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Design of Pension Arrangements to Mitigate Longevity Risk

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Introduction

1. This report is the first output of the project on designing post retirement arrangements to address longevity risk. Delegates at the December 2017 meeting of the Working Party on Private Pensions approved this project proposal [DAF/AS/PEN/WD(2017)18] to look in detail at the different ways that pension arrangements can be structured to address the longevity risk of their members.

2. This report aims to identify and describe the different types of pension arrangements and discuss some of the advantages and the challenges that they present in managing risks. While the focus of this project is managing longevity risk, or the risk that individuals will outlive the assets accumulated to finance their retirement, the related risks of investment, interest rate and inflation cannot be ignored in the discussion as these will also drive whether or not the assets will be sufficient. As such, all of these risks are interrelated and any discussion of how longevity risk is managed in retirement will need to address the role that these other risks play.

3. The balance of who bears the risks of providing a pension income in retirement has shifted over the last decades. Defined benefit pension arrangements, where pension income is fully guaranteed by a sponsor or third party who bears all the risks in fulfilling the pension promise, have given way to individual defined contribution plans, where all of these risks fall squarely on the individual. However, both of these solutions present serious concerns with respect to sustainability. Defined benefit arrangements can be costly for the sponsor if risks are not measured accurately and managed appropriately. Defined contribution arrangements, on the other hand, make individuals responsible for these risks, whereas most individuals are not well-positioned to be able to bear these risks or decide themselves how to mitigate them. In order to try to balance these two extremes and find a more sustainable solution, there is a need for more innovative ways to share the risks of financing retirement across multiple stakeholders.

4. There can be numerous ways to design pension arrangements to mitigate the different risks that individuals face in saving for and financing their retirement. These can involve fully protecting the individual from all risks (investment, interest rate, inflation, and longevity) through sponsors providing retirement income guarantees, sharing some of the risks between the sponsor and the individual, or sharing the risks among the individual members of a scheme. Section 2 provides an overview of the different types of plans according to the guarantees provided.

5. There is a trade-off between having guaranteed protection against the risks and the cost of providing retirement income. A higher cost of pension will translate into lower pension income for individuals. High guarantees imply higher capital requirements for annuity providers, who can be assumed to pass this cost onto the individuals. For employer sponsors it means higher costs on their balance sheet.

6. However, different types of arrangements also present different levels of flexibility for the members. Portability, the level of choice offered to individuals, the transparency of the scheme, and the fairness with respect to the distribution of risks among scheme members varies across different pension arrangements depending on the guarantees provided by the plan sponsor and the risk sharing mechanisms in place

7. Section 3 will discuss the risk sharing mechanisms in the different types of pension arrangements and assess the advantages and disadvantages with respect to the trade-off between costs and flexibility, including implications for portability, individual choice, transparency and fairness. The final section concludes.

8. Delegates are invited to provide their views on the following:

- Do delegates find the classification sensible and useful?
- Are there any other types of schemes that should be included?
- Would a survey be feasible to collect information on how these types of schemes are regulated in different jurisdictions and more detail on capital requirements and how the transition between accumulation and pay-out is managed?

Classification of different types of pension arrangements that mitigate longevity risk

9. This section provides a brief overview of the types of pension arrangements by focusing on how risks are distributed. In particular, whether they are borne by the sponsor, shared between the sponsor and the members, or borne collectively among members.

10. The various types of pension arrangements can be viewed along a spectrum of how the risks to financing retirement are distributed (Figure 1). Individual defined contribution (DC) pension arrangements sit on one end of the spectrum. For these types of arrangements, individuals are fully exposed to all risks related to pension income: investment risk, interest rate risk, inflation risk and longevity risk. However, these types of plans also provide the greatest level of flexibility in how accumulated assets can be used to finance retirement.

Figure 1. Spectrum of risk distribution of pension arrangements

11. At the other end of the spectrum lie pension arrangements where some or all risks are fully transferred to a sponsor or third party, as is the case for defined benefit (DB) pension arrangements or annuity products that fully guarantee a certain level of income for life. While offering the most security to individuals, this security comes at a higher

cost to cover the guarantees offered, and these types of arrangements offer little to no flexibility in how assets are paid as income in retirement.

12. In between these two extremes lie pension arrangements in which risks are shared either between the individuals and a sponsor or third party provider, or collectively within a group of individuals. In exchange for lower security of benefits, the cost of providing a regular pension is reduced because less capital is needed to back the guarantees. The level of flexibility offered by these types of plans will depend on the underlying risk-sharing mechanism. Table 1 presents the details of this classification, along with some specific examples of each type that are discussed in this report.

Table 1. Classification of different types of pension arrangements that mitigate longevity risk for individuals

Who bears risk	Type of arrangement	Example
Sponsor	Traditional DB	Typical occupational pension plans in UK
	Traditional annuity products	Fixed payment annuities
		Inflation indexed annuities
	Longevity insurance	ALDA
Shared between sponsor and individual	Annuities with minimum guarantee	Participating annuities
		With profits in UK
		Traditional life product in Sweden
		ATP in Denmark
		Retirement savings with guaranteed income option
	Hybrid DB plans	Conditional benefit (e.g. Ontario teachers pension plan)
		Cash balance (e.g. typical occupational pension plans in US, NDC arrangements)
		Floor/underpin (e.g. Wisconsin hybrid model)
Shared among individuals	Target benefit schemes	Collective defined contribution in the Netherlands
		Defined ambition plans in Iceland
		Risk sharing plans in Japan
		Shared risk pension plan in Canada (e.g. New Brunswick)
	Collective individual DC	Variable payout annuities
		PPR-CB in Netherlands
	Tontine-type schemes	Lorenzo tontines
		Natural tontines
		Fair tontines
		Group self-annuitization

Pension arrangements where risks are fully transferred to a sponsor/provider

13. Pension arrangements where risks are fully transferred to a sponsor or provider fully protect individuals from investment and longevity risk by providing a guaranteed pension income that is known and defined in advance. These types of arrangements include traditional defined benefit (DB) structures, traditional annuity products and longevity insurance.

Traditional defined benefit plans

14. Traditional defined benefit plans protect individuals from all investment, interest rate, longevity, and inflation risk in both the accumulation and pay-out phase. They typically define member rights as the pension income earned per contribution made that will be calculated as a percentage of final or average salary at retirement. Benefits are normally indexed annually to the cost of living. These types of plans were commonly

offered by employers in countries such as Canada, Ireland, The Netherlands, the United Kingdom, and the United States. More recently, however, they have been closed to new members due to sustainability concerns.

Traditional annuity products

15. Traditional annuity products protect individuals from all investment and longevity risks. Traditional annuity products include all fixed payment annuity products for which payments are clearly defined in advance, and can cover only the pay-out phase, as with immediate annuities, or both the accumulation and pay-out phase with deferred annuities. Inflation indexed annuities are also included in this category for the purposes of this classification, as they protect the individual from one of the key risks that this report discusses. Individuals are still exposed to interest rate risk, however, that the income that they can receive from an annuity at the time at which they retire will be lower than expected.

Longevity insurance

16. Longevity insurance, in form, resembles a traditional annuity product, but payments do not begin at retirement. Instead payments are deferred to some advanced age, with the aim of protecting individuals from the pure longevity risk of outliving their assets. The advanced life deferred annuity (ALDA) is an example of this type of scheme.[1] Individuals are still exposed to investment risk between retirement age and the age at which the insurance begins. They may also be exposed to inflation risk to the extent that benefits are not adjusted for the future cost of living. Interest rate risk can be mitigated through the phased purchase of such insurance, or potentially by delaying the purchase of the insurance.

Pension arrangements where risks are shared with a sponsor/provider

17. Pension arrangements where risks are shared with a sponsor or provider aim to reduce the cost of providing a pension by reducing the generosity of the guarantees. These types of arrangements can take the form of annuities that offer some minimum level of a guarantee, or hybrid DB plans that have more flexible benefits or share some characteristics of DC schemes.

