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The Role of Annuities, Partial Lump-Sums and Special-Purpose Withdrawals in Pension Design

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The role of annuities, partial lump-sums and special-purpose withdrawals in pension design

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Introduction

1.1 Abstract

This thesis studies the role of two specific liquidity features in pension design: special purpose withdrawals during the accumulation phase and partial lump-sums at retirement. Interim reviews of the academic literature and the international experience show that these features are more common in pension systems than is commonly though and that there appears to be sound economic grounds sustaining their implementation. The small set of specialized research on these topics focus on individual defined contribution accounts. This thesis presents qualitative considerations as well as numerical illustrations for the type of collective pension funds operative in the Netherlands.

1.2 Context, motivation and relevance

There is a lack of academic guidance about the exact optimal annuitization level and therefore on the role of lump-sums in retirement. This may partially explain why in practice there is a lot of variation in the design of the decumulation phase across countries. A quick review of the specialized literature would reveal that, if there is any consensus, it is that the two extreme decumulation solutions (i.e. full annuitization and full lump-sum) are welfare-decreasing compared to intermediate solutions (Blake et al., 2008; Maurer and Somova, 1999; Mennens, 2009). There are only a few examples of countries located in these extremes but the Netherlands may be one step further by mandating the purchase of an annuity *for all the three pillars* at retirement.

In the first quarter of 2014 the United Kingdom (UK) government announced a package of reforms that revamp the design of the decumulation phase in that country. Among other measures, the reform completely liberalizes the decumulation phase by allowing individuals to cash out their pension savings at once at retirement at no tax surcharge. Being the UK one if not the most developed annuity market and coming from a historically outstanding 80 percent annuity take-up rates, this move has definitely been noticed around the world. The Netherlands, where there is a permanent high-profile debate about the future of the pension system, was not an exception and there are currently discussions on the decumulation phase architecture. The main motivation of this thesis is to contribute to that ongoing discussion by studying the convenience of introducing some degree of flexibility in the decumulation options and products.

The relevance of this thesis lies in producing a review of international practices around specific issues

related to the role of annuities and lump-sums and their design, distilling lessons for the Netherlands. This includes the setup of a working group with experts from Prudential, a leader in the design of decumulation products in the United States. It also explores the role of special purpose withdrawals which is a very topical in the Netherlands. This thesis is relevant in another dimension. The literature on the some of the topics covered is scarce and most of it has been produced in the context of individual accounts under defined contribution (DC) principles. Nothing has been published yet for the collective schemes relevant for the Dutch second pillar context.

1.3 Research questions and structure

The main set of questions for this research are the following:

1. Is there any role for partial lump-sums (PLS) in the design of the decumulation phase? If so, how can PLS be designed? What is the international experience?
2. Is there any role for special purpose withdrawals (SPWs)? If so, how can SPWs be designed? What is the international experience?
3. What special considerations are needed in the case of collective pension schemes if PLSs and SPWs are introduced?

The remainder of this thesis is outlined as follows. Chapter II reviews the theory and the empirical evidence behind these three research questions. Chapter III then strives to get more light on these topics by exploring the design in a sample of eight selected countries. Finally, Chapter IV presents some considerations for designing PLS and SPWs in the Dutch pension schemes context.

1.4 Acknowledgments

I am thankful to my supervisors, Theo Nijman and Eduard Ponds. This thesis was in the making for a few months, during which I held several design and progress review meetings in Tilburg and Amsterdam with both supervisors. The final outcome only reflects a selection of the topics brainstormed during these meetings. The aide-memoir I produced from these meetings is a very valuable roadmap for a enticing and challenging future research agenda. Both supervisors devoted a lot of time to put the current pension debate in the Netherlands into perspective and compelled me to work on a topic that was relevant to these developments. In every meeting I got from them detailed comments on earlier drafts–even when I submitted materials on a short notice–as well as a cadre of powerful ideas on the next steps. I am deeply grateful to both for their time, commitment, superb guidance, infinite patience, and support throughout this project. The whole process of being up to their expectations was lifelong enriching to me.

