase so as to protect the real value of pensions. This investment policy, however, leaves open the risk that falling nominal interest rates worsen the nominal funding rate, necessitating a cut in nominal pension rights. This tension between hedging *nominal* and *real* liabilities has become especially stark in the aftermath of the financial crisis— and how stark it is depends in part on whether one believes that changes in nominal interest rates are primarily driven by changes in real interest rates or by changes in expectations about inflation and the inflation risk premium.

...and investment risk

As regards investment risk, various funds have also taken rather different decisions. Indeed, supervisory authorities do not force pension funds to match their nominal liabilities if capital buffers become low.¹⁰ The supervisory rules thus leave substantial discretion to the pension funds on how to respond to low funding rates in terms of their investment risk. Some pension funds chose to defend nominal pension rights by not only matching these nominal obligations through hedging nominal interest-rate

¹⁰ They do, however, prohibit funds that face a nominal funding shortage taking more mismatch risk.

risk but also cutting back on investment risk. Other pension funds, in contrast, decided to continue taking investment risk in order to retain upside potential.

Insufficient scope for tailor-made risk profiles gives rise to intergenerational conflict

The trade-off pension funds face in setting their investment policy can also be regarded as a trade-off between the interests of young and old participants. As many papers advocating life-cycle investing show (see Bodie et al., 1992; Cocco, Gomes and Maenhout, 2005), taking substantial investment risk is more attractive for young participants than for retirees. Similarly, protecting nominal guarantees by hedging nominal interest rate risks is primarily in the interests of the elderly. The current Dutch occupational pension plans impose uniform investment and adjustments in pension rights (indexation and cuts in nominal pensions) on all participants. This limits the scope to attune risk exposure to the needs of various cohorts (see Ambachtsheer, 2013), although intertemporal smoothing of shocks allows for limited age differentiation between the risk exposures of various generations (see Boelaars et al., 2014). The limited scope for tailor-made risk profiles may lead to suboptimal risk profiles and result in intergenerational conflicts about the investment policy of the pension funds.

Nominal cuts of pensions in payment due to materialized interest-rate risk

Many pension funds that had deliberately chosen to continue to take mismatch risk at low nominal funding rates saw their nominal funding rates fall below 100% when interest rates reached low levels during the financial crisis and the subsequent euro crisis. Most of these pension funds were unable to recover from their funding shortage within the maximum period of five years without cuts in nominal pension rights, including pensions in payment.

The biggest wave of cuts in pensions in payments occurred in 2013. During that year, 68 pension funds (out of 415) were required to cut nominal pension rights. The cuts in 2013 affected around 2.0 million active participants (who pay contributions), 1.1 million retired participants and 2.5 million inactive participants who neither pay contributions nor receive benefits.¹¹ Figure 3 shows a bar chart displaying the size of pension cuts. Around 2 million participants faced a relatively large cut of 6 to 7 percent. A cut of 7 percent is observed frequently because the Dutch government allowed pension funds to cap the level of pension cuts in 2013 at 7% and defer the remainder to 2014.¹²

Moreover, most pension funds have been unable to provide (full) indexation in recent years. Figure 4 illustrates that actual indexation to retirees has lagged indexation ambitions: on average retirees have experienced a decline of around 10% of their replacement rates as a consequence of inadequate indexation. This decline is expected to increase further because the current low funding rates will not allow pension funds to provide full indexation in the near future.

¹¹ These numbers include some double-counting for people who have pension entitlements in more than one pension fund, for example people who are active participant in one pension fund and who are an inactive participant in another pension fund (i.e. people who did not transfer their pension wealth when moving to another company or sector).

¹² The wave of pension cuts in 2014 is smaller compared to the year before: 29 pension funds are required to cut pensions. The cuts in 2014 affect around 200,000 retirees, 300,000 active participants and 600,000 participants who neither pay contributions nor receive benefits. The size of cuts is on average 1.3 percent.

Inadequate communication about risks profile

Pension funds typically communicate to participants in terms of nominal pension rights but are rather silent on future indexation prospects and the possibilities of future cuts in nominal pension rights. Communication to participants has thus not yet adapted to the new realities in which participants are the main risk bearers.¹³ Hence, the possibility that pension pay-outs could be cut came as an unpleasant surprise to many pensioners and eroded the confidence of members in occupational pensions. Figure 5 shows that the percentage of people expressing 'some or a lot of trust' in pension funds declined from 64% before the crisis to 42% after the crisis.¹⁴

Pension funds aren't 'walking their talk': incomplete investment policy

The cuts in pension pay-outs have made it clear that the current contract does not provide guarantees, even though pension funds communicate in terms of nominal pension rights. Indeed, pension funds do not 'walk their talk'. Whereas they suggest that they supply fixed annuities, they in fact provide variable annuities because they continue to deliberately take mismatch risk at low funding rates in the absence of the risk-bearing capital of flexible contributions. The financial crisis thus exposed a major weakness of the Dutch pension system: namely, the ambiguity of the risk profiles of future pension payments on account of incomplete investment policy, and a mismatch between the communicated risk profile and the investment policy of the funds. In particular, risk profiles for various cohorts are not specified and communicated ex ante, and supervisory authorities do not force pension funds to make their investment policies consistent with the communicated risk profiles. The risk exposures of the liabilities are not clearly specified, which results in a lack of discipline in asset management.

To address this weakness, pension funds would have to walk their talk. The first solution ('do what you currently say' or 'walk your current talk') would imply a so-called "combi-contract" in which there is a "base" level of pension payments that is guaranteed and a remainder that is conditional on performance.¹⁵ A combi-contract, which involves both debt-like and equity-like claims, would require solvency rules that do force pension funds to defend the guaranteed part of obligations through dynamic investment policies that reduce investment risks and interest-rate risks at low funding rates.¹⁶ The second solution ('say what you currently do' or 'talk about your current walk') would change the communicated liability structure of the fund by communicating that all pension rights have become uncertain in a particular statistical sense.

¹³ The government has announced that, starting in 2015, pension funds should communicate to individual participants projected pension incomes in real terms for both the median outcome and a 'bad weather' scenario.

¹⁴ The recent cuts in nominal pension rights in 2013 and 2014 are not yet measured by this survey and are likely to have resulted in a further decline in confidence levels.

¹⁵ At current asset levels and interest rates, nominal guarantees would have to be lower than current pension rights if pension funds would maintain enough upward potential for indexing pension rights to (wage) inflation. Such a 'debt-equity swap' would especially necessary for (younger) workers.

¹⁶ Ambachtsheer (2013) contains a proposal for the introduction of a two-fund solution in the Netherlands that is based on a similar idea. In Ambachtsheer's proposal, young participants start accumulating wealth in a return-seeking mutual fund with a long investment horizon and gradually convert their wealth into an annuity fund during the life-cycle.