Annuities with a minimum guarantee

18. Participating annuities offer a minimum guaranteed level of income that is typically lower than what would be offered by a traditional annuity product, but offer additional bonus payments depending on actual investment returns or longevity experience (OECD, 2016[1]). As such, both investment and longevity risk can be shared with the individual during the pay-out phase. As bonus payments can increase over time, individuals are also less exposed to interest rate risk that would lock in low payments at the point of retirement. Bonus payments that can increase with inflation will mitigate this risk for individuals.

19. With profits schemes in the United Kingdom are an example of a participating annuity. These schemes invest the assets backing the product into a collectively managed fund. A minimum return on assets is guaranteed, but payments can be higher depending on actual investment returns. Some of the investment gains in high return years are

[1] See (OECD, 2016[1]) for a more detailed description of these products.

retained in surplus fund to be paid in period of negative returns in order to reduce the volatility of payments to individuals.

20. Traditional life products in Sweden are another type of participating annuity. Each contribution buys a fixed income in retirement, and excess returns over the guarantee are 'soft' pension rights paid as bonuses. Insurer assets above the hard and soft pension rights are managed in a collective buffer that the board of the insurance company decides how to distribute to smooth pension payments. The consolidation ratio, or the total assets over the retrospective reserve based on the actuarial interest rate, is used to manage the distribution of pension rights and bonus payments (Bovenberg, Cox and Lundbergh, 2015[2]).

21. The ATP in Denmark provides a participating annuity offering a guaranteed nominal pension based on 80% of the contributions, which are invested in fund that fully hedges the guarantee. The remaining 20% of contributions are invested in return-seeking fund that is used to provide conditional indexation of benefits if the funding ratio exceeds 120% (Blake, 2016[3]).

22. Retirement savings products with a guaranteed income option typically offer a minimum return on assets during the accumulation phase. These types of products include the variable annuity and fixed indexed annuity products available in the United States (OECD, 2016[1]).[2] Some products also impose a cap on the returns that the individual can earn. At retirement, accumulated assets can be converted either into a traditional annuity product or taken as a programmed withdrawal with a minimum withdrawal rate guaranteed by the provider.

Hybrid defined benefit plans

23. This report considers three types of hybrid DB plans: conditional benefit plans, cash balance plans, and floor/underpin plans.

24. Conditional benefit plans define the expected pension as a traditional DB plan, but the level of benefit paid is conditional on the funding position of the plan. The Ontario Teachers' Pension Plan is an example of this type of scheme. Since 2009, the indexation of pension benefits reduced in the event of a funding shortfall (Ontario Teachers Pension Plan, 2017[4]). As such, the funding risk is shared between the sponsor and the employees, and full protection of inflation risk is not granted to pensioners.

25. Cash balance plans can provide risk sharing of investment risk during the accumulation phase and protection from investment, longevity and inflation risk during the pay-out phase. For these plans, contributions accumulate at either a fixed rate or a rate that is indexed to prevailing interest rates, actual investment returns, or other market variables. In this way investment risk can be shared with members, because in periods of low returns or interest rates, contributions will accumulate at a lower rate. At retirement, the accumulated balance can be converted into a life annuity, protecting members from investment, longevity risk and inflation risk in pay-out. Nevertheless, they remain exposed to interest rate risk at the time of retirement. These types of plans are common occupational schemes in the United States.

[2] While most types of arrangements in this section offer lower guarantees, the guarantees offered by variable annuities have historically been rather generous, and therefore the cost of providing these products is not necessarily reduced. Nevertheless, the guarantees that these products offer have become less generous in the years following the financial crisis.

26. Notional defined contribution (NDC) schemes can also be viewed as a cash balance plan. In the NDC scheme in Sweden, contributions are accounted for in a notional fund that credits a return linked to wage growth and funding. The notional account is converted into an annuity at retirement that is indexed conditional on the financial position of the scheme (Blake, 2016[3]). In this way economic and financing risks are shared with members in the accumulation phase, and systemic longevity risk is partially shared with members by annually adjusting the life expectancy on which benefits are calculated. Pensions remain partially exposed to inflation risk.

27. Floor/underpin plans contain both a DB and DC formula, and offer the members benefits based on the higher of the two. These plans demonstrate less risk-sharing than the other types of plans as the sponsor still guarantees the DB calculated benefits as a minimum, however they can offer more upside potential to the sponsor as a reward for good management of the plan. In the Wisconsin hybrid plan, for example, active employees have two accounts, one of which is credited as a benefit accrual as a percentage of salary that is guaranteed by the employer, and the other which reflects the employee's contribution credited with the actual rate of return on assets. If the return on assets is higher than the rate needed to fund the DB liabilities, the sponsor may retain the excess returns. Thus while the member is protected from investment risk, the provider also benefits from higher investment returns. At retirement, the higher of the two balances is annuitized, fully passing the idiosyncratic longevity risk to the sponsor at that point. Investment risk and systemic longevity risk, however, continue to be shared with retirees. If overall returns over the last five years have exceeded 5%, the excess is used to credit an adjustment reserve used to increase the level of benefits. This reserve can also be reduced, but benefit levels cannot be reduced below the level initially calculated at retirement (Villa, 2015[5]).

Pension arrangements where risks are shared collectively among a group of individuals

28. Pension arrangements where risks are shared collectively can eliminate guarantees completely, thereby reducing the cost of providing a pension. Risks that members face are mitigated by sharing them with other participants in the schemes. These types of schemes can be arranged as target benefit schemes, collective individual defined contribution (CIDC) schemes, or tontine-type schemes.

Target benefit schemes

29. Target benefit schemes define a target pension benefit for members based on either a DB-type formula that defines benefits in terms of a percentage of income, or a DC-type formula that defines benefits in terms of a return on contributions. However, these benefits are not guaranteed and can be adjusted when certain conditions are met, typically linked to funding position and any smoothing mechanism that may be in place such as a buffer fund used to reduce volatility or a forbearance period during which target benefits are not adjusted. For these types of plans, investment risk is shared across generations, and idiosyncratic longevity risk is shared among retired members. As the assets in the scheme are managed collectively throughout accumulation and pay-out, the interest rate risk to members is limited. The extent to which these arrangements address inflation risk will depend on the formula used to pay benefits.

30. The collective defined contribution (CDC) schemes in the Netherlands are an example of a target benefit scheme. Target benefits are accrued as in a traditional DB scheme, with benefits accrued each year independent of age. There are no strict rules

around how benefits should be adjusted in the event of a funding shortfall, but adjustments can be made to the indexation of benefits, the level of nominal benefits and/or the accrual rate for active members. CDC schemes in the Netherlands are now moving towards using age-dependent accrual rates and collective buffer funds.

31. Defined ambition DC schemes in Iceland accrue benefits based on age dependent accrual tables and an assumed long term real rate of return. If the asset position differs from the liability position by more than 10%, or by more than 5% for five consecutive years, benefits must be adjusted. These adjustments can affect current rights, current benefits, and sometimes the accrual tables as well.

32. Risk sharing plans were introduced in Japan in 2017, and can accrue target benefits for members based on either a DB-like or DC-like formula. Benefits must be adjusted upward or downward depending on the level of the funding ratio.

33. The shared risk pension plan (SRPP) in New Brunswick relies on the principles of fairness, sustainability, transparency and sound risk management. Target benefits are set based on the contributions that the plan sponsor can afford. Although benefits in these plans are not guaranteed, the plan must demonstrate that there is a 95.5% certainty that base benefits will be paid over 20 years and that there is a 75% chance that indexation will be paid. There must be a clear protocol in place specifying actions to be taken in case of underfunding (Pensions Policy Institute, 2014[6]).

Collective individual defined contribution schemes

34. Collective individual defined contributions schemes resemble individual defined contribution schemes in the accumulation phase, with individual accounts and personalised investment profiles. Investment risk is therefore borne by the individual. During pay-out, assets are managed collectively, which can mitigate the interest rate risk of individuals by keeping the assets invested and potentially investing in higher return assets. Investment risk can potentially be shared across generations if certain mechanisms, such as collective buffers, are put into place. Idiosyncratic longevity risk is pooled among members. The extent to which the individual is exposed to inflation risk will depend on the pattern of drawdown, which can also be tailored to individual preferences.

35. Variable pay-out annuities represent one type of CIDC scheme. At retirement, an assumed interest rate (AIR) is selected that determines the speed of drawdown. The initial benefit is adjusted in each subsequent period to reflect actual investment and/or longevity experience (OECD, 2016[1]).

