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Reform Options for Mature Defined Benefit Pension Plans: The Case of the Netherlands

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Abstract

The Netherlands has been operating fully funded, defined benefit second pillar pension schemes that have consistently ranked high worldwide for delivering high replacement rates while featuring strong solidarity among members. Yet the long-term sustainability of the Dutch pension funds has been undermined in recent years by protracted low interest rates and unfavorable demographic developments, exacerbating controversies over intergenerational transfer mechanisms within the plans. This has prompted a national debate over ways to move toward more individualization while preserving financial security at retirement for all. This paper draws on this experience, illustrated by stress testing simulations and assessed vis-à-vis solutions implemented in peer countries, to discuss the main policy trade-offs associated with the reform of mature pension systems in advanced economies.

I. INTRODUCTION[1]

1.   **The debate over the reform of the Dutch pension system is of general interest to shed light on sustainability issues faced by mature pension funds worldwide.** The case of the Netherlands may be deemed particularly insightful for at least two reasons. First, the Dutch pension system has consistently ranked among the best performers worldwide for delivering high financial security at retirement while keeping contingent liabilities in check – e.g. according to the Melbourne Mercer Global Pension Index, where the country ranked second along the adequacy, integrity and sustainability dimensions in 2017. Yet notwithstanding these achievements, the 'new normal' environment of protracted low real growth and interest rates has undermined the financial position of occupational pension providers, highlighting the need for a thorough overhaul of the system. Second, the Dutch labor market has been characterized by increasing duality since the early 2000s, arguably anticipating on some developments observed in other advanced economies on the wake of the crisis, as well as reflecting more general globalization trends. The effects of labor market changes on social security schemes have been far-reaching in the Netherlands, and this paper seeks to innovate by providing some quantitative simulations of their impact on the financial position of the pension funds.

2.   **The Dutch pension system has served its beneficiaries well, achieving extended coverage at reasonably low cost to the government.** The combination of a flat-rate 'first pillar' pay-as-you-go statutory public scheme and pre-funded, earnings-related pension funds has resulted in virtually eliminating old age poverty while ensuring generous replacement rates. The basic old age retirement income from the public scheme (Algemene Ouderdomswet -
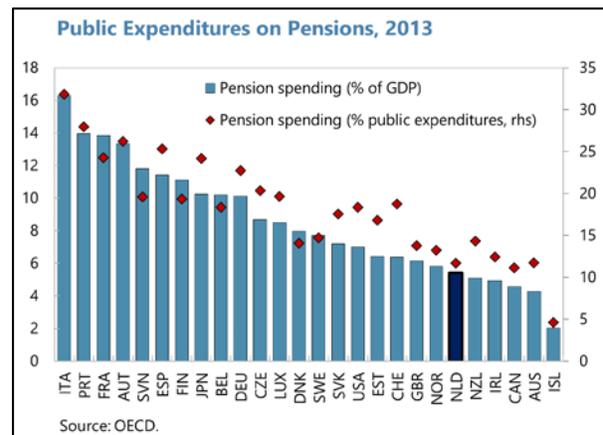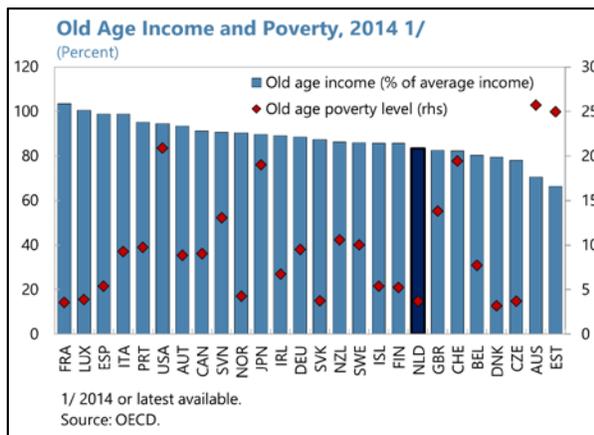
Old Age Income and Poverty, 2014 1/
(Percent)
1/ 2014 or latest available.
Source: OECD.

Public Expenditures on Pensions, 2013
Source: OECD.

AOW) is available to anyone who has reached pension age. Benefits accrue at 2 percent per year spent in the country, providing for a full pension representing 70 percent of the minimum wage for a single person, 50 percent for each member in a couple – broadly corresponding to a replacement rate of 30 percent of the average wage. Most of the retirement income comes from 'second pillar' occupational pension plans, funded by tax deductible employee and employer contributions, and typically guaranteeing the replacement of about 60–65 percent of the average wage for a complete career. The Dutch pension system also features a 'third pillar' of individual, private pension products, subscribed to on a voluntary basis; their contribution to the overall retirement income remains limited.

3.   **While the fiscal sustainability of the first pillar has improved, the second pillar pension funds have come under strain during the financial crisis.** In the face of a rapidly ageing population, the fiscal sustainability of the public scheme has been recently strengthened by a stepwise increase in the retirement age to 67 years by 2021, to be adjusted for life expectancy thereafter. Meanwhile however, the solvency of most second pillar pension funds has been undercut by the financial crisis. Funding ratios have deteriorated under the joint effects of an initial drop in investment returns and a protracted increase in accrued liabilities triggered

by very low discount rates – prompting some funds to levy catch-up contributions or reduce benefit indexation in a pro-cyclical way. These financial difficulties have added to a number of structural shortcomings of the funds, notably a high degree of complexity likely to affect cost efficiency, limited flexibility in the face of changing labor market needs, and opaque redistribution channels, notably from younger to older generations.

The Netherlands: Pension Fund Funding Developments
(Percent)
Source: DNB.

4.   **This paper examines the challenges and pitfalls associated with the envisaged reform of the Dutch pension system, with a view to providing more general insights on ways to approach sustainability issues faced by fully funded social schemes worldwide.** The financial difficulties encountered by the Dutch pension funds have prompted the government to initiate a national consultation in 2014 on ways to improve, or possibly introduce fundamental changes to, the second pillar of the system. First steps have been taken, including a thorough revamping of the supervisory framework in January 2015 and the submission of reform

proposals to parliament in July the same year, the main building blocks of which have been formally adopted by the "coalition agreement" entered into by the newly elected government in October 2017; the elaboration of the reform itself may be assigned to the social partners. With the aim of giving some perspective on this debate, Section II takes stock of the main characteristics and recent developments of the Dutch pension funds in a cross-country setting. To investigate more rigorously the impact of the new financial environment and labor market changes on the solvency of the second pillar at large, Section III performs single factor stress tests on the liabilities of a 'virtual' pension fund constructed by aggregating the balance sheets of existing pension providers nationwide. Section IV discusses the trade-offs associated with possible reform options to address the main shortcomings of the Dutch second pillar, drawing on the experience of alternative schemes in other countries. Section V concludes by offering a few policy considerations.

II.   THE IMPACT OF THE CRISIS ON THE DUTCH PENSION FUNDS

Organization and size of the collective pension schemes

5.   Occupational pensions complement public benefits for about 80 percent of the workforce. Set up by social partners at industry or company levels in the aftermath of the Second World War, the second pillar pension plans feature quasi-mandatory participation, at the initiative of the employer, for workers covered by collective labor agreements. About 5.5 million active members participate in the schemes, a number which has recently declined alongside a shrinking workforce and an increasing share of 'self-employed' in the active population, while income-related benefits are handed out to more than 3 million retirees. The number of providers has steadily decreased, as De Nederlandsche Bank (DNB) – the Dutch central Bank, acting as supervisor – has indirectly encouraged mergers through additional regulatory requirements (e.g. reporting requirements, rules governing the composition of the boards of the funds), resulting in economies of scale. The industry is heavily concentrated, with the two main funds (ABP and PFZW) and the ten biggest funds accounting for about 45 percent and 68 percent of total assets, respectively.