B. Lack of economic valuation and fair pricing: ambiguous property rights

Lack of economic valuation

Valuation of pension rights is still based on an outdated DB design, which opens the door for intransparent redistribution of wealth across various stakeholders. In particular, pension rights are valued as guaranteed nominal annuities rather than variable annuities that are the result of the investment policies of the pension funds in combination with the withdrawal of external risk bearers. In calculating the value of pension rights, economic valuation would take into account the option value of the claim of individuals on collective buffers. This conditional claim depends on the rules for distributing surpluses and funding shortages across stakeholders. This section explains how the lack of economic valuation (and thus fair pricing of pensions entitlements) leads to ambiguity about ownership rights when the pension contract and investment policies are changed or if annuity units are bought and sold.

Incomplete pension fund policies

A necessary requirement for determining the economic value of individual property rights is that the pension contract is complete in the sense that the rules for distributing risk are known in advance and are not subject to discretionary changes. Pension contracts, however, typically do not offer transparency ex-ante about the rules for allocating the mismatch risk on the balance sheet of pension funds across stakeholders ex-post. Although pension funds have strived recently to make risk-sharing contracts more complete, these contracts are little more than guidelines for the governing board. Indeed, the governing boards of the pension funds still dispose of substantial discretion in redistributing resources across stakeholders. For example, most contracts tend to stay silent on what happens in the situation of a funding deficit. It is also unclear what happens if the buffers rise above the level that is necessary to finance fully indexed pensions. Discretionary decision making by pension fund boards may alter the value of individual annuities and thus redistribute wealth positions across stakeholders if the different variable annuities produced by a change in distributional rules or investment policy are not exchanged at fair prices (see also Kocken, 2012). This politicizes decision making in pension funds.

Incomplete government policies

In addition to discretion in the decision making of pension fund boards, also the policies of the government are a source of ambiguity about the distribution of risk and thus the economic value of ownership rights. The government regularly adjusts the rules for pension funds and thereby alters the way in which mismatch risk is allocated across stakeholders. If the original and new variable annuities as a result of a change in government policy are not exchanged at fair prices, the government in effect redistributes economic value across participants.

At given annuity units, the discount rate is particularly important for the distribution of resources across stakeholders, because it determines the financial position of a pension fund and thus both the pension payments to retirees in the short run and the remaining resources for pension payments in the long run. Starting in 2007, discounting was no longer based on a fixed discount rate of 4% but on the term structure of nominal interest rates. The new discounting method causes the funding position to be highly sensitive to changes in nominal interest rates. The low interest rates during the euro crisis led to proposals for a more stable discount rate.

The current valuation method is controversial also because it is still based on guaranteed nominal annuities. The social partners have proposed alternative valuation methods that aim to provide a better representation of the risk characteristics of the variable risk-bearing annuities that are, in fact, being provided (see SER, 2013). A key property of these proposals is that they feature a reduced sensitivity to fluctuations in interest rates. Proponents of these alternative valuation methods argue that fluctuations in the risk-free rate are less relevant for the valuation of variable annuities so that the price of new annuities should be less sensitive to time-variation in the market price of certainty (as reflected in interest rates of safe assets).

In the third quarter of 2012 the Dutch government adopted from Solvency-II proposals the so-called “Ultimate Forward Rate” (UFR) method for discounting liabilities with long maturities. The introduction of the UFR with fixed annuity units led to an instantaneous increase of 3 %-points in the funding rates of the average Dutch pension fund. The improved financial position allows pension funds to provide more indexation or reduce the size of required pension cuts.¹⁷ Hence, the introduction of the UFR methodology shows how adjustments in regulation lead to redistribution of market value across stakeholders. Another example of an adjustment in government regulation is the temporary increase in 2008 from three to five years of the maximum number of years that pension funds are allowed to be underfunded. The frequent changes in the rules for computing and distributing mismatch risk have led to intergenerational conflicts and politicized pensions.

To minimize political conflicts, the government asked CPB (an independent government body for economic policy analysis) on several occasions to calculate the redistributive effects between generations that result from proposed changes in regulation.¹⁸ CPB applied value-based generational accounting to calculate the change in the value of pension rights. These calculations employ stochastic discounting of projected stochastic cash flows instead of valuation based on nominal guarantees.

Intergenerational conflict about investment policy due to asymmetric contract

The valuation based on guaranteed nominal annuities, which the pension funds have to report, fails to recognize that the economic value of individual annuities depends on the investment policy of a pension fund. In particular, the relatively short recovery period of five years for a funding shortfall implies that the downward risk associated with risk taking is allocated primarily to the older generations. The upward potential, in contrast, is used to build up collective buffers, thereby benefitting primarily younger generations. With the old in effect providing a put option to the young participants, an intergenerational conflict emerges about the investment profile of the fund. Whereas the old want to hedge nominal interest-rate risks and reduce investment risks, the young prefer to take more interest-rate and investment risk in order to increase the economic value of their pension entitlement. Hence, due to the asymmetry in the current pension contract (which is another legacy of the DB nature of contracts), one should make the contract complete in terms of not only

¹⁷ This wealth transfer from workers to retirees through pension payments is partially offset by the impact of the discount rate on the contributions that workers have to pay for new accruals (see CPB, 2012b).

¹⁸ CPB (2012a,2012b,2013)

distributional rules but also investment policy in order to protect the value of individual property rights.

Intransparent redistribution when selling annuity units...

The lack of fair pricing of annuity units due to inadequate valuation leads to redistribution of wealth if annuity units are bought and sold. In particular, lack of economic valuation of pension rights implies that transfers of pension rights across pension funds may hurt either those who transfer the rights or the remaining participants. This distorts decisions to transfer value across funds.

...and buying annuity units

Moreover, since the price charged for new pension rights does not reflect the economic value of these rights, the accumulation of new pension entitlements by workers causes intransparent redistribution between retirees and inactive participants, on the one hand, and workers who are accumulating new (deferred) annuities, on the other. This problem has worsened due to another legacy of the DB schemes: namely, a fixed accrual rate for newly accrued entitlements. A fixed accrual rate implies that the economic costs of pension accruals vary over time as a result of fluctuations in the price of the annuity units. With fair prices, this system of a fixed accrual rate independent of the price of the accrued annuity units is pro-cyclical because the price of annuity units tends to be high in recessions (with low interest rates) and low in booms (with high interest rates). To prevent this pro-cyclical, the Dutch system allows for smoothing of the price over time— but this leads to intransparent redistribution between existing participants and active workers. The pro-cyclical could be mitigated without these value transfers by either moving to a more stable discount rate (as proposed by SER, 2013) or employing variable accrual rates that fluctuate inversely with the price of the annuity units.