36. The new Personal Pensions with Risk Sharing and Collective Buffers (PPR-CB) recently introduced in the Netherlands are a type of the variable payout annuity. These products allow flexibility in the choice of the AIR, but cap the risky asset allocation to 25%. Investment returns beyond a certain threshold are put in a collective buffer fund to be paid out when returns are quite negative, reducing the volatility of pension payments and imposing a certain level of intergenerational investment risk sharing (Bovenberg and Nijman, 2018[7]).

Tontine-type schemes

37. Tontine-type schemes are focused on the pay-out phase, and are arranged around a group of individuals that pool their assets in a typically low-risk investment. The value distributed from the pool on regular basis among the members is divided among the surviving members. In this way, when a member passes away there is a gain in value for

remaining members.[3] These gains in value or mortality credits, received from the pooling of longevity risk, are more explicit and transparent than with traditional annuity products. Structures which allow the payments to increase over time will provide protection against inflation risk. However, individuals remain exposed to interest rate risk at the time they enter the scheme at retirement.

38. The classic tontine was introduced in the 17th century. Members enter the pool at the same time. Payments to the pool remain stable over time, so payments to each individual increase as members pass away.

39. Natural tontines are similarly structured as a closed pool, but the investments are made in zero coupon bonds with durations that match the expected survival of the pool. As such, payments to the pool decrease over time but payments to each member are expected to be stable (Milevsky et al., 2018[8]).

40. Rather than dividing payments equally across all members, fair tontines distribute the payments proportionally to each member based on age and investment, eliminating any cross-subsidisation across members. As such, members can enter the pool at any time and at any age. For these, payments will increase with age and will increase in volatility over time. Fair tontine annuities make payments more stable by returning a portion of the initial contribution over time, as with a traditional annuity product (Sabin, 2010[9]).

41. Group self-annuitization schemes are similar to a variable payout annuity, except that investment remains conservative and members have no flexibility around the payment received. The initial payment to each member is based on the actuarially fair annuity payment based on their initial investment. Each subsequent payment is adjusted to reflect the actual investment and mortality experience of the pool (Qiao and Sherris, 2013[10]).

42. The following sections look in detail at the different ways for pension arrangements to mitigate risks for individuals. They describe the risk sharing mechanisms that can be used as well as some advantages, challenges and trade-offs with respect to cost, portability, individual choice, transparency and fairness.

Pension arrangements where risks are fully transferred to a sponsor/provider

43. Various types of pension arrangements exist that fully guarantee the level of pension benefits that individuals will receive, thereby protecting individuals from all investment and longevity risk. The guarantee can be provided by any third party, including an employer or other pension plan sponsor, an insurance company or even the government.

44. As risks are fully guaranteed by the sponsor, there is no risk sharing by members in these types of arrangements apart from the pooling of idiosyncratic longevity risk. The guarantees increase the cost of providing the pensions, as the sponsor will need to ensure that there are sufficient assets to meet the promised benefit payments. Flexibility and portability will also tend to be low, as including this optionality would increase the uncertainty of payments for the sponsors. Individual choice with respect to investment

[3] Assume three people pool 1 million currency units each. The total value of the pool is 3 million. The pool distributes 300 thousand every period. Each receives 100 thousand currency units. If one of the members dies, the other two will receive 150 thousand each. The difference, 50 thousand is the mortality credit in this simple example.

and level of benefits received will also be limited, as this will be managed by the sponsor to optimise funding or solvency levels. This means that the transparency of the underlying asset management tends to be low, even if benefits that individuals will receive are fully transparent. The different types of arrangements differ in the extent to which risks are equally shared among participants of the scheme.

Traditional defined benefit pension arrangements

45. The risks of investment, interest rate, longevity and inflation are fully borne by the plan sponsor for traditional defined benefit pension arrangements. From the perspective of the individual, the certainty and stability of benefits is therefore very high because benefits are guaranteed, and individuals are only exposed to the potential credit risk of the sponsor.

46. Because benefits are fully guaranteed, the sponsor must ensure that they have sufficient assets to back these guarantees and meet the promised pension payments. The cost to the sponsor (typically the employer) of providing such guarantees is reflected in its accounting and funding requirements. IFRS pension accounting standards under IAS 19 require that pension liabilities are fully recognised on the balance sheet on a mark-to-market basis and costs are recognised as profit or loss. These plans are usually also subject to certain minimum funding requirements, though full funding on a solvency basis is not always required and as a result the cost of capital will generally be less than that for an insurance company offering an equivalent guarantee.[4] Nevertheless, the increased recognition and transparency of the value of pension liabilities on the balance sheet has made the cost of these plans more tangible to sponsors. This has contributed to the shift away from DB pensions as employers decide that they do not want to support the cost of providing these types of guarantees.

47. Given that the sponsor has full responsibility for the plan and how benefits are defined, the portability of pension rights is typically limited. As benefits are defined in terms of salary, individuals do not have ownership rights to a specific pot of money, rather they have a right to receive a specific income stream which can be valued using appropriate assumptions regarding longevity and discount rates. Benefits cannot normally be transferred out or withdrawn during the accumulation phase.

48. Individuals will also not typically have much choice in how the assets are managed or benefits are received. Participation is often mandatory or automatic. The investment of assets backing the plan is managed collectively, and individuals are not required to make any investment decisions. These plans can, however, allow the individual to choose a lump sum or an annuity at retirement. Where there is an option for pay-out, the framing of benefits in terms of income can encourage individuals to prefer receiving benefits as an annuity income, protecting them from longevity risk. The annuity option can be further encouraged where it is made the default pay-out, as is the case in the United States.

49. Given the low transparency of plan management for individuals, a key challenge for the good governance of these plans is to ensure that the investment and funding decisions made for the plan are in the best interest of plan members.[5] They must

[4] See DAF/AS/PEN/WD(2017)1 for a more detailed overview of the accounting and solvency treatment of defined benefit plans.

[5] See OECD Core Principle 3 of Private Pension Regulation.

appropriately balance the conflicting aims of increased security of benefits and increased profitability of the sponsor.

50. While pension benefits are guaranteed and defined at an individual level, the distribution of risk and reward within the plan is not necessarily evenly distributed among the members, with younger generations typically more exposed to risk. To the extent contributions are independent of age, contributions for younger members will partially finance the benefits accrued by older members whose accrued benefits are worth more in present value terms because they are closer to retirement. Also, younger generations are more likely to be penalised for the cost realised by older generation linked, for example, to higher than expected longevity. Additional contributions needed to improve plan funding may impact the profitability of the employer and the potential for wage increases. Allowing for longer recovery periods to achieve adequate funding levels may also penalise younger generations whose benefits would remain less certain in the long term. In the event that poor plan funding makes it impossible to pay future pension obligations, there may be a preference to cut the benefits of future pensioners rather than current pensioners, also penalising younger generations.

51. Because of the cross-subsidisation of contributions by younger members to pay for the benefits accrued by older members, funding concerns may arise if the demographics of members become more skewed to older ages. This could happen as schemes close to new members. This will also increase the cash flow mismatch for the scheme, and result in less ability to invest in return-seeking assets, making it more difficult to achieve full funding. This would put the benefits of younger members left in the scheme at a greater risk of not being paid.

Traditional annuity products[6]

52. Traditional annuity products can fully protect the individual from longevity, investment and inflation risks. They guarantee a specific income for life that can be level in nominal terms, change by a pre-defined rate over time or be indexed to inflation. They can easily be integrated with a defined contribution pension arrangement to fully transfer the risk from the individual to the annuity provider in the pay-out phase only, as with immediate annuities, or beginning in the accumulation phase with a phased purchase of a deferred annuity. Phased purchase would help to mitigate the interest rate risk for individuals.

53. The cost of providing these products is one of the main challenges for their use. This is largely driven by the cost of holding capital for reserving and solvency requirements that intend to ensure that there will be sufficient assets to meet payment obligations, even in the event of adverse investment experience or higher-than-expected longevity. Recent low interest rates have pushed prices up further, and annuity products are widely perceived as offering poor value by the public and media.