| The Netherlands: Pension Fund Structure and Developments, 2005-2017													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total number of funds	800	767	713	656	579	514	454	414	382	365	320	290	260
Number of industry-wide pension funds	103	103	96	95	87	82	77	74	72	69	67	63	58
Company funds	683	650	604	547	479	419	364	327	297	284	241	215	186
Professional funds	14	14	13	14	13	13	13	13	13	12	12	12	9
Number of members (thousands)	6232	5958	5984	5824	5820	5852	5823	5699	5577	5500	5480	5503	
Number of deferred members (thousands)	8292	8522	8960	9341	9507	8861	9046	8929	9026	9209	9451	9618	
Number of beneficiaries (thousands)	2438	2484	2577	2609	2710	2767	2875	3009	3057	3125	3191	3244	
Assets under management (EUR million)	635,647	704,266	778,561	709,901	744,738	801,842	874,742	1,005,844	1,024,088	1,252,339	1,250,652	1,378,037	1,452,838
Technical provisions (EUR million)	479,993	501,900	493,167	621,762	634,287	719,160	837,385	911,923	886,316	1,070,995	1,143,113	1,257,097	1,240,873
Gross benefits (EUR million)		24,105	23,130	24,411	26,853	27,435	28,961	31,725	33,697	32,227	28,814	29,657	33,180
Gross contributions (EUR million)		20,006	20,483	21,446	22,412	23,680	24,544	24,853	25,756	26,475	27,453	28,631	29,789
Average funding ratios (percent)			144%	96%	109%	107%	98%	102%	110%	108%	102%	102%	109%

Source: DNB.

6.   Most pension funds offer pre-funded defined benefit (DB) retirement incomes, allowing for generous replacement rates. Benefits are typically accrued at a constant rate recently reduced to 1.875 of the annual pensionable wage (gross wage minus deductible), and computed using an average salary formula, thus ensuring replacement rates of about 70 percent for a complete 40-year career. They are generally granted on top of the first pillar retirement income (the so-called "AOW franchise") in the form of real life annuities indexed to either price or industry wage developments, as cash withdrawals are prohibited. Along with mandatory participation, these characteristics ensure the pooling of the macro-longevity and investment risks, in application of the principle of solidarity among members. Further to returns achieved on past investment, the schemes are funded

Gross Pension Replacement Rates, 2017
(Percent of individual earnings)
Source: OECD.

by tax deductible employer (two thirds) and employee (one third) contributions, which currently amount to 18 percent of the gross wage on average, implying a substantial savings effort and a considerable 'contribution wedge' on earnings. To promote a level playing field in the labor market, contributions are levied at a uniform rate (*doorsneepremie*) on wages regardless of age. This implies an *ex ante* transfer from younger to older generations, since the future value of the formers' contributions is much larger due to longer time span until retirement.
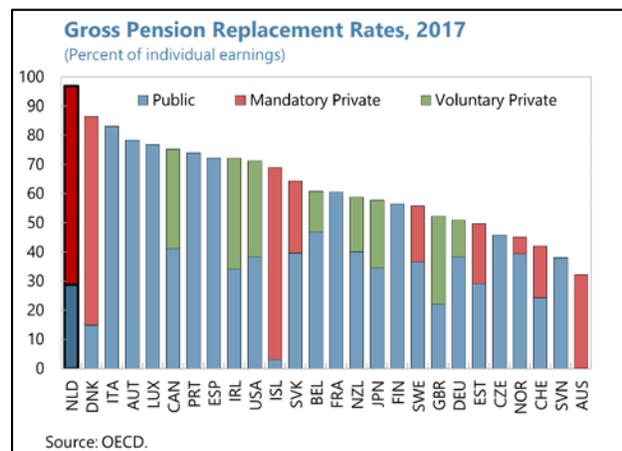
7.   The investment portfolios of Dutch pension funds amount to about 180 percent of GDP. Most pension funds are mature financial vehicles, currently engaged in their divestment

phase after decades of asset build-up. Over time, notwithstanding intergenerational discrepancies, pension assets have come to represent the bulk of household wealth in the country, encouraged by the tax deductibility of contributions and returns. From a balance of payments perspective, they account for a sizeable stock of net foreign investment as fund managers tend to diversify their holdings, only allocating about 15 percent of investment to domestic projects.

Pension Fund Assets, 2017
(Percent of GDP)

Source: OECD.
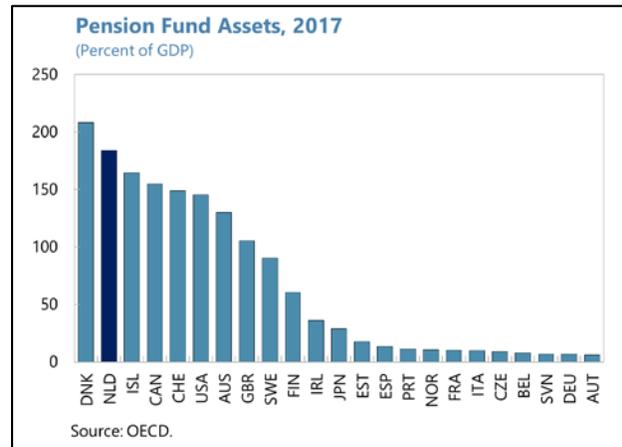
Financial developments of the pension funds over the crisis

Funding developments

8.   The financial sustainability of the pension funds has been severely undercut by low interest rates in the wake of the global financial crisis. At an aggregate level, funding ratios, i.e. the total market value of the funds' assets as a share of their pension commitments, have deteriorated from about 150 percent prior to the crisis to about 102 percent in 2017. While initially attributable to a sharp drop in investment returns over the years 2008–2010, these developments have been mostly triggered by a protracted increase in accrued liabilities associated with very low discount rates since then. In July 2015, to adjust for this new financial environment, the central bank acting as the pension and insurance sector supervisor changed its calculation method of the "ultimate forward rate" (UFR), the evolving long-term reference rate anchoring the yield curve used to discount actuarial liabilities for maturities beyond the "last liquid point" for which market rates are not available. The UFR was consequently reduced from 4.2 percent to 3.3 percent, closer to market values (but still above the 30-year zero coupon bond yield) at the cost of further immediate pressure on funding ratios. Prior to this, the legislator had introduced a new Financial Assessment Framework (nFTK) to strengthen the economic rationale underpinning the computation of funding ratios and clarify the funds' strategy for rebuilding financial buffers in the face of shocks (Box 1). As per the new rules, about 90 percent of the funds were forced by end 2016 to adopt "recovery plans" aimed at restoring within ten years their solvency ratio, which had fallen below the minimum funding ratio of 104.2 percent, to a required coverage ratio contingent on their asset allocation mix. While some funds were
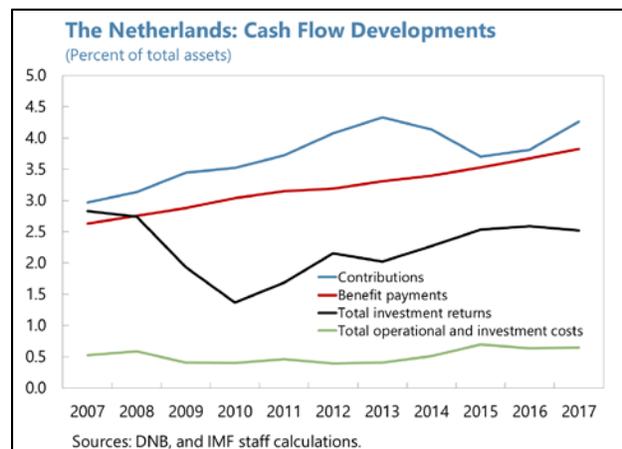
able to cross this threshold in 2017 owing to good investment returns and rising interest rates, the largest funds, covering about 10 million members, are still facing the prospects of benefit curtailment by 2020–2021 for staying five years below the regulatory minimum.