Difficulties in introducing elements of individual choice

With risks increasingly being shifted onto participants, interest has grown in giving individuals a greater say in how much risk they want to bear. However, inadequate valuation hinders the introduction of more elements of individual choice (not only in risk profiles but also contribution levels). In particular, individual choices will be distorted.¹⁹

5. Characteristics of DA plans

The weaknesses of Dutch occupational pension plans, which became more apparent in the aftermath of the financial crisis, led to proposals to address these weaknesses by the introduction of so-called DA schemes. This section describes the key features of DA plans. It explains also how these schemes address the shortcomings of current contracts described in section 4, while protecting the desirable features of traditional occupational schemes described in section 3.

A. Employer as distribution platform for annuities rather than risk sponsor

¹⁹ Individual choice in contribution levels is distorted also by the combination of backloading of pension benefits in combination with the uniform pricing of annuities

DA schemes are similar to DC plans in that they both lack outside risk sponsors: mismatch risk on the balance sheet is borne by the participants of the scheme rather than a corporate sponsor. Participants can thus trade risk with outsiders only through tradable financial instruments.

The absence of corporate sponsors is in the interest of workers for two reasons. First, workers are not exposed to the credit risk of their employer or industry. This is an important advantage because the expected lifetime of firms and industries is declining in the face of more dynamic and competitive economies. Second, by relieving firms of their role as risk sponsor, workers keep firms involved as a distribution platform for occupational pensions. In this way, employers can continue to help address the behavioral imperfections, agency issues and the imperfections of insurance and financial markets identified in section 3.

Pension entitlement as (deferred) annuity

Pension entitlements are defined in terms of (deferred) annuity units (i.e. lifetime income streams beginning at a particular retirement age). Conversion of capital into annuities occurs already when contributions are paid. Hence, participants share idiosyncratic longevity risk within the insurance pool of the fund. DA schemes thus preserve the advantage of current Dutch contracts in which collective risk-pooling combats selection in longevity insurance.

Risk-sharing with complete contract in mutual insurer yields variable annuities

Participants share not only idiosyncratic longevity risk but also the systematic risks associated with joint asset and liability pools on the basis of complete contracts. In particular, if the value of aggregate liabilities deviates from the value of aggregate assets, the pension contract specifies how annuity units are adjusted over time so that the aggregate value of individual pension rights continues to match the value of the assets in the fund. The fund can thus be viewed as a stand-alone mutual insurer: all risks within the collective are allocated to plan members so that there is no residual balance sheet risk left to outside shareholders or sponsors. Risk-sharing within this fund thus results in variable annuities: annuity units vary with financial and biometric risk of the common asset and liability pools.

Completing financial markets

Through the shared liability pool, participants share biometric risks. Liabilities may also include other non-traded risk factors, such as (wage) inflation risk.²⁰ In that case, individuals hold claims on notional assets that are not (yet) traded in financial markets. DA contracts thus preserve the benefit of traditional collective occupational pension schemes in that they allow participants to exchange systematic risk factors that are not (yet) traded on these markets.

Innovation in occupational pension schemes

The DA schemes with variable annuities can be considered a similar innovation in the context of funded occupational pension schemes as non-financial defined-contribution (NDC) schemes were in the context of pay-as-you-go public schemes (see Holzmann, Palmer and Robalino, 2011). In particular, by replacing DB schemes in which outside risk sponsors absorb risk, both NDC and DA schemes lack external risk sponsors. Indeed, funding gaps do not affect contribution levels. Both of these

²⁰ The supply of inflation-linked bonds is limited in the Euro area. Moreover, these bonds use Euro inflation rather than Dutch price inflation used by pension funds.

schemes allocate risk of joint asset and liability pools across participants on the basis of complete contracts that specify how liabilities are adjusted if the value of aggregate assets deviates from the value of aggregate liabilities.

Specific form of risk-sharing contract

The contract for allocating mismatch risk in proposals for DA in the Netherlands has some specific features. First of all, it is symmetric. Hence, positive shocks in the funding rate are allocated in the same way as negative shocks. Second, proportional adjustments of annuity units are uniform across individuals. This imposes restrictions on the risk exposure of participants. Annuities are all variable, and vary with financial and biometric risk of the common asset and liability pool. Third, income streams provided by the variable annuities are adjusted gradually after an unexpected shock that causes a mismatch between assets and liabilities. Hence, retirees take investment risk but can take some time to adjust their standard of living after an unexpected event. This smoothing of adjustment of consumption to shocks is consistent with habit formation. Gradual adjustment leads to life-cycle investment in which risk exposure declines with age also during the pay-out phase. This is because retired agents have less time to absorb shocks when they become older and their remaining expected lifetime declines. Risk exposures are thus tailored to the investment horizon.

B. Communication and risk management on basis of consumption frame

Pension rights are communicated not just in terms of capital but also in terms of a risk profile of an income stream in retirement. In particular, the pension contract specifies how sensitive income in retirement (in real terms) is with respect to the various risk factors. These communicated risk profiles of retirement income at each horizon are the starting point for risk management (see Figure 6). Specifying this risk profile is the main responsibility of the board of a pension fund. The investment policy of the pension fund is then determined endogenously such that the risk surrounding projected pension payments matches the desired risk profiles. In this way, the idea of liability-driven investment based on asset-liability management familiar from DB schemes is generalized to stochastic liabilities with risk budgets. Indeed, the contract is complete in terms of not only the allocation of mismatch risk across participants but also investment policy, so that participants obtain the risk exposures that have been communicated to them. Pension funds walk their talk: assets match liabilities.²¹ The desired liabilities discipline the investment policy.

As a result of employing the consumption frame for risk management, interest-rate risk is actively managed during both the accumulation and pay-out phases. In addition, contribution levels can be set so as to reach a particular goal for retirement income. In this regard, we can distinguish between a defined-contribution scheme, which fixes the premium, and a DA scheme, which adjusts the premium level so as to attain a particular objective for retirement income.

C. Economic valuation

²¹ Even though assets match liabilities ex ante, liabilities may diverge from assets ex post because liabilities are stochastic. Hence, mismatch risk is zero ex post only if liabilities are guaranteed (i.e. non-stochastic).