54. Once purchased, traditional annuity products offer very little portability and the individual relinquishes any claim on the assets underlying the contract. While some contracts do offer the possibility of surrendering the contract, this option will always come at an additional cost to the individual.

[6] See (OECD, 2016[1]) for a more detailed discussion of these products. Here traditional annuity products refer to fixed payment products and inflation-indexed annuities.

55. Individuals can typically have the choice to purchase an annuity, but once purchased the annuity product itself removes the need for any individual decision-making for how assets are invested or pensions paid. However, where their purchase is voluntary annuities can be a hard sell because the decision to purchase an annuity is fraught with behavioural barriers. Some of these include loss aversion, as consumers would not get their premium returned if they die sooner than expected, and present bias and hyperbolic discounting, which makes consumers reluctant to give up a large sum today for future financial benefit. The phased purchase of annuity products can mitigate these biases, as the annuity product would be purchased gradually over time. Framing the option of an annuity as a guaranteed stream of income can also nudge preferences towards annuities.

56. The benefits received from traditional annuity products are fully transparent to individuals, as they know in advance what they will be receiving. However, asset management is the provider's responsibility is not generally disclosed to individuals.

57. The extent to which members of this pool bear the shared idiosyncratic longevity risk equally will depend on how the annuity provider has segmented the population for pricing purposes. At a given price, those with shorter life expectancies will implicitly subsidize the incomes for those with longer life expectancies. Segmenting the population according to criteria by which life expectancy varies - such as gender, health, or socioeconomic status - will reduce these cross-subsidies.

Longevity insurance

58. The purpose of longevity insurance is to provide a guaranteed income for life beginning at an advanced age beyond retirement (e.g. from age 80 or 90) in order to protect individuals from the tail end of longevity risk. As such, it is meant to be a complement to a drawdown strategy during the early years of retirement. Longevity risk and investment risk at advanced ages only is fully transferred to a third party, and payments could also be linked to inflation to maintain the individual's purchasing power. If purchased at retirement, individuals remain exposed to the interest rate risk, but the phased purchase of this insurance could help to mitigate this risk.

59. Such a design could take one of several forms, and the provider of this insurance could be an insurance company, a centralised institution or the government itself. Insurer-provided forms of longevity insurance, referred to as Advanced Life Deferred Annuities (ALDAs) in OECD (2016[1]), tend to be purchased with a single premium at retirement to begin payments at a later date.[7] Blake (2016) suggests a variation on this product, Retirement Income Insurance (RII). Instead of guaranteeing payments to begin at a certain age, the RII would begin payments in the event that drawdown assets are exhausted.

60. Alternative structures have been proposed in Latin America as a way to increase the level of pensions taken from individual accounts while protecting individuals from outliving their assets. These proposals involve diverting a portion of the regular pension contribution for active individuals to fund this insurance, which could begin payments at an advanced age such as 85 or at the age of the average life expectancy of a retiree (Berstein, Morales and Puente, 2015[11]), (Larrain, 2014[12]). With this insurance in place, at retirement the balance of the individual account could be used to purchase a fixed term

[7] This is an option suggested in *The OECD Roadmap for the Good Design of Defined Contribution Pension Plans*.

annuity, or regular withdrawals could be taken from the account between the retirement age and the age at which the insurance would begin payments. These amounts would be based on a truncated life table rather than a full life table, which would automatically increase the calculated payments. This insurance could either be managed through a private entity or the state.

61. Longevity insurance can be significantly cheaper than a traditional annuity product providing a comparable level of income because it benefits more from the mortality credits - the subsidisation of the payments from those who survive by those who don't - that are higher late in life. Berstein et al. (2015) estimate that the cost of providing 70% of the current initial pension payment beginning at age 85 would only cost 1-1.5% of salary over 45 years.[8] Having this structure in place in Chile would result in an increase in the annuity income able to be purchased at retirement of around 15%, and an increase of the initial programmed withdrawal by 20-25% (Berstein, Morales and Puente, 2015[11]).

62. Nevertheless, the ultimate cost of the provision of longevity insurance will depend heavily on the institution providing this insurance and the regulatory requirements in place. The longevity risk borne by the provider of these products - and the inflation risk to the extent that payments are indexed - can be significant due to the greater uncertainty around assumptions at older ages and for durations very far in the future. As a result, combined with the lack of instruments to hedge these risks, solvency capital requirements may be prohibitive (Blake and Turner, 2014[13]). This is one reason that it may be more efficient for the state to provide longevity insurance as part the non-contributory pension benefits.

63. In principle, this type of structure would not offer any portability or choice in terms of how payments from the longevity insurance would be received, though there is room for flexibility in how a pension is taken during the first part of retirement and at what age the payments from the longevity insurance would begin. There may also be potential for flexibility to opt-out of the insurance at retirement and have the contributions reimbursed if certain conditions are met, for example poor health.

64. As with traditional annuity products, expected benefits are fully transparent for individuals, but how assets are managed to ensure that those benefits are paid is not.

65. Longevity insurance presents the same cross-subsidization from those with low life expectancies to those with high life expectancies as traditional annuities, though this subsidization may be amplified because the insurance only benefits those who survive to a very old age. Nevertheless, it can be argued that the utility of such insurance could still be higher for low income people who have lower life expectancies, because these people are not well positioned to protect themselves from falling into poverty in old age if they do happen to have a long life. Other transfers could be from single to married retirees where the insurance continues to pay survivors. Additionally, linking the insurance to the life expectancy at retirement by gender could potentially increase the gender gap (Ballesteros, 2015[14]).

[8] Based on analysis for Chile, Colombia, Mexico and Peru.

Pension arrangements where risks are shared with a sponsor/provider

66. The cost of providing a pension can be reduced by sharing the investment, inflation and/or longevity risks between the sponsor/provider of the pension and the individual. This is done by offering a lower level of guarantee and allowing for some uncertainty around the actual benefit level. Annuities with a minimum income guarantee offering lower guarantees than traditional products can provide a minimum level of certainty with the potential to increase pension payments if investment and longevity experience is better than expected. Hybrid defined benefit schemes offer more flexibility in how benefits are accrued and paid, making it easier to achieve adequate funding levels.

67. The flexibility that these types of plans offer in terms of portability and individual choice depend largely on the specific design.

68. The transparency of these types of plans is one of the biggest challenges. The formula that is used to calculate the benefit payment can be complex and opaque and individuals may have a hard time understanding the actual benefit that they can expect to receive and the risk that it could be below expectations.

69. The extent to which risks are fairly distributed among participants will depend largely on the underlying risk sharing mechanisms used and the plan design.

Annuities with a minimum income guarantee[9]

70. These types of schemes offer a minimum guaranteed level of income with the potential - and expectation - for higher payments to be made if investment and/or longevity experience allow for it. The underlying risk-sharing mechanism and the way in which the additional upside potential is calculated and distributed can be done either on an individual or a collective basis, and can cover the accumulation period, the pay-out period, or both.

71. Schemes for which increased pension payments are calculated at an individual basis share the investment risk between the individual and the provider. These typically take the form of an individual retirement savings account, though the account itself may be notional and investments are not necessarily self-directed. For these types of products, the minimum income guarantee is typically derived based on a minimum return on the premium or contributions paid which can be a fixed level or based on some referenced rate of return (indexed or actual). This type of scheme includes retirement savings products guaranteed income options (OECD, 2016[1]). The potential for additional upside for these products is defined during the accumulation phase if investment returns are greater than the guaranteed minimum, though some variable annuity products offer the potential for an increase of the guaranteed lifetime withdrawal benefit during the pay-out phase as well.[10]

72. Schemes for which increased pension payments are calculated at a collective level can share both investment and longevity risks between the provider and the individual. These typically involve the management of a collective buffer reserve fund that

[9] See (OECD, 2016[1]) for a more detailed discussion of these products. Here annuities with a minimum income guarantee refer to participating annuities and retirement savings products with guaranteed income options.