Thanks also to Professor Lans Bovenberg, who introduced me to NETSPAR and the Masters in the Economics and Finance of Aging in 2012 during a coffee break at the 5th Contractual Savings Conference at the World Bank premises in Washington DC. Enrolling in the program after so many years of experience in the field was refreshing and with a high return on investment. Getting to know more about the Netherlands pension solution and the ongoing discussion on reform and innovation avenues has also been extremely enriching.

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I dedicate this thesis to my wife, Raquel Mundaca, who never gave up, and to my amazing babies, Constanza and Nicolas. The three of them are my main drivers.

[1] Although I recently found out in an article at Harvard Business Review that in my case this programs are not called internships but *returnships*.

Chapter 2

Literature review

2.1 Introduction

Popular wisdom holds that *taxes* and *death* are the only two things certain in life.[1] However insightful, that adage is only half true because the exact timing of death is uncertain,[2] and unlike paying taxes, living more and specially in good health is considered a blessing rather than a burden. Nevertheless, from an economic and financial perspective, living longer poses the challenge of saving enough during the working life to maintain consumption patterns in retirement.

The risk of outliving pension savings is called *longevity risk*. The financial implication of this length-of-life uncertainty is that an individual must balance the risk of consuming too aggressively, which runs the chance of resulting in a large consumption drop at advanced ages, against the risk of consuming too conservatively, which would result in a lower of level of consumption than could otherwise be afforded (Brown and Nijman, 2010). **Annuities** are financial products that offer protection against longevity risk by guaranteeing a stream of payments from purchase until death on a specified frequency–usually monthly.

The standard annuity is a *fixed* stream in *nominal* terms but there are many variants that meet different needs, like the lack of stock market exposure, bequest motives, etc. that will be covered in more detail later in the chapter.[3] Annuities are high yield financial instruments because they offer a return enhanced by risk pooling and risk sharing. On top of returns obtained by *investing* the premiums, annuities generate an *age-and-survival-dependent return* from *pooling* the *idiosyncratic* mortality risks of many individuals and *sharing* the resources of those who do die early to the survivors at any given moment.[4] This feature increases with age because the survival probability declines over the years. At older ages the premium over risk-free rate provided by annuities is practically impossible to beat by any other financial instrument.

From the individual perspective, annuities produce economic value because they allow to get more resources in states of the world in which their marginal value is higher–namely, being alive at older ages– in exchange for giving up resources in states of the world in which their marginal value is lower–namely,

[1] This phrase is usually attributed to Benjamin Franklin.

[2] Needless to say, there is also uncertainty about paying taxes in certain settings. This is the case for example in settings where informality and corruption are pervasive.

[3] To avoid confusion, whenever the word "annuity" is mentioned in the rest of this chapter, it refers to the standard product just defined, *unless otherwise qualified* by its other features, like "deferred" annuity, "escalating" annuity, so on and so forth.

[4] This is called the **mortality credit**, because it is provided in return for giving up the accumulated wealth upon death.

when the individual is dead (Brown, 2008). This attractive feature is not a free lunch because annuity contracts cannot be renegotiated or reversed and typically come with no liquidity options attached.[5] This can be costly if an unexpected need arises, such as an uninsured health problem (Cannon and Tonks, 2008). This may explain why in reality only a negligible number of individuals purchase annuities when they are given the freedom to select other options.

In the face of a worldwide tendency to retreat from Defined Benefit (DB) plans in favor of Defined Contribution (DC) schemes, the decision about the optimal pension savings decumulation product becomes increasingly relevant and different countries have approached the issue in varied ways.[6] This chapter reviews the theory and the empirical evidence behind the question of how should pension systems be designed in terms of options and products for the decumulation phase. The main motivating questions are the following: is it optimal to fully transform pension savings into an annuity? is there any role for lump-sums? If so, how can lump-sums be designed? Is there any role for special purpose withdrawals?[7]

2.2 Annuity economics

Annuities have existed since a long time ago and pre-date stocks and other financial products but it was not until the 20th century that they were analyzed formally by economists (Milevsky, 2013).[8] Probably the first economist to write about them was **Irving Fisher** in the context of exploring the determinants of real interest rates. The famous Yale economist wrote in the 1930s:

> The shortness of life thus tends powerfully to increase the rate of time preference beyond what it would otherwise be. This especially evident when the income streams compared are long...But whereas the shortness and uncertainty of life tend to increase impatience, their effect is greatly mitigated by...solicitude for the welfare of one's heirs. Probably the most powerful cause tending to reduce the rate of interest is the love to one's children and the desire to provide for their good...[9]

Thirty years later the Israeli economist **Menahem Yaari** seminally introduced the decision to purchase annuities in a life-cycle savings model. Yaari wrote:

> One need hardly be reminded that a consumer who makes plans for the future must, in one way or another, take account of the fact that he does not know how long he will live. Yet, few discussions of consumer allocation over time give this problem due consideration. Alfred Marshall and Irving Fisher were both aware of the uncertainty of survival, but for one reason or another they did not expound on how a consumer might be expected to react to this uncertainty if he is to behave rationally...[10]

Yaari (1965) showed under a set of specific assumptions that annuities are welfare enhancing and that individuals should fully annuitize their pension savings at retirement. The model was built under rather strong behavioral assumptions:

- Individuals are expected utility maximizers with intertemporally separable utility
- There is no bequest motive

[5] If annuity contracts were reversible annuity providers would be subject to adverse selection. Any unexpected shock, like a health problem, would be reason enough to surrender the contract, leaving only the bad risks (i.e. those in good health) in the pool. This would naturally increase prices and in the extreme dry the market.

[6] Traditionally DB plans offered annuities. DC plans offer a variety of choices which sometimes includes a full lump-sum.

[7] The main references for this chapter, from which the contents below borrow heavily are Blake et al. (2008), Brown and Nijman (2010), Cannon and Tonks (2008), Milevsky (2013), Valdes (2002) as well as the lecture notes of the course *Pension System Design* prepared by Prof. Theo Nijman at Tilburg University.

[8] The topic was tackled by scientists other than economists first. For instance Milevsky (2013) documents that Edmond Halley famously provided the first formula for annuity pricing in an article published in 1693.

[9] Fischer (1930), cited by Milevsky (2013).

[10] Yaari (1965), cited by Milevsky (2013).

- The only source of uncertainty facing the individual is the time of death[11]
- There is no inflation or interest rate risk
- Annuities markets are complete in the sense that all future risks can be completely hedged using currently available assets
- Annuities are actuarially fair[12]

Box 1 below provides a simplified exposition of this result taken from Cannon and Tonks (2008). Yaari's article was highly influential and spurred an amazing thread of follow-up research. Without intending to be comprehensive, some of the frequently cited references in that area are surveyed in the subsequent sections.[13]

The full annuitization result contrasts sharply with the fact that voluntary annuity markets are thin all around the world (Brown, 2001; Inkmann et al., 2011). Lindeman and Yermo (2002) concluded that "except in a few OECD countries, annuities markets either do not yet exist or are still in an incipient stage of development." Also, the empirical evidence suggests that individuals often choose lump-sums rather than annuities if allowed to do so (Brown, 1999, 2001; Friedman and Warshawsky, 1990; Mirer, 1994; Modigliani, 1986; Poterba and Wise, 1999).

Box 1. Annuitization in a simplified life-cycle model : Consider the consumption problem of an individual i who has just retired with pensions wealth W_0 and who must allocate this wealth over the two remaining periods of his life (c_0, c_1). There is uncertainty, however, over whether the individual will be alive in the second period. In the absence of an annuities market, individual $i1$ maximizes expected utility (1) subject to a budget constraint (2):

$$max \frac{c_0^{1-\gamma}}{1-\gamma} + \delta p_i \frac{c_1^{1-\gamma}}{1-\gamma} \tag{2.1}$$

Subject to:

$$c_1 = (W_0 - c_0)(1+r) \tag{2.2}$$

Where p_1 is the probability of surviving into the second period; δ is the rate of time preference; and r is the interest rate. In the most simple case where $r = 0$ and $\delta = 1$, the solution boils down to:

$$c_0 = \frac{W_0}{1 + p_i^{1/\gamma}}$$

and

$$c_1 = \frac{W_0 p_i^{1/\gamma}}{1 + p_i^{1/\gamma}}$$

Note that:

- If $p_1 = 0$, i.e. death in the fist period is certain, then a trivial solution obtains in which the individual optimally spends all resources in the first period, i.e. $c_0 = W_0$ and $c_1 = 0$.