Box 1: The new Financial Assessment Framework (nFTK)

Introduced in January 2015, the new Financial Assessment Framework (nFTK) is aimed at better smoothening the consequences of financial shocks on pension fund balance sheets, so as to limit the pro-cyclical impact of benefit curtailments or contribution increases on disposable income and consumption. Further to strengthening the board governance rules, the revised supervisory framework clarifies the regulatory constraints applicable to funds depending on their financial position. In case their solvency ratio falls below the "minimum required coverage ratio" of 104.2 percent, pension funds are now required to submit a "recovery plan" to restore their "policy funding ratio", calculated as the average funding ratio over the past twelve months, above a "required coverage ratio" within ten years. The latter is computed for each fund based on its asset allocation so as to ensure that it can meet its nominal liabilities with a certainty of 97.5 percent; it currently represents on average 125 percent of the providers' own funds. Recovery may be achieved through catch-up contributions, albeit with the possibility of 'cushioning', i.e. of setting premiums based on expected (possibly optimistic) returns rather than prevailing interest rates. It may otherwise rely on some (partial or total) freeze of benefit indexation, with benefit curtailments only required as a last resort in the case of solvency ratios falling below 80 to 90 percent or in case the policy funding ratio remains below the regulatory minimum for five consecutive years; however, such curtailments may be spread out over ten years, thus allowing for a gradual absorption of shocks. On the other hand, benefit indexation can only progressively resume after funding ratios have crossed the 110 percent threshold.

Contributions, benefits and costs

9.   **The pension funds have sought to offset declining returns by reducing benefit indexation or, in some instances, levying catch-up contributions, thus increasingly operating as collective defined contribution (CDC) schemes.** Faced with deteriorating financial conditions, some funds were prompted to reduce or freeze indexation benefits or sometimes levy catch-up contributions to preserve solvency ratios, hence negatively affecting

disposable income. Thus, while in principle (although not *de jure*) offering defined benefits, the funds have increasingly started to operate as collective defined contribution schemes, but in a non-transparent and unpredictable way. To limit the pro-cyclical interplay between the economic downturn and reduced household earnings, the nFTK has allowed the funds to spread out the

The Netherlands: Cash Flow Developments
(Percent of total assets)

Contributions
Benefit payments
Total investment returns
Total operational and investment costs

Sources: DNB, and IMF staff calculations.

amortization of unfunded actuarial liabilities over longer periods of time (see Box 1). These new regulations have been instrumental in smoothing out consumption and sustaining the domestic demand-driven economic recovery in recent years. However, provisions allowing for the 'cushioning' of premiums as part of the recovery plans have recently come under criticism for allowing the funds to set contribution levels in line with excessively optimistic projections for investment returns (typically at the 7 percent maximum authorized by the legislator), i.e. below levels needed to restore solvency, implying that new premiums actually worsen their financial situation in actuarial terms. Moreover, over the last few years, the coverage of outflows (benefit payments) by inflows (contribution premiums) has gradually deteriorated, reflecting demographic pressures. Taken in combination, the postponement options embedded in the recovery plans and liquidity pressures stemming from trend demographic changes have markedly increased the reliance of the funds on future investment returns to preserve their financial sustainability over the medium run.

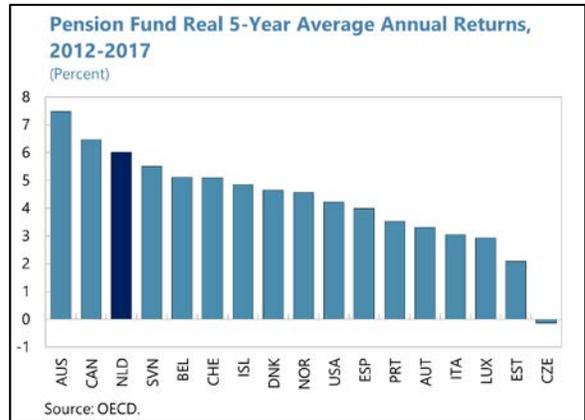**10.   Overall costs have been contained, but there remains some room for efficiency gains**. Over the crisis, the pension funds were able to contain management and investment costs at about 0.5 percent of total asset holdings, ranging from about 0.25 percent for fixed-income and equity products to more than 3 percent for private equity investments. While low by international standards, such cost levels may arguably be deemed insufficiently ambitious in light of sizeable economies of scale, with major players such as APG (the asset manager of the civil servant pension fund ABP) commonly charging 50–70 basis points for relatively standardized products. Administrative cost containment appears to have been mostly achieved

by wage compression, albeit with important disparities among the funds depending on their size, with cost ratios halved for the five biggest funds compared to the sector average. These developments point to pervasive sources of inefficiencies, likely attributable to complex redistribution mechanisms within and among institutions but possibly also reflecting increasingly complex supervisory requirements.

Pension Funds' Operating Expenses, 2016 1/
(Percent of total assets)

Sources: OECD and DNB.
Note: Data refer to 2015 for Germany, 2014 for New Zealand, and 2013 for the United Kingdom.
1/ All data are not strictly comparable, as some funds do not report on indirect investment expenses.
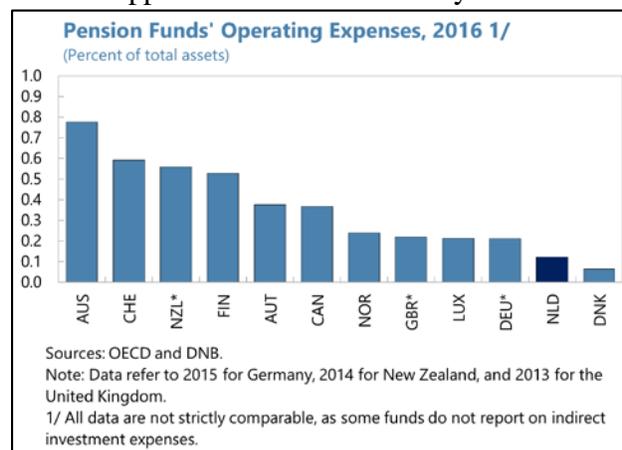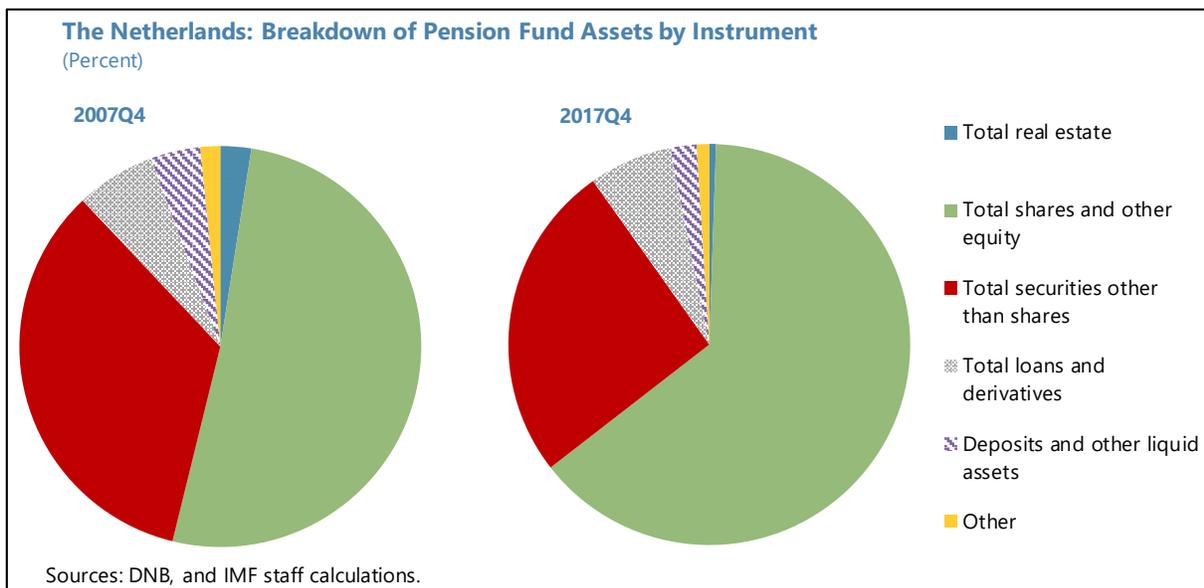
Financial returns and balance sheet developments

11.   Profitability has bottomed out against the backdrop of an increase in the share of equity assets in portfolios, but the funds remain heavily committed to long duration fixed-income instruments. In the wake of the financial crisis, Dutch pension funds have managed to bounce back to satisfactory rates of return in comparison to peers, achieving above 6 percent in real terms on average over the last 5 years. The rebound has taken place against the backdrop of an increasing share of equity in the funds' portfolios. However, this shift appears mostly attributable to valuation effects on the stock market, whereas investment flows have actually continued to be evenly allocated to fixed income and equity. Moreover, the quality of fixed-income instruments held on the asset side of the funds' balance sheets to match their long duration pension liabilities has steadily deteriorated over the crisis, albeit starting from very high levels, reflecting low credit ratings worldwide. The funds also appear to have made more use of financial derivatives to actively hedge the interest rate risk for about half of their portfolios.