[10] These types of schemes can also be converted into a traditional annuity product at retirement.

distributes additional payments in the pay-out phase if investment returns have been sufficient, which also imposes risk-sharing across generations of participants. These collective funds can either be funded through a proportion of contributions or through investment returns exceeding a certain threshold. The ATP in Denmark takes the former approach, with 80% of the contributions going towards the purchase of a deferred fixed payment annuity (nominal), and the remaining 20% invested in a collective fund in return-seeking assets that is used to provide conditional indexation if the funding ratio is high enough (Bonenkamp et al., 2014[15]). Traditional life products in Sweden are structured similarly, with the provider guaranteeing a deferred fixed annuity and offering the indexation of payments conditionally depending on the funding level (Bovenberg, Cox and Lundbergh, 2015[2]). With the same objective of smoothing payments, with profits policies in the United Kingdom hold back bonus payments in periods of good returns to be paid in periods of poor returns in order to provide more stability of pension payments. As an alternative to risk sharing based only on underlying returns on investment, participating life annuities in Germany base the bonus calculation on the overall profitability realised by the annuity portfolio, so both investment and longevity risks are shared with the provider.

73. In exchange for accepting more uncertainty around the ultimate pension payment that will be received, the cost of these types of annuities should be less than traditional annuity products that provide a similar level of expected income. This is largely driven by the reduction in the costs of capital, to the extent that capital requirements are calculated only for the guaranteed portion of income.[11] These types of products can also offer the potential for individuals to receive higher payments than they otherwise would have. One reason for this is the ability to invest more in return-seeking assets.

74. Another advantage of these types of structures is that it possible to calculate individual rights, at least for the hard guarantees, and therefore these rights can be portable during the accumulation phase. Individuals have the option to change providers during the accumulation phase for both Riester plans in Germany and traditional life products in Sweden, with the latter transfer value including both guaranteed and conditional rights. Retirement savings products with guaranteed income options also generally allow access to the underlying capital during the accumulation phase, and withdrawals can be made with a corresponding reduction of the future guarantee.

75. Individuals can have the choice of how assets are invested to the extent that bonuses are calculated on an individual level. Investment choice for collectively managed schemes, however, remains limited as assets are generally managed on a collective basis.

76. The transparency of the calculations of bonus payments from these types of arrangements is one of the biggest challenges they face. The calculation of the underlying pension benefit and how any collective buffer is distributed to members is not always clear. Where the decision is not completely objective and based on the decision of a board, a strong governance structure and full accountability is needed. The lack of transparency and accountability for with profits policies in the United Kingdom, for example, contributed to the reputational harm of the providers who were accused of holding back excess funds that should have been paid to members.

[11] This is not always the case, however, where products offer generous guarantees, as variable annuity products have in the past.

77. The lack of transparency and complexity of calculations can also make communication of how the payments are calculated difficult. The poor reputation of with profits policies in the United Kingdom can partly be blamed on the communication of expected income from these products, which was based on high returns of a strong bull market. The financial shocks in the 2000s resulted in actual payments that were significantly lower than what individuals had been expecting, and the reputation of the providers suffered as a result. Communication is also a challenge for traditional life products in Sweden, where differences in the measures used for solvency and those used to calculate the bonus payments can result in pensions being cut in years with good returns if the liability value increases more than the asset value because of lower interest rates (Bovenberg, Cox and Lundbergh, 2015[2]).

78. Schemes for which additional payments are calculated on a collective basis result in more risk-sharing among participants than those managed at the individual level, and risks may not be shared equally across generations. The rules of how additional payments are calculated, however, will drive the direction of this transfer. The Swedish model, for example, results in upsides that are shared equally across generations, but the downside impacts pensioners more because their benefits are cut. Furthermore, the older generations benefited more from higher non-guaranteed benefits relative to the guaranteed ones, whereas returns on these products for younger cohorts are much closer to the guaranteed rate, so older generations are effectively helping to fund the hard guarantees for younger generations by reductions to their non-guaranteed pensions (Bovenberg, Cox and Lundbergh, 2015[2]). This risk transfer could go in the other direction where the collective buffer is used for smoothing income payments, to the extent that the reserve fund becomes depleted and younger generations will be expected to build it back up. Mandatory participation in these types of schemes, as is the case for the ATP in Denmark, can be useful to enforce intergenerational risk sharing and maintain the participation of younger cohorts. The implementation of schemes using a collective buffer fund may also be more likely to penalise the initial cohorts. Such a fund would require some time to build up sufficient assets to be used to distribute to members. This could be exposed to significant sequencing risk in the event that the plan begins at a moment before a market downturn, which could prologue this process.

Hybrid defined benefit plans

79. There are three types of hybrid defined benefit plans that share risk between the sponsor and the member: conditional benefit plans, cash balance plans, and floor/underpin plans (Pugh and Yermo, 2008[16]).[12] Each of these types of plans utilise different risk sharing mechanisms to share the risk between members and the sponsor.

80. Conditional benefit plans can share investment, longevity and/or inflation risk with members by linking the actual benefit paid to the funding status of the plan. The Ontario Teachers' Pension Plan is one example of a conditional benefit plan that shares only inflation risk with members. The indexation of pension benefits is conditional on the funding position of the plan.

81. Cash balance plans can share investment risk with members during the accumulation phase to the extent that the contributions are credited with a return that is

[12] Pugh and Yermo (2008) also identify nursery plans that are not discussed here, because they are simply a pure DC plan at younger ages and a traditional DB plan at older ones.

linked to prevailing market variables. Once these plans are converted into a life annuity, however, all risks are then transferred to the sponsor.

82. Floor /underpin plans demonstrate less risk sharing than the other two types of hybrid DB plans, but can allow for sponsors to benefit if the plan is well managed. The Wisconsin hybrid plan allows the provider to keep investment returns that are higher than expected during the accumulation phase. In the pay-out phase, investment, inflation and systemic longevity risk is shared with pensioners. If investment and longevity experience has been poor, benefits can be reduced to their initial level at the point of retirement.

83. Hybrid DB plans largely resemble annuities with a minimum income guarantee in terms of how risks are shared between the provider and the individual and in terms the ultimate benefits paid to individuals. Nevertheless, there are some subtle features which can differentiate how these schemes are managed. The first is the regulatory framework governing the scheme. Annuity-type structures described in the previous section are governed by an insurance regulatory framework, which usually requires certain reserving and solvency capital requirements that can impact the cost of the scheme and the ability to pay bonuses. Hybrid DB plans are governed under a pension regulatory framework, with funding requirements and recovery periods that can be less severe than those required under the insurance regulation. The second difference is how benefits are framed. The expected benefits from the schemes for the annuities with a minimum income guarantee are framed as a minimum plus an expected bonus, and liabilities are usually valued considering only the hard guarantees. The expected benefits from hybrid DB plans are framed assuming that all conditional benefits will be paid, and liabilities are valued with this assumption. These differences can impact the underlying investment policies and decisions around how benefits will be paid.

84. To the extent that funding requirements for these types of schemes are lower than solvency capital requirements of insurance-type structures, hybrid DB plans may be less costly to operate. Nevertheless, including any soft guarantees in the liability valuation for conditional benefit plans in particular will result in a relatively lower funding ratio. The allowance for conditional benefits can reduce the need for additional contributions by the sponsor in the event of poor investment performance of the plan assets.

85. The valuation of benefits in terms of an account value with cash balance plans and floor/underpin plans imply that these types of plans could easily offer more portability than traditional defined benefit plans.

86. As with traditional defined benefit schemes, hybrid plans encourage and facilitate participation through the limitation of individual choice. Here again, participation is often mandatory or automatic, and asset management is done at a collective level. However, framing the benefits in terms of accumulated capital rather than an income amount may not encourage individuals to choose a lifetime annuity where the option is given, and will thus suffer the same challenge of uptake as traditional annuity products.

87. The benefits that will be received from hybrid DB plans are not necessarily known in advance, so the way in which benefits will ultimately be calculated needs to be made transparent to members. Where benefits are conditional, the clear communication of the potential for benefit adjustments and transparency of the process in which to do so is important.

88. The extent to which risks are borne equally across generations varies depending on the type of hybrid DB plan. For conditional benefit and floor/underpin plans relying on DB-like accrual formulas independent of age, the contributions of younger cohorts serve

to fund benefits accrued by older ones, The notional account approach taken by cash balance plans presents an actuarially fair link between contributions made and ultimate pension benefits received, resulting in more intergenerational equity.