Economic valuation of the individual property rights on annuity units is possible. The value of the variable annuities can be derived endogenously from the stochastic pension promises (i.e. the pension ambitions), which are in fact the liabilities of the DA scheme. In particular, the mean of the (deferred) stochastic annuities provided by the DA schemes are priced on the basis of the term structure of interest rates amended by a horizon-dependent risk premium that rises with the investment horizon, as illustrated in Figure 7.²²

Non-traded risk factors in the common liability pool complicate valuation, since these schemes cannot be valued objectively on the basis of prices in financial markets. This gives rise to a trade-off between completing financial markets versus being able to make an objective valuation. On the one hand, these schemes allow participants to trade risk factors among themselves that are not yet traded on financial markets, thereby potentially creating value. On the other hand, the prices of these risk factors are difficult to determine objectively, which may give rise to political risk.

Investment policy does not affect intergenerational distribution

The symmetric nature of the pension contract implies that the investment policy of the fund does not affect the market value of individual pension rights at given annuity units.²³ The separation between risk exposures and the value of the individual annuities allows trustees to change the risk profile of given annuity units without changing their value. Hence, pension funds may be allowed more discretion to modify risk profiles.

Economic valuation allows individual choice

Proper valuation is important for giving participants some limited freedom of choice in selecting their own risk profile or saving level. In particular, by allowing individuals to exchange various types of variable annuities at fair prices, pension funds can provide individuals discretion in selecting their own risk profile and contribution level without imposing externalities on the other participants of the fund.

Economic valuation allows for pricing when buying and selling variable annuities

Market-consistent valuation is relevant for determining the prices for buying and selling the annuities that do not impose externalities on existing owners of annuity units. In particular, required pension contributions can be derived endogenously from the stochastic pension promises (i.e. the pension ambitions). This is reminiscent of traditional DB schemes in which the pension contributions are determined on the basis of the guaranteed income stream during retirement. Similarly, the value of the variable annuities can be determined when individuals want to transfer their pension rights to another pension fund.²⁴ This avoids distortions.

Economic valuation allows for discretionary changes in contract

Economic valuation helps to protect property rights and generational fairness if the risk-sharing contract is changed. In particular, the value of property rights should

²² See Bovenberg, Mehlkopf and Van Bilsen (2014).

²³ See Bovenberg, Mehlkopf and Van Bilsen (2014).

²⁴ In the present Dutch context, transferring pension rights between pension funds is possible only if workers change jobs. Market valuation, however, would in principle allow workers to select their own pension fund, and hence would allow more competition in pension provision. Drawbacks of this freedom of choice between pension providers are additional transaction and marketing costs as well as less scope for pension funds to benefit from liquidity premia by investing in illiquid assets.

remain constant if a change in the pension contract implies that participants exchange one type of variable annuity for another type. Exchanging variable annuities at fair prices avoids mixing up a change in the pension contract with intergenerational redistribution. This condition of neutrality in market value in case of changes in the contract allows one to value the contract on a market-consistent basis even though the contract is incomplete in the sense that it may be changed over time in the face of new information. To illustrate, the single annuity may be transformed into a joint-and-survivor annuity. Such a change should leave the total value of the pension right unaffected. Another element that may be subject to change is the way the discount rates and hence liabilities are computed. In particular, how sensitive the discount rates should be to the nominal interest rate is a controversial issue (see section 4). Indeed, pension funds may differ in how they want to define liabilities. By enforcing fair pricing if the definition of the liabilities changes, supervisors can allow pension funds more discretion in how the funds want to define liabilities.

Whether it is desirable to ensure that changes in the way discount rates are computed do not lead to intergenerational distribution is a matter of debate. It could be argued that changes in the discount-rate methodology set by the government, based on an advice from experts, should lead to similar intergenerational risk-sharing as when interest rates change (at given annuity units). To illustrate, a higher assumed risk premium (at a given risk) raises the expected future rates of return and thus reduces the current cost of funding an uncertain future pension with a given expectation. The pension contract thus allows generations to share risk factors that are not traded on financial markets (namely, the subjective estimates of experts on the equity risk premium). However, allowing changes in the estimated risk premium to redistribute market value across generations may well lead to intergenerational conflicts about the unobservable risk premium. Moreover, pension funds cannot hedge discretionary changes in the assumed risk premium.

6. Current status of pension reform in the Netherlands

Proposals for DA plans

In the pension agreement of 2010, the social partners proposed moving towards DA-type contracts in occupational pensions. They agreed that pension income should adapt to unexpected changes in life expectancy and returns on financial markets. Hence, unexpected biometric and financial shocks would be absorbed in pension rights (i.e. annuity units) rather than in recovery contributions paid by employers and workers. The move towards DA contracts provides risk-bearing capital to the pension funds in the face of the withdrawal of the contributors as external risk sponsors. The social partners agreed that new pension contracts should be transparent and complete, and that pension funds should communicate to participants the risks implied by the pension contract (including investment policies).

As regards systematic longevity risk, the social partners proposed that the eligibility age for the public pension and the accrual rate in occupational pensions would be linked to life expectancy. In particular, the average number of pension years for each generation would be equal to the average expected pension years for the generations who started to collect the public pension between 2000 and 2009.

Government's response

The Dutch government has adopted the proposals made by the social partners regarding increases in the retirement age. In particular, the Dutch parliament implemented legislation in 2012 that links to life expectancy the eligibility age for the public pension and the accrual rate for tax-privileged occupational pensions. The eligibility age for the public pension will gradually increase from 65 to 66 during the period 2013-2019 and will be further increased to 67 during 2020-2023. After 2023, this age is linked to longevity.

Unclear whether DA will be implemented

The proposals of the social partners to move towards a DA contract in the funded pillar are still under consideration. It is unclear whether the government will adopt the full set of proposals for DA or whether it will implement only a set of rather small changes to current pension legislation.²⁵ Three main reasons complicate the actual implementation of DA and explain why the government is reluctant to adopt DA.

A. What to do with existing rights?

The first reason involves transitional problems. The social partners want the new contracts to apply not only to newly accrued pension rights but also to existing pension rights. This retrospective change in the pension contract could be challenged in court. The Dutch government is reluctant to take on these legal risks and is therefore unwilling to mandate a conversion towards DA contracts. Instead, the choice to retrospectively change the pension contract would be the responsibility of the pension funds. Many smaller pension funds fear the possible legal risks, while some larger sectoral funds seem to be willing to accept them.

Two factors complicate the conversion of existing "DB" rights into "DA" rights, and make the outcome of court cases uncertain. First, individual property rights under the current contract cannot be valued objectively because the contract is incomplete. Among other things, the economic value of pension rights depends on the portfolio mix because of the asymmetric nature of pension contracts. Hence, it is not so clear who gains and who loses from a transition to DA. Second, the risk profile under the current contract is ambiguous and not clearly specified and communicated ex ante. Hence, the extent to which the move toward DA changes the risk profile of pension entitlements is unclear. If existing pension rights would be interpreted as guarantees, then the move towards DA contracts could be viewed as a debt-equity swap. However, as explained in section 4, most pension funds do not match nominal liabilities in their investment policy even though they lack external risk sponsors. Hence, nominal pension rights are in fact already risk-bearing.