Pension Fund Real 5-Year Average Annual Returns, 2012-2017 (Percent)
Source: OECD.

The Netherlands: Breakdown of Pension Fund Assets by Instrument (Percent)

2007Q4   2017Q4

- Total real estate
- Total shares and other equity
- Total securities other than shares
- Total loans and derivatives
- Deposits and other liquid assets
- Other

Sources: DNB, and IMF staff calculations.

12.   Overall, the financial strategy of the pension funds remains conservative, but recent trends point toward an increase in risk taking. From a corporate governance viewpoint, the funds have started to outsource a larger proportion of their investment portfolios to multinational

asset managers or insurance companies. Whereas the share of pension fund investment in the domestic economy has reportedly remained constant at around 15 percent of total assets, specific vehicles have been set up to enter the domestic mortgage market at a rapid pace, with new entrants accounting for about 30 percent of the transactions over the last two years. In a context where upward pressures on interest rates could hurt equity portfolios in the coming years and in view of reduced liquidity buffers, such recent developments, marginal at this stage but featuring higher credit and counterparty risks, as well as lower diversification, entail the risk of increased balance sheet volatility in the coming years.

III. STRESS TESTING THE DUTCH COLLECTIVE PENSION SCHEMES

13.   We construct the balance sheet of a virtual national pension fund replicating the features of the overall system of Dutch pension schemes. While existing second pillar pension providers differ in terms of size, demographics and financial situations, they operate under a rather homogeneous framework with regard to benefit computations, actuarial assumptions and funding methods. This makes it possible to set up and stress test the balance sheet of a virtual pension fund consolidating their nationwide demographic and financial characteristics, with the objective of investigating the resilience and vulnerabilities of the system as a whole. To that end, we rely on a customized version of the stress testing framework proposed by Impavido (2011) to simulate the impact of various shocks on the solvency ratio of this aggregate fund offering defined, indexed benefits in the current financial environment (see the Appendix for data sources and the main actuarial assumptions).

14.   Financial liability stress tests indicate that the solvency of Dutch collective schemes remains sensitive to interest rate and inflation risks (Table 1). Starting from a (scaled) solvency ratio of 105 percent close to the regulatory minimum, we stress test the impact of a downward shift of the entire yield curve prompting a commensurate re-pricing of liabilities. Other things being equal, such an across-the-board decrease in discount rates for an extended period would exert significant downward pressures on funding ratios, given the associated value increase in real life annuities, in a context where no benefit curtailment is assumed to take place.

Table 1 - Dutch national (model) plan - Solvency stress test (yield curve shift)								
Yield curve shock (basis points)	-150	-100	-50	-25	0	+25	+50	+100	+150
Funding ratio (percent)	81.5	88.9	96.5	100.5	105	109.5	114.2	123.8	133.8

Note: interest rates are assumed to remain at the zero lower bound instead of turning negative when the magnitude of the assumed negative shock is bigger than the actual, prevailing levels.

15.   Wage inflation shocks turn out to exert broadly similar effects on funding ratios, reflecting both the larger build-up of accrued benefits by active members due to higher nominal income and the indexation of retirement pensions (Table 2). While the likelihood of near-term inflation spikes in the euro area is probably low on current trends, it is worth pointing out that significant effects are shown to materialize as of a 3 percent wage inflation – from the 2.5 percent commonly used as a basis for calculations by pension funds in the Netherlands.

Table 2 - Dutch national (model) plan - Solvency stress test (inflation)								
Inflation shock (basis points)	-150	-100	-50	0	+50	+100	+200	+400
Funding ratio (percent)	128.2	120.1	112.4	105	97.9	91.1	78.5	67.2

Overall, these standard simulations confirm that Dutch pension funds remain vulnerable to financial developments at the current juncture – although estimates above are to be considered upper bounds, inasmuch as they do not factor in any endogenous policy reaction by the funds in the face of shocks whereas the nFTK explicitly provides for benefit de-indexation measures contingent on solvency pressures, and given that half of the funds also hedge interest rate risks.

16.   We seek to capture the impact on funding ratios of changes in the membership structure of the funds by simulating various patterns of contribution disbursement. We compute the future value of contributions paid by all active members as a constant share of their salary. Assuming that the proportion of accrued contributions to the existing asset pool of our representative fund remains constant from one generation to the next (say, because of rules aimed at preserving certain financial buffers), we then test for the impact of changes in the composition of the population on overall solvency by assessing the variation of total assets associated with different contribution amounts, themselves determined by the wage scale and changing average compounding horizons. Thus, we essentially follow a comparative-static approach to assess the effects of long-term generational changes, abstracting from transition paths. With all other factors assumed to grow at the same rate, the simulation results should be interpreted with caution as pointing to directions of change rather than yielding precise values.

17.   A protracted switch of younger generations to self-employment status would put pressure on the long-term solvency of Dutch collective schemes (Table 3). With these caveats in mind, membership termination by younger workers is found to severely undermine solvency ratios in the long run. This is because the actuarial value of contributions paid by younger workers is higher than the value of their retirement benefits. As the reverse holds true for older workers, the separation of the latter category from the funds is found to bring about improvements in solvency ratios. In this case however, an implicit hypothesis is that these

members would totally relinquish their accumulated pension rights, which is not the case in practice; thus, the mechanical improvement generated by the model should be considered an upper bound, reflecting simplifying assumptions. While more granular investigation would be warranted to identify the specific income categories most likely to opt out of collective schemes and build a personal pension on their own, these results suggest that the erosion of fund membership associated with increasing self-employment on the labor market may pose structural challenges to the long-term viability of collective pension schemes, especially if it were to primarily affect younger generations in the future. Also noteworthy is the finding that across-the-board departure from the funds would (slightly) undermine their solvency ratios.

Table 3 - Dutch national (model) plan - Solvency stress tests (change in the membership composition)

	Funding ratio (percent)
5% of active members aged 20-45 leave the fund	101.1
10% of active members aged 20-45 leave the fund	97.2
15% of active members aged 20-45 leave the fund	93.3
5% of active members aged 46-65 leave the fund	107.8
10% of active members aged 46-65 leave the fund	110.8
15% of active members aged 46-65 leave the fund	114.1
10% of all members leave the fund	102.5

Note: the cutoff date of 45 years has been identified in the literature as representing a turning point from a situation where members tend to contribute more than they accrue, to one where the reverse holds true.

IV. REFORMING MATURE SECOND PILLAR PENSION FUNDS: CHALLENGES AND PITFALLS

Current proposals in the Netherlands – Moving towards more individualization

18.   Recent developments point to the need for more individualization in the design of Dutch pension schemes. The occupational funds have started to combine some of the disadvantages associated with both defined contribution (DC) and defined benefit (DB) schemes. Akin to DC schemes, the funds have exhibited increasing uncertainty over the future level of benefits, albeit in a non-transparent way. Akin to DB schemes, the plans feature a range of structural weaknesses that have become problematic owing to unfavorable demographic changes: opaque risk-sharing mechanisms; lack of flexibility in the face of labor market changes; and actuarially unfair *ex ante* intergenerational transfers. Further to undermining the funds' solvency, these shortcomings have turned out to entail substantial economic costs over the crisis, notably some increased macroeconomic volatility prompted by pro-cyclical income developments, insufficient coverage of growing segments of the labor market, and uncertainties

on asset allocation objectives. In turn, these detrimental consequences have the potential for eroding the social consensus upon which the collective schemes were built, including in a non-linear way – as possibly foreshadowed by the rapid increase in the number of workers opting for self-employment status. In a context where the ambition of most schemes has been *de facto* revised downward and sponsors are tempted to switch to individual DC plans, the challenge for Dutch policy makers is to overhaul the basic pension contract in a way that assigns more explicitly members' pension rights and obligations at the individual level, while preserving an appropriate level of solidarity and risk sharing at the aggregate level.