Pension arrangements where risks are shared collectively among a group of individuals

89. Pension arrangements where risks are shared collectively among a group of individuals rely on the collective pooling of risk with the aim to provide a lifetime income in retirement. The elimination of any guarantee also eliminates the need to hold capital to back those guarantees, thereby reducing the cost of these types of arrangements. However, as no minimum guarantee is offered, pensioners can be subject to increased uncertainty around the level of benefits. These types of schemes can be organised as target benefit schemes, collective individual defined contribution schemes, or structured as tontine-type plans.

90. The collective management of these types of schemes implies that portability is more difficult as the calculation of individual rights is less clear, though it can still be possible to leave the schemes during the accumulation phase.

91. The collective management of assets also limits the choice that individuals have with respect to investment and speed of drawdown. However, collective individual defined contribution plans can offer some flexibility around both of these aspects.

92. The transparency of these schemes and ensuring that members understand how their benefits are calculated and the potential for benefits to be reduced is a significant challenge. Strong governance needs to be in place to ensure that adjustments are made in an objective and fair manner and in order to maintain the trust and confidence of members that they are being treated fairly.

93. Intergenerational fairness tends to be another big challenge for these types of schemes, as depending on the underlying risk sharing mechanism used there can be significant risk sharing across generations. Careful plan design, however, can improve intergenerational equity.

Target benefit schemes

94. Target benefit schemes, as defined here, are those that define an expected pension but do not offer guarantees and that manage the plan assets on a collective basis. These plans tend to go by many different names, including defined ambition (DA), collective defined contribution (CDC) and shared risk pension plans (SRPP). There is no well agreed upon definition for these types of schemes.[13]

95. Investment, interest rate, inflation and longevity risks for these plans are mitigated only through the pooling with other members and appropriate governance and investment policies. Beyond this broad definition, the features of target benefit schemes can vary widely in terms of how benefits are defined and how risks are distributed.

[13] Some observers include the hybrid-type schemes of conditional benefits with these types of plans, which this report classifies as a pension arrangement where risks are shared between the sponsor/provider and member.

96. The target benefit can be defined in terms of an expected benefit or in terms of the expected outcome from a given contribution. CDC plans in the Netherlands typically take the first approach, and define a benefit accrual rate in terms of the proportion of average salary that the member will earn from an annual contribution, equivalent to how benefits are accrued under traditional DB plans. Contribution rates are then set to meet this objective. Risk sharing plans recently introduced in Japan also take this approach. DC plans in Iceland and SRPP in Canada take the opposite approach, where contribution levels are defined in advance and determine the target benefit that can be accrued.

97. The link between contributions made and target benefits earned can also differ, which will influence the extent to which risks are shared across generations. The Netherlands takes an average premium approach, with every member earning the same benefit for a given contribution regardless of age. This implies that the younger cohorts are earning less benefit per contribution than older cohorts because their contributions will accumulate for a longer period of time, so there is a certain level of cross-subsidization. The approach of Iceland, where benefits are calculated based on an assumed return for a given age, implies that the cost of the benefit earned is actuarially fair and there is no cross-subsidization across ages. The choice between the approaches reflects a choice in how fairness is defined, and whether it is desirable to have equality in terms of benefits earned or equality in terms of contributions made.

98. In the event that plan assets are not adequate to meet the targeted pension payments, the adjustment of benefits can be defined through an adjustment to the indexation of pensions in payment, to the nominal level of pensions in payment, or to the benefit accrual rate for active members. The order and magnitude of the adjustments to each of these variables will determine who bears the risk of inadequate funding and whether this risk is borne equally across all plan members. It could be preferable for this to not be the case, for example there could be no benefit cuts for the eldest pensioners with larger cuts for active contributors who have a longer period to make up funding levels. In some cases, other adjustments could be made to improve the funding position, such as modifying contribution rates or retirement age. Some plans can also increase targeted benefits if funding levels are better than expected, whereas for others the member cannot receive more than the target benefits, and any excess is kept in fund.

99. Benefit adjustments from changes in funding levels do not necessarily need to be immediately reflected, and can be delayed through mechanisms such as a funding corridor, forbearance periods, or buffer funds. These features can allow for full target pensions to be paid even if the scheme is in deficit. Funding corridors allow for the target pension to be paid as long as the funding ratio remains within a certain range, such as between 90% and 110%. This limits the need to make benefit adjustments as a result of normal market fluctuations. A forbearance period would define the amount of time that target pensions will still be paid for a plan in deficit before benefits are cut. This period of time could vary depending on the level of deficit. Collective buffer funds can be built up through plan surpluses to be used to fund the target pension during periods of underfunding. While it can be argued that buffer funds are not economically optimal because they reduce the overall expected benefit, there is still value in promoting more stability of pension benefits to help retain confidence and trust in the system, which could be eroded through increased uncertainty.

100. Longevity risk sharing could be among all members or restricted to the pay-out phase or more advanced ages where mortality credits are higher. Sharing among all members could result in more stable retirement income by trading this risk across

generations (Bovenberg and Nijman, 2018[7]). However, restricting this risk sharing to the pay-out phase avoids intergenerational conflicts. Plans could also create more homogeneous pools for sharing longevity risk in order to avoid undesirable cross-subsidies from, for example, males to females or low income to high income.

101. These types of schemes can result in higher pensions coming from both higher investment returns in accumulation and lower costs. The main driver for the higher potential pension benefits in target benefit schemes compared to individual DC schemes is that the collective asset management and intergenerational risk sharing removes the need for the fund to de-risk as retirement approaches, mitigating the interest rate risk for members. Furthermore, the collective management benefits from economies of scale and reduces the cost of investments. Members can therefore expect that the fund will experience higher net returns on average compared to the typical life-cycle investment strategy for individual DC plans. Some estimates put the resulting increase in pension benefits at 30% (Blake, 2016[3]). While longevity swaps or group annuities could in theory be integrated in the investment policy of the plan to hedge longevity risk, this would reduce some of the potential upside of higher benefits for members (Wesbroom et al., 2013[17]). In addition to cost savings through economies of scale, plan sponsors can avoid negative impacts to their balance sheet from funding deficits. Indeed, the accounting treatment of traditional defined benefit schemes was one driver of the introduction of CDC type pension plans in the Netherlands. Furthermore, as the benefits are not guaranteed, sponsors can avoid the cost of solvency buffers (Bovenberg, Mehkopf and Nijman, 2014[18]).

102. While the intent of these types of schemes is lifetime participation over both the accumulation and pay-out phase, it is possible to allow individuals to enter and leave the plan during the accumulation phase and take their money and/or change schemes. Transfer values can be based on a claim on the assets equal to the proportional interest that the member has accrued in the scheme relative to the interest of all members. SSRP in New Brunswick take an alternative approach, allowing the member to withdraw the maximum of their own contributions accumulated at actual investment returns of the scheme, or the value of the accrued benefits multiplied by the funding level of the plan (Blake, 2016[3]). Transfers out could be allowed up to and at the point of retirement. Allowing transfers out of the fund during pay-out, however, would erode the benefits of longevity risk pooling as those who expect to have shorter lives would withdraw from the scheme. For the longevity risk pooling to be effective, members must forfeit their claim on assets upon death and any excess assets remain in the scheme.

103. The collective management of the scheme means that there is no need for individuals to make decisions regarding how their contributions are invested or pensions paid, reducing the risk of poor financial decisions. Benefits are framed in terms of expected pension, rather than accumulated capital, enforcing the goal of the scheme to provide an income in retirement to members.

104. The complexity of the risk sharing mechanisms in these types of schemes makes the transparency communication to members regarding expected benefits extremely challenging, as the case of the Netherlands has shown. In the Netherlands, the CDC schemes were born out of a traditional DB culture, and for legal and communicative purposes CDC plans are treated as DB. As such members did not fully understand the risk that benefits could be cut, the benefit reductions that were necessary following the financial crisis led to a loss of confidence in the pension system. Furthermore, the risk

sharing process is not transparent, and there are no hard rules around how benefits should be adjusted, only loose guidance (Bovenberg and Nijman, 2009[19]).