B. Disagreement about risk profiles

The proposals for DA contracts have led to heated discussions about the desired risk profile of pension payments. One controversial issue is the extent to which pension funds should offer nominal guarantees. On the one hand, some people argued that guarantees should be omitted altogether, because real guarantees cannot be

²⁵ These changes would be aimed at making cuts in nominal annuities after adverse shocks in a more gradual way, in order to prevent large abrupt cuts in pensions during economic downturns.

purchased (the supply of safe inflation-linked bonds is very limited in the euro area) and are too expensive— especially for workers. On the other hand, others argued in favor of including some form of nominal guarantee in order to offer some certainty. This makes the pension product easier to communicate. Moreover, investment policy of the pension funds can be disciplined better. Some proponents of the second view denounced contracts without guarantees as “casino pensions.” At the same time, those who supported nominal guarantees were accused of exploiting the money illusion of participants.

C. Intergenerational conflict about valuation with fixed annuity units

The third reason why DA plans have not yet been adopted has to do with the combination of the subjective and unstable character of the contracts and the legacy of the traditional DB mindset with fixed annuity units. In particular, fair pricing is difficult to adopt if the contract (including the discount methodology for computing liabilities) is changed, because then annuity units would have to change.²⁶ With fixed annuity units, however, a change in the pension contract (including the discounting methodology) results in redistribution of wealth across participants and therefore yields intergenerational conflicts. The experience of the last couple of years shows that smoothing periods and discount rates are frequently changed. Some argued that economic valuation under DA would reduce political risks by increasing transparency about intergenerational redistribution associated with changes in the contract. Others, in contrast, maintained that the discount methodology in DA contracts may be changed even more frequently because the risk premium and expected inflation in the discount rate are difficult to estimate. Hence, DA contracts would give rise to even more intergenerational conflict than the current contracts. Concerns about political risk intensified when the social partners proposed employing the expected return on the portfolio of pension funds as the discount rate for calculating liabilities. Critics pointed out that using the expected return as discount rate would result in intergenerational redistribution from older to younger participants if pension funds raise their expected return by investing in more risky assets and are not willing to raise the annuity units for especially young participants.

Market pricing of a variable annuity is hard to adopt because of the legacy of DB thinking in terms of fixed annuity units not only when contracts are changed but also if new annuity units are bought. Social partners wish to maintain a fixed annual accrual rate (in terms of annuity units) even though they are no longer willing to tolerate fluctuations in the contribution rates as a consequence of changes in the economic value of the annuity units. The desire of the social partners to stabilize both accrual rates and contribution levels has led to heated discussions about the interest sensitivity of the discount rate. The social partners argued that discount rates should be more stable than nominal interest rates so as to ensure that the large interest sensitivity of contribution rates does not affect the economy in a pro-cyclical fashion. The discussion about the discounting methodology together with the unwillingness to modify either the fixed accrual rate or annuity units when the discounting methodology is changed has intensified the concerns about the political risks surrounding DA contracts.

²⁶ In the pay-out phase, one could smooth the adjustment in the annuity units to prevent large discrete changes in income levels.

Companies are considering individual defined contribution...

Some proposals for pension reforms look beyond DA and are based on systems with individual accounts in which entitlements are defined in terms of claims on tradable financial assets without joint liability pools that are difficult to value.²⁷ Several large companies that have their own pension fund and are not part of a large industry fund have lost patience with the slow reform process. These companies are considering a move towards individual defined-contribution schemes in which entitlements are defined in terms of claims on tradable financial assets in the accumulation phase, while annuities are provided in the pay-out phase.²⁸ These companies continue to play a role as a distribution platform, setting defaults and collectively contracting out a pool of insured participants to the financial service industry. Hence, these individual contribution schemes are put in a collective wrapping.

...to stabilize contributions and protect property rights of workers...

These individual defined-contribution schemes do not rely on fixed accrual rates of deferred annuities and thus can reconcile a fixed contribution level with the absence of external effects on the value of existing pension rights. Other advantages are that property rights are defined in terms of capital rather than difficult-to-value annuities. Hence, DC plans are less subject to political risk than DA plans are. Moreover, DC plans allow for more tailor-made risk exposures because they are not constrained by the uniform definition of liabilities (and the associated discounting methodology, including the interest-rate sensitivity of discounting) prescribed by the government and uniform adjustments of annuity units.

...but face three obstacles

The firms considering a move to defined contribution face three obstacles. First, Dutch tax privileges for individual defined-contribution schemes are less generous than those for schemes that define entitlements in terms of deferred annuities. Second, the tax regime is modeled after the fixed accrual rate in DB schemes, which implies that the accrual of pension benefits is backloaded. Hence, tax deductible contribution rates are low for young workers and rise sharply with age. Third, legislation stipulates that capital has to be converted at retirement into a fixed nominal annuity bought from an insurance company. Already before retirement, public guidelines require investment and interest-rate risks to be shut down. Together with the relatively low contribution rates for young workers, this makes it difficult to benefit from the equity risk premium. These regulations also expose workers to inflation risk. Regulatory changes to allow variable annuities for Dutch DC pensions are currently under consideration.

7. Lessons of DA for DC schemes in the United States

This section explores the relevance of DA plans for mainstream DC schemes in the United States.

A. 'Consumption frame' during the accumulation phase

²⁷ See PJO (2013) and WI CDA (2014).

²⁸ These companies are inclined to close the DB fund for new entrants without converting existing rights.

Liability frame allows liability-driven investment ...

Traditional DC schemes adopt a more conservative portfolio when retirement approaches. These schemes thus recognize that taking investment risk is more attractive for young workers than for older workers and retirees. However, they are typically based on a 'capital frame,' which fails to recognize the importance of interest-rate management for providing a stable lifetime income stream during retirement. Indeed, with interest rates affecting expected future returns, rational investors should engage in intertemporal hedging. Hence, risk management of DC schemes could be improved if investment would be 'liability driven' by adopting the 'consumption frame' of DA.

Liabilities are used to conduct individual asset-liability risk management only. Unlike in DA, risks of liabilities are not shared with others in a mutual insurance framework. The advantage of this individual approach is that one does not have to confront controversial valuation issues of joint liabilities and the associated political risks (including changing the valuation methodology of the joint liabilities). The disadvantage of not sharing liability risks is that one cannot share risks that are not traded on financial markets.

...but may be difficult due to capital frame...