19.   The government recently embraced a proposal for "personal pensions with risk sharing" (PPR) that builds on individual accounts to reinstate some degree of risk sharing. In July 2015, the Ministry of Social Affairs submitted to parliament some general principles for pension reform, which notably included a proposal for "personal pensions with risk sharing" (PPR). These consist in mandatory personal, DC pension contracts complemented with two provisions: (i) the compulsory conversion, upon retirement, of accrued personal assets into annuitized income streams as opposed to cash withdrawals, so as to prevent participants to opt out from pooling the micro-longevity risk; (ii) the compulsory subscription of a complementary insurance policy covering macro-longevity and investment risks, to an extent still to be determined. These principles have been laid out in the coalition agreement adopted by the newly elected government on October 2017, with the detailed elaboration of the forthcoming reform and the organization of the transition from the old to the new system left to the social partners.

20.   Alternative proposals tend to argue for more individualization within the current collective schemes. A few stakeholders and pension sponsors have advocated an explicit transformation of the existing DB plans into collective defined contribution (CDC) schemes. These would involve levying fixed contributions on members and recording them in notional accounts, while still defining benefits by means of a formula referring to accrued earnings – with the proviso that retirement incomes take the form of variable annuities, the value of which would be contingent on the financial health of the funds. As a midway option, some experts have argued for the setting up of a two-tier system, where defined benefit plans featuring a 'reasonable' (i.e. lower) level of ambition would be complemented by some variable retirement income streams accumulated in individual notional accounts. In what follows, we seek to assess whether these competing schemes may actually help address, or not, outstanding financial and structural issues identified in the Dutch system, also referring to solutions implemented in peer countries. Beyond this specific case, the discussion aims at shedding light on more general policy trade-offs to be expected when reforming mature second pillar pension schemes.

Policy trade-offs – Ensuring long-term sustainability while preserving solidarity

Transparency and flexibility

21.   Schemes featuring personal pensions guarantee the highest level of transparency.
The experience of the crisis has exposed a high degree of opacity regarding the allocation of
costs within the existing Dutch collective schemes, severely affecting both current and
retirement incomes. By construction, individualized DC schemes such as personal pensions are
meant to address this concern by directly linking retirement benefits to accumulated personal
assets. By contrast, most CDC schemes typically fall short of comprehensively quantifying risk
transfers among participants, because strategic investment decisions have to be taken with
regards to the joint interests of all members while the associated modulation in the value of the
annuities is implemented at an individual level. In this respect however, the design and
operationalization of the first pillar of the Swedish pension system offer relevant insights on
ways to clearly allocate costs and risks among active and retired members within collective
schemes featuring individual notional accounts. Furthermore, as the system also makes room for
DC strategies in the determination of the overall retirement income, it provides an example of a
two-tier organization explicitly aimed at pooling both the longevity and some investment risks
within the framework of personal accounts (Box 2).

**22.   Personal pension plans also appear best suited to the needs of self-employed
workers**. In the Netherlands, further to catering to the needs of those individuals who genuinely
opt for the status of self-employment on account of the flexibility required by their job, the
introduction of mandatory personal pensions would straightforwardly allow for extending social
security coverage to those workers pushed toward the status of self-employment by their
employers for tax and contribution avoidance motives – hence alleviating some negative
consequences of the increasing duality observed on the labor market. To accommodate the
specific needs of various categories of participants, who are all entitled to first pillar retirement
income and sometimes also succeed in accumulating more wealth than employees in similar
professions, the pension contracts could possibly feature a mix of lower contributions and lower
benefit accrual in some economic sectors.

Box 2: Notional DC Plans and Premium Accounts in Sweden

The Swedish pension system relies on three pillars: (i) the public pension system, which features earnings-related benefits financed for the most part on a pay-as-you-go basis, but also partly through defined contributions, and supplemented by a means-tested guarantee; (ii) mandatory occupational pension schemes, which cover about 90 percent of the workers as part of nationwide collective labor agreements; (iii) voluntary private savings through insurance companies.

The major component of the public scheme is an income based notional defined contribution plan, financed on a pay-as-you-go basis and combining DB and DC features. Benefits are recorded in notional accounts, but converted into real life annuities at retirement using a coefficient which depends positively on lifetime earnings and negatively on contemporaneous life expectancy, hence providing for gradually decreasing replacement rates as life expectancy improves. Contributions of about 16 percent of the pensionable salary are paid to four autonomous national pension funds, the financial balance of which is automatically ensured by symmetric adjustments of pension benefits and returns credited to the notional accounts in the case of shocks.

Established in 1999, the so-called "Premium Pension" accounts represent the DC components of the mandatory individual accounts. Contributions amounting to 2.5 percent of the pensionable wage are credited to individual investment accounts, offering a limited range of options to choose from about 700 independently managed mutual funds. The Premium Pension Agency (PPM) collects contributions and invests them in the individually chosen options, charging a fixed annual fee of 0.3 percent of the account balance plus the management fees of the various mutual funds. To keep costs under control, the PPM forces the funds to offer fee rebates depending on the premiums they charge and on the size of their portfolio, and pass them on evenly to all participants, thus subsidizing members who opt for low-costs plans. Participants can claim benefits as of 61 years old or continue accumulating them after retirement age, either in the form of life annuities or lump sums.

In terms of insights for the reform of maturing DB schemes such as those in the Netherlands, the main component of the two-tier Swedish first pillar public scheme appears to provide an interesting blueprint for CDC plans featuring clear cost allocation rules, while the complementary Premium Pension system could be considered an interesting option to progressively educate beneficiaries to the build-up and management of their own retirement income accounts in a (potentially) cost effective way.

Risk sharing

23.   Collective DB schemes feature a large degree of risk sharing but may end up encouraging a suboptimal degree of risk taking. There is a strong economic case for *ex post* risk sharing mechanisms within DB pension schemes, not least because the pooling of longevity and investment risks theoretically eliminates precautionary savings, resulting in lower contributions and/or higher benefits. Moreover, centralized investment strategies with virtually infinite horizons can theoretically be expected to translate into greater risk taking at the aggregate level. Yet in the context of an ageing population, asset allocation decisions within collective schemes have actually become increasingly biased towards the interests of older members in the Netherlands, typically favoring fixed-income products to the detriment of higher return instruments – thereby diverting a substantial share of domestic savings from growth-enhancing investments. In this respect, CDC schemes do not substantially differ from DB schemes, inasmuch as they seek to limit the variability components of annuities that do not arise from *ex post* financial shocks. By contrast, personal pension plans are explicitly geared toward smoothing the investment risk profile of individuals over their life cycle, allowing for more risk taking at a younger age, when workers still have the time and ability to make use of their human capital to offset possible downturns, and for choosing more stable returns in the years preceding retirement. As such, contributory schemes may be expected to support long-term investment without the need for funds to hedge interest rate risk, since they do not guarantee nominal stability. As an illustration, the "Superannuation" accounts set up in Australia have been instrumental in building up a large pool of pension equity in record time (Box 3).

Box 3: Superannuation Funds in Australia

Australia features a three-pillar pension system, comprising: (i) a strictly means-tested public pay-as-you-go old age pension scheme; (ii) a network of mandatory, privately operated "Superannuation Funds"; and (iii) private savings funded, *inter alia*, by voluntary contributions to the Superannuation Funds.