105. The complexity of these schemes also means that strong plan governance and the accountability of trustees is essential to maintaining transparency and confidence in the system. Making benefit adjustments that are fair to all members is very difficult, and the technical nature of the topic requires high levels of knowledge and competence from trustees. Requiring that all decisions are made completely transparent to the public would make it easier to hold the trustees accountable. Even if plan members themselves are not able to completely understand the technicalities of the decisions made, other observers in the pension field would be able to check and validate that appropriate decisions are being made.

106. The nature of this type of scheme relies on risk sharing across all members, and across generations, with some gaining more than they otherwise would have and some losing. Nevertheless, the extent to which these schemes involve intergenerational risk sharing depends on the design of the plan, and care must be taken to ensure that participation in the scheme is not viewed as unfair for certain members, particularly younger members, who may then not be willing to participate in the scheme.

107. Mechanisms which will increase intergenerational risk sharing include average premiums, buffer funds and forbearance periods. The average premium approach, where the same pension rights are earned for a given contribution independently of age, results in a generational transfer from younger to older generations. This feature has presented a challenge in the Netherlands, where these schemes are increasingly being viewed as unfair to younger cohorts. This view is enforced also by the increased flexibility of labour markets. If younger individuals stop contributing because they become self-employed, for example, they will have put into the scheme much more than they can expect to receive. Buffer funds will also increase intergenerational risk sharing, holding back high investment returns for some cohorts to be shared with those who experience low investment returns. If the buffer fund becomes depleted, younger generations may no longer be willing to participate because they would be taxed upfront on their contributions to replenish the buffer fund. Longer forbearance periods also result in a risk transfer from the young to the old, as contributions from active members will go to fund the target pension benefits even if the plan is in deficit.

108. There is a clear trade-off to be made between low risk sharing, which benefits the active generations, and high risk sharing that benefits retirees (Bams, Schotman and Tyagi, 2016[20]). To avoid the perception of risk-sharing as inequitable for some members, these schemes may need to be designed in a way that limits this intergenerational risk sharing to a certain degree. Actuarially fair accrual rates which vary by age, as opposed to the average premium approach, would limit the cross-subsidisation by the young to the old in terms of the contributions they make. With respect to buffer funds, limits regarding the maximum size of the buffer and not allowing it to be negative will also reduce the intergenerational risk transfer from these mechanisms. Importantly, however, there needs to be a clear and fair formula for benefit adjustments in terms of order and magnitude. One of the key principles of the SRPP plans in New Brunswick, for example, is that the plan must be equitably designed, with no single age cohort unduly subsidizing another, and there is a clear sequence of actions to take when the plans funding position changes (Pensions Policy Institute, 2014[6]).

109. The feasibility of a conversion of traditional DB plans to a target benefit scheme may depend on the regulatory framework in place. The introduction of target benefits

schemes in the Netherlands resulted from a conversion of the existing traditional DB plans. Current legislation in the United Kingdom could be a barrier to such a conversion as accrued benefits are guaranteed by law, and cannot be adjusted (Blake, 2016[3]). Starting a target benefit scheme from scratch is another option. An initial reserve fund is not necessarily needed, but could be useful to cover start-up costs and provide for the benefits of scale (Blake, 2016[3]).

Collective individual defined contribution schemes

110. Collective individual defined contribution (CIDC) schemes restrict risk sharing to the pay-out phase. These types of plans largely resemble individual DC plans, and investment, insurance and pay-out features can be tailored to individual preferences. As such, they define individual rights more clearly than target benefit plans, and there is not necessarily a target benefit or fixed contribution defined in advance. As with target benefit schemes, however, some portion of the assets in CIDC schemes are managed on a collective basis.

111. As with target benefit schemes, CIDC schemes can result in higher pensions than individual DC schemes due to higher investment returns and lower cost. While a higher level of investment de-risking leading up to retirement will be necessary compared to target benefit schemes, the collective management of assets and the pooling of longevity during the pay-out phase imply that more investment risk can be taken compared to pure individual accounts where the individual fully bears all risks. Asset management for these plans can be done fully on a collective basis, or incorporate collective elements such as a buffer fund or insurance. In theory, these types of schemes could be organised fully in a self-directed DC plan during the accumulation phase, and convert to a collectively managed pool of assets for the drawdown phase. Alternatively, assets could be managed collectively throughout both the accumulation and pay-out phase, while still allowing for some personalisation with respect to investment risk profile.

112. As there are no guarantees for CIDC, no solvency buffer needs to be held for these types of plans, representing a cost savings compared to guaranteed schemes. Furthermore, the plans benefit from the cost savings from scale due to the collective management of assets.

113. Individual property rights for CIDC is very clear during the accumulation phase, as members hold individual accounts, so these plans lend themselves easily to portability. To the extent that risk sharing is restricted to the pay-out phase, flexibility around withdrawals up to the point of retirement could be allowed for. However, where intergenerational risk sharing mechanisms like collective buffers are imposed, participation may need to be mandatory in order to ensure that younger generations will participate even if the buffer is low.

114. CIDC schemes allow for more individual choice in terms of the choice of investment and speed of pay-out compared to other types of schemes. This freedom exposes members to an increased risk of making poor financial decisions. In contrast to target benefit schemes, the framing of the account value in terms of capital rather than income may result in a reluctance to draw down assets at an appropriate rate because the account value will be decreasing over time (Bovenberg and Nijman, 2018[7]). Alternatively, individuals could be subject to present bias in their selection of the AIR, preferring a higher income in the near term to more stable income in the longer term. Cultural norms may also play a role in the preference for these types of schemes compared to the more collective target benefit schemes. The Netherlands, for example,

has a culture of intergenerational solidarity that may be lacking in the United Kingdom. This could lead the United Kingdom to prefer CIDC plans over target benefit schemes (Blake, 2016[3]).

115. Even if these schemes are individualised, and therefore more transparent, their collective nature still requires a strong governance structure to be in place. While individuals are allowed to make more personalised decisions for these types of plans, the collective management of assets requires a certain level of fiduciary duty in deciding what options are available to them and make sure they are appropriate. Rules around how any collective buffer is built up and used will also need to be made clear and transparent to avoid any perception of unfairness.

116. CIDC schemes result in more intergenerational equity than target benefit schemes as the risk sharing for these plans is more limited compared to other types of pension arrangements. Longevity risk-sharing is restricted to the pay-out phase and not shared across cohorts, and investment risk is only shared across generations where collective buffers are imposed.

117. Equity issues would need to be addressed, however, in transitioning existing arrangement to CIDC. The Netherlands is increasingly discussing moving away from CDC plans towards CIDC plans. However, the valuation of the DB entitlement would need to address individual funding imbalances and the gap between book and market values (Bovenberg and Nijman, 2018[7]). The transition would imply that the implicit debt and cross-subsidization from older to younger generations would need to be paid off. However, if DB rights are converted concurrently with a shift to actuarially fair contributions, generational differences could be somewhat offset (Bovenberg and Nijman, 2018[7]). With this type of transition, the older generation would gain from the former and the younger generation from the latter.

Tontine-type schemes

118. The basic premise of a tontine structure is that the assets of a deceased member in a pool of individuals are divided among the surviving members, thus making the monetary value of these mortality credits explicit and more transparent. The focus of these types of schemes is purely on the pay-out phase rather than the accumulation phase.[14] Compared to other types of schemes that pool risks among members, the underlying investments of these schemes tend to be low-risk and the formula for re-allocating the value of the accounts of deceased members tends to be more transparent. This also implies little flexibility in the amount or pattern of payments that will be received, because an increase in investment risk and/or flexibility around the speed of drawdown would reduce the transparency of the mortality credits received.[15]

119. To the extent that the tontine-type structure is limited to those that take little to no investment risk, the primary risk-sharing mechanism is that of the pooling of idiosyncratic longevity risk. However, members may be exposed to reinvestment risk where long-maturity bonds are not available. The original Lorenzo tontine, with its increasing payments over time, could be seen as a hedge against hyper-inflation (Milevsky et al., 2018[8]). But even the stable tontine structure, such as the natural tontine, may also be a partial hedge against inflation given the observed historical correlation

[14] Though in theory the initial investment could be received in advance, as with a deferred annuity.