If all risk factors determining the value of liabilities are traded in financial markets, then a DC scheme that bases its investment strategy on a properly defined individual liability can in theory mimic the risk exposures of a DA scheme that defines entitlements in terms of annuity units that are purchased and sold on the basis of fair economic pricing. The practical advantage of DA, however, is that the 'consumption frame' is inherently integrated in its design because individual entitlements are defined in terms of annuity units—and thus income streams. This is in contrast to DC schemes, which define entitlements in terms of capital and thus adopt more naturally a capital frame rather than a consumption frame. As a result of this difference in framing, DA schemes typically feature more advanced risk management with more intertemporal hedging. The disadvantage of the 'consumption frame' in DA schemes is, however, that the economic value of individual entitlements may be less well protected in DA schemes than in DC schemes, in which property rights are based on easy-to-value financial assets and thus do not require controversial valuation issues. In theory, redistributing wealth across individuals can be ruled out in a DA contract if fair pricing would be applied in the event that contracts (including the valuation methodology of the joint liabilities) are changed. In practice, however, individual ownership rights may be subject to political risk because annuity units are not adjusted when contracts are changed.

....or uncertainties and model risk

Managing interest-rate risk is complicated for three reasons. First, during the accumulation phase, an investor may not yet know which fraction of wealth (s)he intends to use to buy an annuity (as opposed to a lump-sum payment) and what the desired risk profile of the income stream will be (nominal or real, guaranteed or variable). In that case, it is not clear which 'liability' needs to be hedged during the accumulation phase. Second, if one continues to take investment risk during retirement, the assumed relationship between interest rates and expected returns on risky investments becomes relevant for intertemporal hedging demands. This relationship, however, is difficult to estimate and is subject to substantial model risk.

Third, if the aim is to provide an income stream that is linked to (wage) inflation in the absence of (wage) inflation-linked bonds, then the optimal intertemporal hedging strategy in terms of hedging nominal interest-rate risk depends on whether one believes that changes in nominal interest rates are driven primarily by changes in real interest rates or by changes in expectations about (wage) inflation.

Communication in terms of income stream

Communication in mainstream DC schemes is typically based on the accumulated wealth (the ‘capital frame’) rather than future income stream during retirement. Communication in terms of income streams can improve people’s understanding of their financial situation. Communication is most insightful if it provides information on the uncertainty and purchasing power of future consumption streams.²⁹

B. Dealing with longevity risk

Micro longevity risk

Annuitization of pension wealth is mandatory in the Dutch second pillar, also for individual defined-contribution schemes. The level of annuitization in the United States, in contrast, is relatively low because few retirees voluntarily annuitize their retirement savings. Rational models of risk-averse consumers have difficulty explaining limited annuity demand in view of the potential of mortality credits (especially at the end of life) to reduce the costs of lifetime income. The consumption frame of DA may help to boost the demand for annuities. Indeed, Brown et al. (2008) show that framing plays an important role in annuitization decisions. They show that annuities are considered valuable insurance in a consumption frame. In a capital frame, in contrast, annuities are considered a risky asset because the payoff depends on the uncertain length of the lifespan. Moreover, annuities can help reduce the costs of means-tested public healthcare because they protect individuals from running out of money at the end of life, when people tend to rely on care (see Peijnenburg et al., 2010).

Macro longevity risk

An important challenge for individual pension plans is how to deal with macro longevity risk. If annuities are bought for the pay-out phase, systematic longevity risk can be (re)insured by a third party. One disadvantage of this solution is default risk. It also tends to be costly due to required solvency buffers in the absence of a natural hedge against macro-longevity risk.³⁰

An alternative solution, which does not require insurance at a third party, is mutual insurance with collectively owned solvency buffers for the purpose of absorbing unexpected shocks in longevity. Examples of mutual insurance companies offering fixed annuities include TIAA in the United States and mutual insurers in Scandinavia. A disadvantage of this form of mutual insurance is that the prices for insurance and

²⁹ This typically requires subjective assumptions about expectations and volatilities of future returns (to calculate future asset values) as well as inflation (to calculate future liabilities). Hence, model risk complicates communication in terms of uncertainty and purchasing power.

³⁰ A more attractive solution may be that the government issues longevity bonds for the tail risk of mortality of the very oldest cohorts, especially if longevity risk on the government balance sheet is limited because the eligibility age for public pension benefits is linked to longevity.

the property rights of the mutually owned buffer are not well defined, which may give rise to intransparent redistribution of wealth within the mutual across various parties. Moreover, younger participants may have to bear substantial longevity risk in mutual insurers with a large number of old participants that must be shielded from systematic longevity risk.

A DA solution for sharing macro longevity risk within a joint liability pool can provide an attractive alternative. Indeed, DA resembles the CREF annuity scheme in the United States, which adjusts the annuity units of its retired participants in response to longevity shocks (including changes in projected mortality). CREF differs from DA in that unexpected shocks are not smoothed but immediately absorbed in pay outs. In view of habit formation, a smoothing procedure in the spirit of DA may be more attractive because it results in gradual adjustment.

A DA solution with joint liabilities to deal with systematic longevity risk can be restricted to the pay-out phase. This limits difficult valuation issues (and the associated political risks and potential intergenerational conflicts) in the face of substantial uncertainties regarding future mortality of workers over many decades. Moreover, in contrast to retirees, workers can absorb changes in remaining life expectancy by working up to a higher age. Hence, it does not seem to make sense to have the retired generations share in the systematic longevity risks of workers. One may even want to restrict sharing the risks of joint liabilities to the oldest cohorts (e.g. cohorts of age 75 and older) only. Hence, capital is not completely converted into annuity units at the retirement age and, until the age of full annuitization, income comes in part out of capital.³¹ Indeed, longevity insurance is most valuable at old ages when mortality credits are substantial (Scott (2008)).

Workers can in principle insure the macro-longevity risk of the older participants in the annuity pool also if their capital has not been converted into an annuity. This form of intergenerational risk trading may be welfare-improving because workers can exploit their remaining human capital to absorb shocks (see Bodie et al., 1992). The disadvantage is that the risk premium compensating workers for taking on the longevity risk of the oldest cohorts is not observable in financial markets and therefore may give rise to intergenerational conflicts.

Heterogeneity and selection in longevity risk

Heterogeneity in terms of life expectancy within cohorts can lead to intra-generational transfers in collective pools that insure longevity risk at uniform prices—for example, transfers from men to women or from low-earners to high-earners. If some forms of redistribution between groups with different mortality rates are considered undesirable, these can be ruled out by differentiating prices for annuities based on observed heterogeneity in life expectancy or by forming homogeneous pools. If these transfers are considered desirable, in contrast, one can employ risk-equalization schemes to reconcile solidarity between groups with free entry in insurance pools.