Introduced in 1992, the "Superannuation Guarantee" program consists in a network of private pension plans funded by mandatory employer contributions. The plans can be operated by companies, employer associations (retail, industry), financial professionals, or the individuals themselves. Set at 9 percent of employee earnings (above a certain threshold, and up to a ceiling representing about 2½ times the average wage) since the early 2000s, contributions are in the process of being gradually increased to 12 percent by 2020. Most funds operate on a DC basis, allowing participants to either withdraw the accumulated capital as a lump sum (except if they are still working) or in the form of a real (inflation-indexed) life annuity as of 55 years old – a threshold that is being progressively raised to 60 years old. Employees may also defer claiming Superannuation after the retirement age, currently set at 65 years. No contributions are made for unemployment periods.

As the first pillar flat-rate pension strictly fulfills (very limited) redistribution objectives, ensuring a replacement ratio of just about 30 percent of the minimum wage, most of the income replacement function falls on the second pillar Superannuation Funds – complemented by third pillar private savings. The funds have been successful vehicles for accumulating a large pool of pension assets nationwide in a relatively short period of time – arguably also reflecting an unprecedented period of robust, externally-driven economic growth.

Besides underdeveloped annuity markets, the system's main challenge has been to improve the financial literacy of members, based on the observation that participants tend to overwhelmingly choose the default investment option of the various plans and proceed to early cash withdrawals for other purposes than building their retirement income. Thus, recent reforms have focused on standardizing risk disclosures by the funds, launching educational campaigns centered on default options, and forcing employers to direct contributions made on behalf of 'passive' participants to newly created "MySuper" default products offering significant asset diversification and standardized fee reporting. In the short run, these efforts seem to have resulted in increased complexity and rising administrative costs.

Combining some strong asset build-up due to mandatory participation with the flexibility offered by individual DC schemes, the Australian system may appear to provide valuable insights for the overhaul of collective DB systems unable to live up to their promises. However, the decumulation phase of the system remains to be organized in a context where the financial sustainability of the plans has been untested so far, while cost effectiveness has become a growing concern. Over time, depending on career paths and individual financial decisions (especially with respect to the withdrawal options), or should net returns in some sectors fall short of expectations, the main risk is that a non-negligible proportion of citizens falls back on the first pillar or ends up experiencing old age poverty, thus straining social safety nets – with some recent developments already pointing into this direction.

24.   The challenge for DC options consists in cushioning individual risk taking. In practice, the main reason prompting pension sponsors, including public ones, to advocate DC pension schemes has been to shift risk away from their balance sheets by transferring it to individual members. By emphasizing free choice in savings product and payout options, DC plans strive to closely align the investment strategies and risk profiles of participants. The challenge for policy makers thus consists in defining safeguards against excessive pension losses to prevent old age poverty and avoid undue pressure on the sustainability of social security schemes. In this respect, in the context of a very diversified landscape of contributory occupational funds, the solution implemented in Switzerland has been to force all DC plan providers to guarantee a minimum rate of return to active members, and to empower policy makers with the mandate of periodically setting the conversion rate of accumulated assets into pension annuities – at the cost of an arguably high degree of complexity, along with renewed sustainability issues (Box 4). The Australian alternative has been to implement some strict means-testing to organize the first pillar, in the objective of providing a basic social safety net for the old without jeopardizing fiscal sustainability. While the system still is in its accumulation phase however, preliminary observations suggest that old age poverty may become a concern for some segments of the population (Box 3).

Box 4: Occupational Pension Plans in Switzerland

The Swiss pension system is made up of three tiers: (i) an earnings-related, DB public scheme with redistributive features, supplemented by means-tested benefits; (ii) mandatory occupational plans; and (iii) private savings, in the form of tax deductible supplementary contributions to those plans.

The first pillar public scheme is financed on a pay-as-you-go basis through employer and employee contributions totaling about 5 percent of the pensionable salary. Benefits are calculated using a formula linking the number of years worked and lifetime average income, and are subject to upper and lower limits, thus ensuring some substantial redistribution, with replacement rates ranging from 16 to 32 percent of the average earning.

Occupational pension funds operate defined contribution (about 85 percent of the total), defined benefit, or hybrid plans (15 percent together). Participation has been mandatory since 1985 for all workers with income above a certain threshold, and employer contributions have to at least match those of employees. Pension benefits are fully portable, with employees required to participate in turn to the pension systems of their successive employers. In the case of funded plans, benefits are calculated through the accumulation of yearly individual credits, the value of which increases with age. Up to one quarter of the accumulated capital can be withdrawn as a lump sum. The funds have all latitude to adjust the degree of benefit indexation or to raise supplementary contributions to comply with the required 100 percent funding ratio plus a buffer, provided they guarantee a minimum rate of return on individual accounts, currently set at 1.5 percent and revisable every two years. Furthermore, accumulated savings in DC schemes are to be converted into real life annuities upon retirement using a nationwide conversion rate, which was recently reduced to 6.8 percent in view of increasing life expectancy and falling yields. Taken together, these features introduce a strong DB component in the DC schemes, with the explicit objective that the combination of first pillar and second pillar benefits results in an overall replacement rate of 60 percent of the average income.

In terms of takeaway for the Dutch pension reform, and the overhaul of collective DB schemes in general, the Swiss second pillar appears to combine a very high degree of flexibility owing to the DC features of most plans with the solidarity associated with strong DB components, given also the progressivity of the first pillar. This comes, however, at the cost of acute complexity, translating into non-negligible management and investment fees. Like Australia, the country also came out relatively unscathed from the recent financial crisis, implicitly postponing the sustainability test of its pension system.

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25.   Another difficulty associated with the management of risks within DC schemes relates to the financial illiteracy of the population. In the longer run, the main challenge in entrusting individuals with the build-up of their own pension lies in the financial illiteracy of participants – most of whom have been constantly found to be unprepared and unwilling to make rational investment decisions in various country surveys (Australia, Sweden, United States). To some extent, this problem can be circumvented by restricting the range of possible investment options offered by DC schemes. It also requires that the pension supervisor carefully monitors the risk content of the default option, overwhelmingly chosen by members in countries

operating DC schemes. Following the Australian example (Box 3), this would argue for focusing financial education efforts on the default option itself to ensure a reasonable degree of appropriation by members. As a more radical, albeit possibly more efficient, option, it should be noted that nothing prevents part or all of the individual investment portfolios to be collectively managed by social partners, as is the case in the public pension fund ATP in Denmark (Box 5).

Box 5: The Supplementary Labor Market Pension Fund (ATP) in Denmark

The Danish pension system rests on three pillars: (i) a first pillar of public, pay-as-you-go, defined benefit public retirement income combining a flat-rate pension and some means-tested supplements; (ii) a second pillar comprising the Supplementary Labor Market Pension Fund (ATP) and various labor market funded, defined contribution pension plans embedded in collective labor agreements; (iii) voluntary private savings.

The Labor Market Supplementary Pension (ATP) is a statutory, defined contribution scheme, the defining characteristics of which consists in achieving almost universal coverage of the workforce while being centrally managed by the social partners at the national level. The fund is financed through fixed sum contributions set by the social partners, generally paid by employers (for two thirds) and employees (one third) according to the number of hours worked per week; however, for periods of unemployment or inactivity (such as during maternity or paternity leave), contributions are covered by an unemployment insurance fund, the municipalities, or the government. Contributions represent on average 1 percent of earnings. Even though investments are managed centrally, members can choose their manager and type of portfolio. Pension rights are accrued for 80 percent of the contributions, with the remaining 20 percent allocated to a financial buffer, and liquidated in the form of either a monthly annuity, a yearly annuity, or a lump sum, as a decreasing function of the notional amount that has been accumulated at retirement.

On average, a full ATP benefit after 40 years of employment provides for a replacement rate of 7 percent. While this amount may seem marginal within the framework of an overall generous pension system, it actually turns out to be far from negligible for the most fragile categories of low-income earners and plays a critical role in preventing old age poverty for workers with incomplete careers.

In terms of takeaway for addressing sustainability and equity issues in fully funded schemes, the ATP could be considered, despite its limited size, as providing an original blueprint for a quasi-universal social safety net for the elderly, contributory by design but fulfilling well-targeted redistribution goals while also benefitting from the economies of scales that may be expected from centrally managed schemes.