[15] Such structures could exist, but could be seen more as CIDC structures or CIDC-tontine hybrids.

between inflation and mortality (Milevsky et al., 2018[8]). As with immediate annuities, though, individuals still bear the investment risk of retiring when interest rates are low, thereby receiving a lower expected income.

120. More modern proposals for tontine structures aim to replicate a life annuity with a more stable pay-out rather than one that increases exponentially over time. This can be done through the investment strategy or alternatively by gradually returning a portion of the initial investment, similar to calculating the pay-out of a life annuity. A natural tontine would invest in zero coupon bonds with an expected pay-out following the expected survival, so cash flows from the investment would fall over time along with the reduction in the number of members (Milevsky et al., 2018[8]). The pay-out from a Group Self Annuitisation (GSA) scheme calculates the initial pay-out based on an annuity factor, which is subsequently adjusted to reflect actual mortality and investment experience (Piggott, Valdez and Detzel, 2005[21]). Unlike CIDC products, these structures are designed to take little to no investment risk, with investment being primarily in risk free bonds.[16]

121. Allowing members of these schemes to join at any age would involve a transfer from older individuals to younger individuals, as the younger ones will be expected to live longer and will therefore receive more pay-outs from the fund. In a closed scheme, this issue could be addressed either by requiring that all members are of the same cohort or by providing a larger portion of the payment to older individuals. The fair tontine takes the latter approach, calculating equitable payments to each member as a function of assets in the pool and age (Sabin, 2010[9]).[17]

122. Nevertheless, as the expected mortality of the membership increases over time in a closed scheme, so will the volatility of the payments. This could be addressed by allowing for the fund to be open. To the extent that individuals tend to enter the scheme around the same age, say around retirement age, the transfer of wealth from older to younger cohorts would be offset so long as the scheme continued to receive new members (Qiao and Sherris, 2013[10]).

123. The risk-sharing mechanisms and pension outcomes from tontine-type structures can operate with a surprisingly low number of members. Fair Tontine Annuities could outperform annuities for everyone surviving at least 10 years for a pool of only a few hundred members, and for those surviving at least 5 years if the pool size increased to a few thousand (Sabin, 2010[9]). Nevertheless, the volatility of payments increases as the membership pool shrinks. For Group Self Annuitization schemes, pooling benefits do not significantly improve beyond only 1000 participants (Qiao and Sherris, 2013[10]).

124. The expected cost of a tontine scheme should be lower than that of a traditional annuity product with the same expected pay-out. A tontine designed to mimic the payments of a life annuity should have an expected pay-out greater than the life annuity providing guaranteed payments because no solvency buffer would be required to back the longevity risk, though there may still need to be some provision for operational and/or

[16] As very long duration bonds are not widely available, however, there will still be some exposure to reinvestment risk.

[17] The design of the fair tontine can also be extended to allow for individual investment risk-profiles by increasing the payment for individuals having accumulated more assets (Sabin, 2010[9]). Given the flexibility and investment focus of this design, however, it could be viewed more as a CDIC scheme rather than a tontine-type scheme.

credit risk (Milevsky et al., 2018[8]). As the allocation and distribution of payments should be relatively simple, only a centralised administration system is needed to manage such a scheme. Where the scheme is operated on a for profit basis, however, there could also be additional costs relating to the dividends to be paid to shareholders (Milevsky et al., 2018[8]).

125. Portability is limited for tontine-type structures. While a member's rights within the scheme can be clearly defined, there is no flexibility around leaving the scheme once joined, as the longevity sharing principle on which tontines are based imply that members must join for life.

126. Tontine-type schemes also limit the individual choice of members. The risk-free and transparent nature of tontines implies that little flexibility should be allowed in terms of investment risk or pattern of payments received. Nevertheless, the choice to enter a tontine-type scheme could be appealing to individuals. An annuity-like structure which is able to make the benefits of mortality risk pooling more clear to individuals could help to overcome the reluctance to purchase annuity products. Furthermore, the outcomes from basic tontine structures tend to be positively skewed, which could lead to a preference for tontines over annuities given a similar expected value of pay-outs (Milevsky and Salisbury, 2016[22]).

127. Despite their simple and transparent structure, tontines have suffered from a lack of transparency and proper governance in the past, with mismanagement by insurance companies leading to their ban in the United States at the beginning of the 20th century (Wettstein, 2018[23]). Distributed ledger technology (DLT) has been proposed as one way to improve the governance of these products, as a DLT based platform could automate the payments upon members' deaths and ensure the transparency of the allocation of payments to accounts. Nevertheless, such solutions present their own consumer protection challenges, particularly in the era of over-hyped crypto-currencies and speculative initial coin offerings (ICOs) (McCrum, 2018[24]).[18]

128. Intergenerational equity within tontine-type schemes can be encouraged through proper design, either through the age at which individuals are allowed to enter the scheme or through a larger allocation of mortality credits to older members.

Concluding remarks

129. There are numerous ways to structure pension arrangements to mitigate the risks of investment, interest rate, longevity and inflation that individuals face in saving for and financing their retirement. These can involve fully protecting the individual from all risks through a sponsor providing retirement income guarantees, sharing some of the risks between the sponsor and the individual, or sharing the risks among the individual members of a scheme.

130. The different types of arrangements present different challenges with respect to the cost of providing the pension, the portability and flexibility of the scheme from a member's perspective, the level of choice that is offered to individuals, the transparency of the scheme, and fairness with respect to the distribution of risks among scheme members.

[18] See DAF/CMF(2018)7 for a discussion of the consumer protection issues that ICOs raise.

131. There is a clear trade-off between having guaranteed protection against the risks of investment, interest rate, longevity and inflation and the cost of providing the pension. A higher cost of pension will translate into lower pension income for individuals. High guarantees imply higher capital requirements for annuity providers, who can be assumed to pass this cost onto the individuals. For employer sponsors who carry this cost on their balance sheet, this could translate into lower wages and therefore lower contributions to pensions.

132. However, lower guarantees will result in more uncertainty around the ultimate pension that individuals can expect to receive. Nevertheless, in all structures discussed in this report, the level of pension that can be expected is exposed to less uncertainty than when an individual fully bears all risks themselves by drawing down their assets in an individual defined contribution scheme. Schemes which provide a minimum guarantee provide at least a minimum level of certainty regarding benefit levels. But even where no guarantees are in place, a carefully designed scheme can minimise the risk that benefits will be cut significantly.

133. The collective management of assets in the scheme can lead to higher pensions through two mechanisms. First, the cost of providing the pension can be reduced through gains in economies of scale. Secondly, the need to de-risk the investment strategy as an individual approaches retirement is reduced, particularly where mechanisms that promote intergenerational risk sharing are in place. This mitigates the individual's exposure to interest rate risk at retirement.

134. Generally speaking, plans where individual rights are easily valued during the accumulation phase are more portable. Where longevity risk is pooled during the pay-out phase, however, portability is necessarily restricted. The only way for longevity risk to be effectively pooled and mitigated is for the mortality credits coming from deceased members to be shared among those surviving.

135. There is a trade-off between allowing for individual choice and the ability to maximise the benefit of risk-sharing. Schemes which are managed collectively tend to limit individual choice regarding investment and speed of drawdown, but these schemes are also able to more easily impose risk sharing mechanisms that can reduce the volatility of pension benefits and investment risk that individuals will face.

136. There is also a trade-off between the collective management of schemes and the transparency of the scheme and expected pension benefits. Effective risk-sharing can involve complex formulas and trade-offs with respect to how to distribute any benefit cuts that are necessary. Communicating this to members becomes a major challenge. Strong governance structures must be in place to address this issue and maintain trust and confidence in the scheme.

137. Finally, a balance needs to be found between intergenerational solidarity and intergenerational equity for collectively managed schemes. While risk sharing across generations is the most effective way to mitigate investment risk for all members, younger generations could become reluctant to participate if it becomes evident that they are subsidizing the pensions of older generations. Furthermore, the increasing flexibility of the labour market could make such risk-sharing unfair to certain segments of society who may not contribute to the same scheme for life. Design features will need to be considered that promote risk sharing while ensuring that different groups are not being treated unfairly.

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