³¹ To avoid selection issues, one may want to buy the lifetime income stream after age 75 already at age 65. Risk-sharing within a single cohort (i.e. generational accounts or 'tontine') may also be possible in large pension funds, but may be problematic at high ages (when the number of surviving participants is small) and the insurance pool is no longer large enough for the 'law of large numbers' to hold.

C. Variable annuities: smoothing investment risk

Most annuities purchased from accumulated wealth in individual DC schemes currently take the form of a guaranteed lifelong income stream. The conversion of wealth into an annuity thus prevents the annuitant from taking advantage of risk premia. DA schemes, in contrast, allow participants to continue taking investment risk after annuitization. Gradual adjustments after unexpected investment shocks protect retirees from large discrete changes in their consumption levels. Smoothing of shocks in effect leads to life-cycle investments beyond the moment of retirement: investment risk is gradually reduced after the retirement age.³² Smoothing and the associated life-cycle investment distinguish DA from most variable annuities in the United States, including the CREF annuities referred to above.

D. Role of the employer to deal with behavioral and market imperfections

By discharging employers from their role as risk sponsor, DA makes it more attractive for employers to continue to play a role as a distributional platform for occupational pensions. In this way, employers help address (i) behavioral imperfections by setting defaults; (ii) agency issues in financial markets by collective procurement of financial services from commercial suppliers; (iii) selection in insurance by pooling longevity risks. See also sections 3 and 5.

8. Conclusions: promise of DA schemes for the United States

This paper has explored the strengths and weaknesses of DA pension schemes. Four features of DA hold promise for the United States.

First, the consumption frame of DA schemes can improve communication and risk management in DC schemes. Communication in terms of lifetime income streams may assist individuals in better understanding their financial situation. Among other things, it may boost the demand for annuities. As regards risk management, viewing income streams as liabilities encourages financial providers to engage in better intertemporal hedging.

Second, DA addresses systematic longevity risk in annuity provision through risk-sharing within a joint liability pool. Collective risk-sharing does not suffer from the drawbacks of external insurance (i.e. default risk and costly solvency buffers) or mutual insurance with collective buffers (i.e. intransparent ownership).

Third, DA allows retirees to continue to benefit from risk premia without large discrete fluctuations in consumption because of a smoothing mechanism that leads to a continuation of life-cycle investment throughout retirement. This design of

³² Life-cycle investment can alternatively be organized as an escalating annuity that provides nominal guarantees and uses risky investments to provide conditional cost-of-living adjustments (see van Bilsen, Laeven and Nijman, 2013). These solutions do not rebalance equities and risk-free bonds after a negative investment shock. An advantage of these schemes is that nominal income never declines on account of investment risk. A disadvantage is that expected bonuses may fall short of expected inflation after an adverse shock.

variable annuities reconciles insurance of idiosyncratic longevity risk with taking investment risk.

Fourth, DA schemes allow employers to play an important role in addressing behavioral imperfections, agency issues and imperfections of insurance and financial markets.

Collective DA plans with joint liabilities hold promise, particularly for the pay-out phase for DC schemes. In order to limit valuation problems of joint liabilities and the associated pricing of annuity units, risk-sharing of joint liabilities could be limited to the oldest group (e.g. 75 years and older) only.

DA schemes may also be attractive for the DB schemes in the public sector so as to reduce the risks and costs for taxpayers. However, risk-sharing with a common liability pool of retirees and workers can lead to intergenerational conflicts about the contract, in general, and the discount methodology for valuing joint liabilities, in particular, if annuities are not priced and exchanged fairly in the event the contract is changed or when the annuities are bought. In any case, the current underfunding of public sector pension funds must be addressed. The framing of entitlements as annuity units results in volatile contributions unless accruals move inversely with the price of the variable annuities. Moreover, DA does not allow for sufficient tailor-made risk management if adjustments of annuity units are uniform across cohorts. To illustrate, retired cohorts sharing the longevity risk of the working generations is probably not optimal. Accordingly, DA is attractive for the pay-out phase but holds promise for the accumulation phase only if annuity units are priced fairly, benefit accrual varies with the price of the annuity units, and risk exposure of the annuity units can differ across cohorts.

We conclude that a hybrid solution may be attractive. This solution employs a DC frame (defining entitlements in terms of capital) during the accumulation phase and a DA frame (defining entitlements in terms of annuity units) during the pay-out phase. This combines the strengths of individual DC— in terms of individual ownership, actuarially neutral accruals of pension entitlements, and scope for tailor-made risk management and individual choice— with the strengths of DA— in terms of insurance of idiosyncratic longevity risk, sharing systematic longevity risk, and utilization of the employer as a platform for addressing behavioral and market imperfections.

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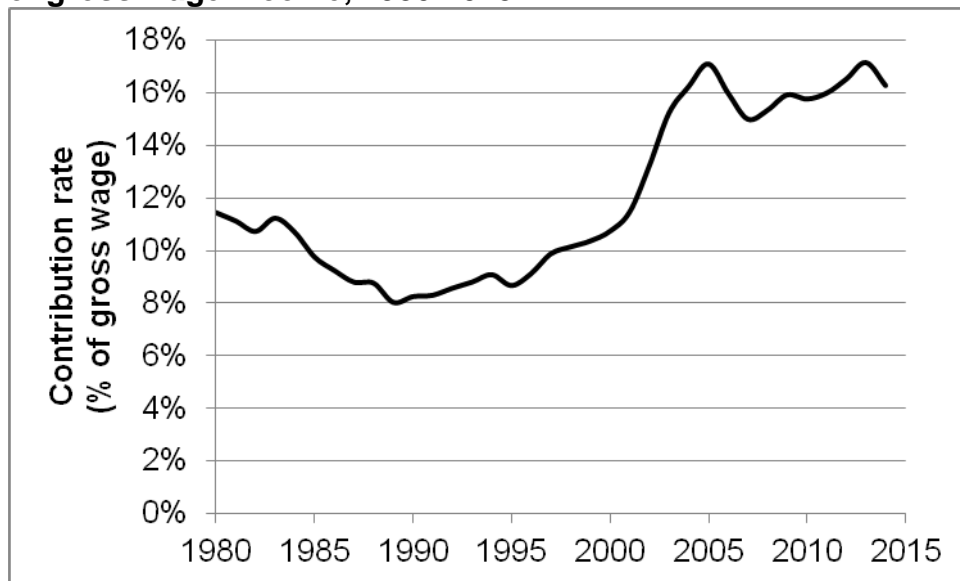
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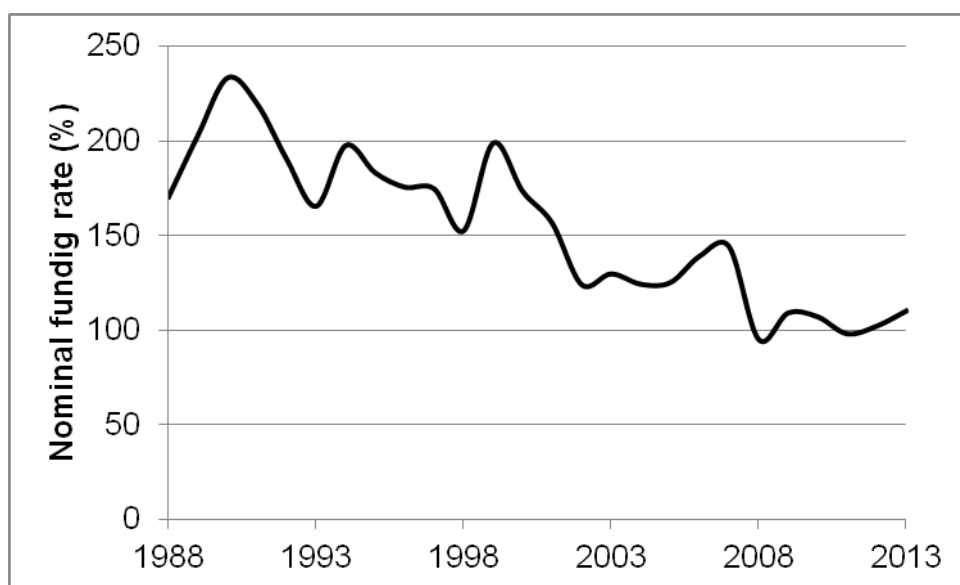
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Figure 1. Average contribution rates to occupational pensions as percentage of gross wage income, 1980-2013