Costs

26. **The jury is still out on the costs associated with the operation of alternative pension schemes.** Substantial economies of scale have generally been put forward as a major comparative advantage of DB schemes, owing to both lower operational costs associated with the management of standardized investment products and reduced investment costs associated with large asset pools and virtually infinite investment horizons. In practice however, such low hanging fruit does not seem to have been fully picked by Dutch occupational pension funds, possibly partly due to the increasing complexity and administrative costs triggered by successive adjustments of the regulatory framework – not to mention pervasive inefficiencies caused by the co-existence of multiple schemes, which could theoretically be avoided by aggregating them into a national fund. On the other hand, DC schemes need not necessarily be as costly as the absence of such economies of scale would suggest, depending on the degree of standardization of the investment products they offer (especially for default options) and their use of IT technologies to manage savings accounts. From this viewpoint, it should be cautioned that the partial pooling of risks within the PPR architecture envisaged by Dutch policy makers may result in adding a costly layer of complexity to the challenges of managing customized investment accounts; this would require careful investigation. In Australia, the standardization of investment options seems to have helped generate savings, but a pervasive degree of decentralization has nevertheless made it challenging to keep costs under control.

Actuarial fairness

27. **Making contributions increasing, or accrual rates decreasing, with age can both substantially reduce actuarially unfair transfers within collective schemes, albeit with contrasted impacts on the labor market or household debt developments.** Redistribution mechanisms within pension schemes have the potential to influence the overall domestic savings rate by unequally (in an actuarial sense) burdening categories of agents with different propensities to save. In the case of the Netherlands, the Ministry of Social Affairs has proposed to gradually abolish the uniform contribution system (*doorsneesystematiek*) by maintaining uniform contributions (i.e. as a fixed proportion of the pensionable wage) but allowing for decreasing accrual rates with age – with the combined objectives of explicitly reducing the ambition of the plans and avoiding putting older workers at a disadvantage on the labor market. An alternative, however, could have been to preserve the constant accrual rate used to compute pension benefits while making contributions progressive with age, thus backloading the contribution schedule to account for the longer accumulation of investment returns by younger generations. By freeing disposable income for the most financially constrained agents in the

economy, such an option would have had the advantage of reducing household debt and, assuming a higher propensity to consume of younger workers than of older ones, sustaining domestic demand. Moreover, in view of an already high structural unemployment rate of older workers in the current economic environment, this reform might arguably have entailed only second-order detrimental effects on the latter category of the active population – with the core issue being best addressed by targeted, active labor market policies in any event. Beyond the case of the Netherlands, this policy trade-off, illustrated by both alternatives in the text figure below, likely exists in other advanced countries seeking to strengthen or establish fully funded pension schemes within the context of segmented labor markets.
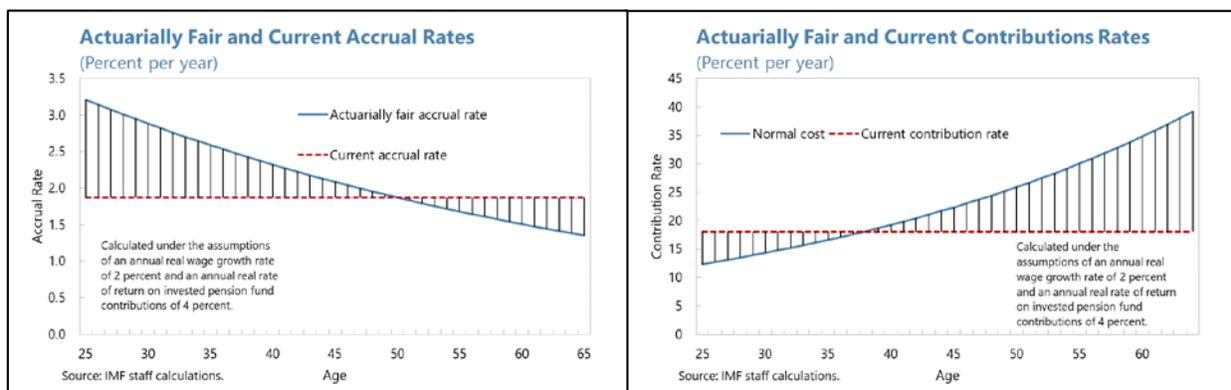
28.   The modulation of accrual rates in second pillar pension schemes may also be used to address equity and sustainability concerns. In the case of the Netherlands, some research carried out at the central bank has suggested that modulating accrual rates by income brackets within the funds, possibly by means of differentiated tax deduction rates, could be used to reduce existing transfers from low skilled to higher educated workers within the collective schemes (due to the fact that the life expectancy of the latter category typically exceeds the one of the former). Further to strengthening second pillar schemes along the equity dimension, making accrual rates a decreasing function of income would likely help foster the development of private savings options for richer households, thus encouraging greater individualization of savings and investment strategies and improving the sustainability of the pension system at large.

V. CONCLUSION

29.   The Dutch occupational funds have started to combine the disadvantages of DC and DB schemes, illustrating difficulties typically experienced by mature, fully funded pension systems worldwide. As a result of *ex post* financial shocks experienced during the

crisis, the level of ambition of most collective plans has been *de facto* reduced through benefit de-indexation or, sometimes, benefit curtailments in the Netherlands, while contributions had to be raised to support funding ratios. However*, ex ante*, actuarially unfair redistribution mechanisms, typically from the young to the old, or from the poor to the rich, have remained unscathed. Thus, the Dutch pension funds have been increasingly operating as collective defined contribution plans, failing to provide the nominal security and fair degree of risk sharing expected from DB schemes while still featuring opaque transfers mechanisms – in turn possibly delaying debt deleveraging and the economic recovery. Looking forward, simulations suggest that the solvency of most funds remains highly dependent on financial conditions, while public confidence shocks have the potential for undermining the sustainability of the system as a whole. In this sense, the Dutch example can be seen as an insightful illustration of the strain put on carefully designed, fully funded pension schemes by the prevailing 'new normal' economic conditions of low potential growth and interest rates associated with increasingly dual labor market conditions.

30. **The prospects of protracted 'new normal' economic developments plead for taking up the challenge of introducing personalized pension accounts while preserving the benefits of longevity and investment risk pooling within centrally managed collective schemes.** The shift from defined benefit schemes to more contributory regimes can simultaneously enable pension funds to better align their funding strategy with the interests of members and put an end to opaque and actuarially unfair transfer mechanisms – thus strengthening the social consensus underpinning the redistributive aspects of social security schemes. In this respect, the introduction of "personal pensions with risk-sharing" in the Netherlands could fix some of the major problems that have emerged over the last few years, thus providing a blueprint for other countries seeking to establish fiscally and socially sustainable pension systems. Yet innovative solutions are still called for to fulfill the promises of longevity and investment risk pooling embedded in the proposed contract, in a context where all forms of insurance products are likely to remain under pressure for some time in the prevailing low interest rate environment. From this viewpoint, the examples of peer countries provide insights into difficulties typically experienced by alternative DC schemes with redistributive features, which appear to mostly pertain to cost effectiveness and the design of payout options. Leaving aside the (non-negligible) difficulty of organizing the transition from the old to the new system, the above discussion suggests that an appropriate degree of risk sharing can probably be best achieved by articulating some form of collective asset management by the social partners with the design of savings instruments clearly attuned to individual life cycle considerations and changing labor market conditions.

VI.   REFERENCES

Agnew, J. (2013), "Australia's retirement system: strengths, weaknesses, and reforms", *Center for Retirement Research Working Paper No.5*, Boston College, April.

Alessie, R. Been, J. Caminada, K., Goudswaard, K., Kalwij, A. and M. Knoef (2014), "Measuring retirement savings adequacy: developing a multi-pillar approach in the Netherlands", *Journal of Pension Economics and Finance, 11(2)*, pp.203-222.

Ambachtsheer, K. (2014), "Taking the Dutch pension system to the next level – A view from the outside", *Netspar Occasional Paper*.

Andersen, T.M. (2015), "The Danish pension system: properties, outcomes and challenges", *Paper for the CLAPES US seminar*, July.

Bodie, Z., Marcus, A.J. and R.C. Merton (1988), "Defined benefit versus defined contribution pension plans: what are the real tradeoffs", *NBER Working Paper No.1719*, October.

Boelaars, I., Bovenberg, L., Broeder, D. Gortzak, P., Kocken, T., Lever, M., Nijman, T., Tamerus, J. and S. van Hoogdalem (2014), "Towards sustainable Dutch occupational pensions", Netspar, November 14.

Bovenberg, L., Mehlkopf, R. and T. Nijman (2014), "The promise of defined ambition plans: lessons for the United States", *World Pension Summit Paper*.

Bovenberg, L. and T. Nijman (2015), "Personal pensions with risk sharing – Affordable, adequate and stable private pensions in Europe", *Netspar Discussion Papers No.3*, March.

Bovenberg, L. and T, Nijman (2017), "New Dutch pension contracts and lessons for other countries", *Netspar Academic Series, DP 09/2017-014*, September.

Chomik, R. and J. Piggot (2012), "Pensions, ageing and retirement in Australia: long-term projections and policies, *Australian Economic Review Vol.45, No.3*, pp.350-361.

Collinson, D. (ed) (2001) "Actuarial methods and assumptions used in the valuation of retirement benefits in the EU and other European countries", European Actuarial Consultative Group, December.

De Nederlandsche Bank (2015), "Position paper from DNB on behalf of the national pension dialogue", January 15.

Durand, O. and S. Gaille (2013), "Switzerland: current retirement system and future prospects", *Life and Pensions Newsletter No.52*, The Geneva Association, March.

Gerber, D.S. and R. Weber (2007), "Aging, asset allocation and costs: evidence for the pension fund industry in Switzerland", *IMF Working Papers 07/29*, International Monetary Fund, February.

Guardiancich, I. (2010), "Denmark – Current pension system: first assessment of reform outcomes and output", *European Social Observatory Country Report*, May.

Hollanders, D., and L. Kok (2006), "Dutch lessons from the Swedish pension reform", *SEO Economic Research*.

Impavido, G. (2011), "Stress tests for defined benefit pension plans – A primer", *IMF Working Paper 11/29*, International Monetary Fund, February.

International Monetary Fund (2011), "Technical note – Pension sector issues" in *Financial Sector Assessment Program Update – Kingdom of the Netherlands-Netherlands, IMF Country Report 11/209*, International Monetary Fund, July.

_____(2017), "Technical note – Insurance and pension sector" in *Financial Sector Assessment Program Update – Kingdom of the Netherlands-Netherlands, IMF Country Report 17/94*, International Monetary Fund, April.

Ionescu, L. and J. Yermo (2014), "Stress testing and scenario analysis of pension plans", *IOPS Working Papers on Effective Pensions Supervision No.19*, March.

Khamis, M. (2006), "A comparison of the Swiss, Dutch, and U.K. pension systems, with emphasis on the occupational pension pillars" in *Switzerland: Selected Issues, IMF Country Report 06/203*, International Monetary Fund, June.

Kocken, T. (2011), "Why the design of maturing defined benefit plans needs rethinking", *Rotman International Journal of Pension Management, Vol.4, Issue 1*, Spring.

_____(2012), "Pension liability measurement and intergenerational fairness", *Rotman International Journal of Pension Management, Vol.5, Issue 1*, Spring.

Kooiman, T. and J. Parleviet (2015), "Wealth formation of Dutch households: a policy assessment", *De Nederlandsche Bank Occasional Studies, Vol.13, No.1*.

Mielonen, A. (2009), "Pension contribution level in the Netherlands", *Finnish Centre for Pensions Reviews Vol.10*.

Ministry of Social Affairs of the Netherlands (2015), Letter to the Lower House on pension reform, July 6.

Organization for Economic Co-operation and Development (2014), *Ageing and employment policies: Netherlands, working better with age*.

_____(2017), *Pensions at a glance 2017, OECD and G20 Indicators.*

_____(2018), *Pension markets in Focus 2018.*

Rocha, R., Rudolph, H.P. and D. Vittas (2010), "The payout phase of pension systems – A comparison of five countries", *World Bank Policy Research Working Paper No.5288*, The World Bank, April.

SER (2015), *Advisory Report on the Future of the Dutch Pension System* (abstract), January.

Steenbeek, O.W. and S.G. van der Lecq (eds) (2007), *Costs and benefits of collective pension schemes*, Springer Verlag.

Turner, J. (2003), "Individual accounts: lessons from Sweden", *Public Policy Institute*, May.

Weaver, K. and A. Willen (2013), "The Swedish pension system after twenty years: mid-course corrections and lessons", *OECD Journal on Budgeting No.3*.

Appendix – Data sources and actuarial formulas used to stress test the Dutch collective pension schemes

Data sources

Mortality tables: Actuarieel Genootschap, Orlevingstafels GBM en GBV 1995-2000, Mannen (Actuarial Association, male mortality table 1995-2000) (no unisex table available)

Yield curve: DNB Statistics, Table 1.3.1 "Nominal interest rates term structure pension funds (zero coupon), updated September 2, 2015

Membership and overall demographics: DNB Statistics, Table 8.7. "Demographics of pension funds", updated September 17, 2015

Fund portolio: DNB Statistics, Table 8.1.2 "Assets and liabilities of pension funds, by sector of counterparty", updated September 10, 2015

Average wage by age: Central Bureau of Statistics (CBS), Table "Employment: jobs, wages, working hours; key figures, 2013"

Actuarial assumptions

Entry age, 20 years; retirement age, 65 years (no early retirement); no deferred members[2]; wage inflation, 2.5 percent; merit increase, 2 percent; labor productivity increase: 1 percent; investment portfolio: 40 percent fixed income, 60 percent equity; payout option: single real life annuity; (uniform) contribution rate: 18 percent; (constant) accrual rate: 1.875 percent

Actuarial formulas

Actuarial liabilities for retired members

- Present value of a €1 real life annuity for each cohort at age x:

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[2] We do not take into account the situation of so-called "deferred members", namely workers that have accumulated benefit rights but do not participate anymore in their previous pension plan after migrating either to other schemes or to self-employment, because we assume that these transitory situations only marginally affect total membership.

$$\ddot{a}_x^{\pi} = \sum_{s=0}^{\infty} (1 + \pi^e)^s \; _s p_x^{(m)} v^s$$

with π^e the expected inflation rate, $_s p_x^{(m)}$ the conditional probability of survival (m) for members aged x and v the discount factor.

■ Aggregated actuarial liabilities for all retired cohorts:

$$AL(R) = \sum_{x=r}^{\infty} [(RN)(RB)(RNd_x)(RBd_x)\ddot{a}_x^{\pi}]$$

with RN the number of retirees, RB the average retirement benefit, d_x denoting these variables' respective distributions, and r the retirement age.

Actuarial liabilities for active members (projected unit credit method)

■ Projected wage at age s>x:

$$w_{s,x} = \frac{m_{s,y}}{m_{x,y}} [(1 + \pi^e)(1 + pr)]^{(s-x)}$$

with $m_{s,y}$ the cumulative merit increase at age s for an entry age y in the pension plan and pr the productivity improvement.

■ Accrued benefits at retirement for each active cohort (final average salary function):

$$B_{r,x} = b(r - y)w_{r,x}[(AN)(AW)(ANd_x)(AWd_x)]$$

with b the (constant) accrual rate, $w_{r,x} = (\sum_{s=r-10}^{r} w_{s,x})/10$, AN the number of active members, AW the average wage, and d_x denoting these variables' respective distributions.

■ Total accrued benefits at retirement for all active cohorts (pro-rated projected unit credit – constant dollar benefit allocation method):

$$AL(A) = \sum_{x=y}^{r-1} \frac{(x-y)}{(r-y)} B_{r,x} (_{r-x}p_x^{(T)} v^{r-x} \ddot{a}_x^{\pi})$$

with $_{r-x}p_x^{(T)}$ the conditional probability of termination (T) at age x.