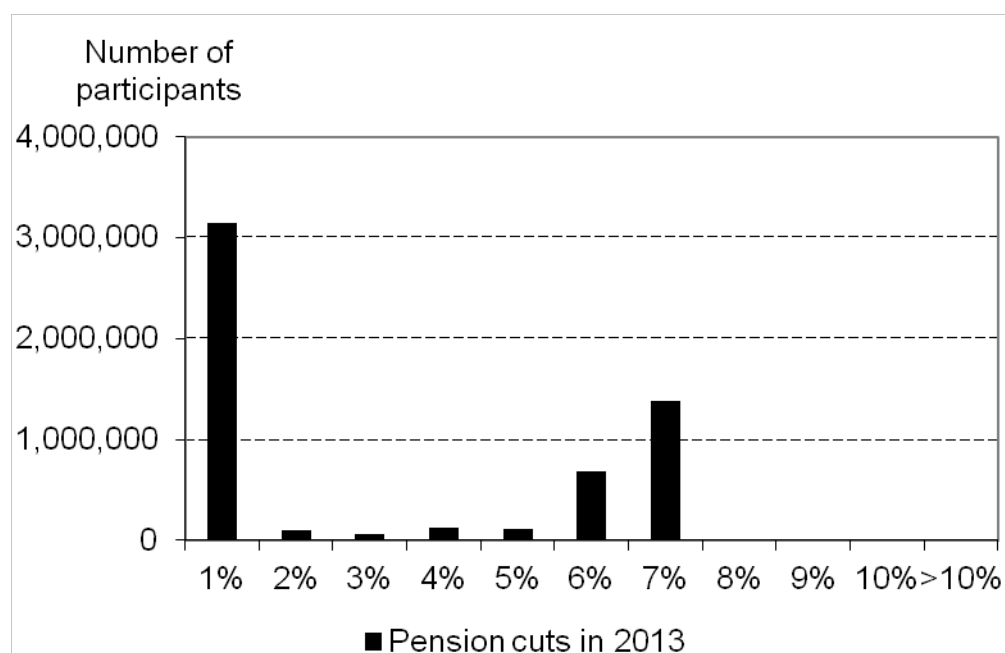
source: CPB (2014)

Figure 2 Average nominal funding rate of Dutch occupational pension funds 1988-2013



source: CPB (2014)

Figure 3: Number of participants affected by cuts in occupation pensions in 2013



source: DNB (2014)

Figure 4: Average indexation shortfall, 2008-2014

	2008	2009	2010	2011	2012	2013	2014
Indexation ambition	1.84	3.76	1.66	1.2	1.35	1.47	1.11
Actual indexation	2.91	0.17	0.42	0.02	0.02	0.08	0.18

source: DNB

Figure 5: Development of confidence in pension funds, the government, banks and insurers (% of people having some or a lot of confidence).

	2004	2006	2009	2011
pension funds	53	64	44	42
Government	37	42	45	41
Banks	32	37	25	34
Insurers	32	37	18	20

source: Van Dalen and Henkens (2011)

Figure 6: Risk profile of future real pension income in DA scheme. The mean of real pension income is normalized to unity in this figure. The dotted and dash-dotted lines illustrate real pension income in the 97.5% and 2.5% percentiles, respectively.

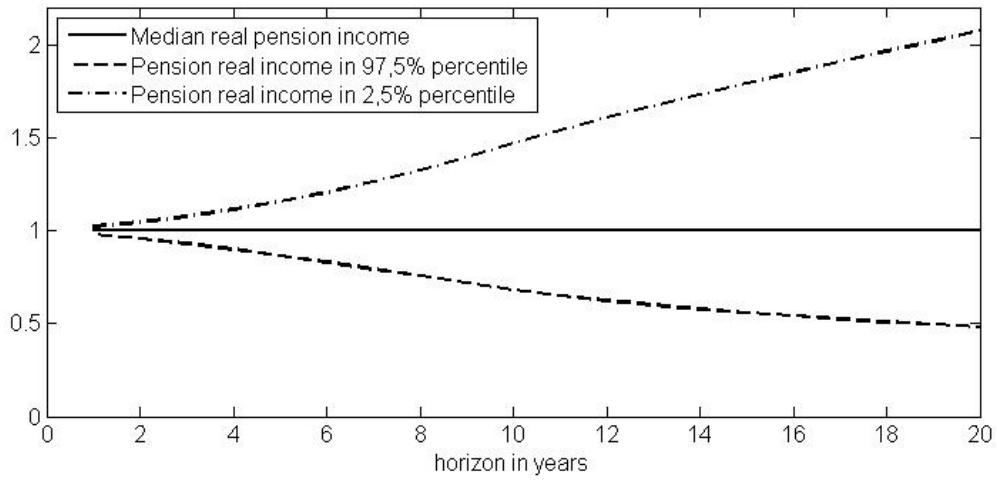


Figure 7: Horizon-dependent discount rate of a DA scheme