[11] In particular, the model ignores background risks. Background risks refer to the risk of having a sudden increase in the required money to cover for special needs, like health costs.

[12] An annuity is actuarially fair when its expected return, discounted by an interest rate and a survival probability, derived from population mortality tables, equals the premium paid.

[13] The main focus of the survey is on the so called *annuity puzzle*, which will be defined below. There are two other lines of research that are not covered in this chapter. One focuses on the optimal timing for purchasing decumulation products. The second explores regulation and supervision of retirement products. The reader is referred to Blake et al. (2008) and Milevsky (2013) for a survey on these topics.

- In the other extreme, if there is certainty to live until next period, that is, $p_1 = 1$, the consumer exhibits a constant consumption path over his two periods of life. Without discounting, the individual splits consumption equally across periods:

$$c_0 = \frac{W_0}{2} = c_1$$

- For intermediate values of p_i the consumption allocation between periods depends on the survival probability and the degree of risk aversion of the individual. In particular, an individual with a $p_i = 0.5$ will consume more in the first period, and less in the second:

$$c_0 = \left(\frac{2}{3}\right) W_0$$

and,

$$c_1 = \left(\frac{1}{3}\right) W_0$$

This result is inefficient, for at least two reasons:

  - Consumption is not the same in each period for those individuals that survive
  - Some resources in the second period are left unconsumed for those individuals that die

Now suppose that an annuities market with fairly priced annuities exists. An annuity contract is offered by an insurance company to an individual such that in return for a payment $\left(W_0 - c_0^A\right)$, in the first period–called the annuity premium (or annuity price)–the insurance company will pay out an income y_1 for sure in the second period provided that the individual is alive, but will pay out nothing if the individual dies.

Annuities are actuarially fair when the expected present discounted value of the payments from the annuity equals the amount of wealth used to purchase the annuity. This happens when the annuity provider breaks even, so that:

$$\left(W_0 - c_0^A\right) = \frac{p_1 y_1}{1+r}$$

The budget constraint facing the individual becomes:

$$c_0^A + \frac{p_1 c_1^A}{1+r} = W_0 = y_0 + \frac{p_1 y_1}{1+r}$$

and the individual uses the promised annuity payment to fund second-period consumption,

$$p_1 c_1^A = \left(W_0 - c_0^A\right)(1+r) \tag{2.3}$$

Note that:

$$\frac{p_t}{1+r} < \frac{1}{1+r}$$

So **the existence of an annuity market is equivalent to the case of no annuity market but lower prices of future consumption** (Cannon and Tonks, 2008). Access to the annuity market increases utility by expanding the budget set, independently of the individual preferences.

The solution to the consumers maximization problem, again for simplest case where $r = 0$ and $\delta = 1$ is a flat consumption profile. Note that:

- In the case $p_i = 0.5$ the solution is:

$$c_0 = \frac{2W_0}{3} = c_1$$

- Therefore, compared to the previous situation, the individual is better off with annuities.

Most importantly, this result still holds independently of how small is the survival probability. So as long as there is a slight chance of surviving to the second period the individual finds it optimal to fully annuitize its wealth:

$$c_0^A = \frac{W_0}{1+p_1} = c_1^A$$

The lack of realism in Yaari (1965) was tackled by Davidoff et al. (2005) who worked out a model under weaker assumptions, such as incomplete markets, utility functions that may not satisfy the expected utility hypothesis and need not be additively separable. Two results are salient from this work:

1. *Full annuitization*: in the absence of a bequest motive and provided that annuity markets are complete and the annuity pays a rate of return to survivors in excess of an otherwise matching asset, fully annuitizing financial wealth is optimal even if pricing is not actuarially fair.
2. *Partial annuitization*: the wealth effect of accessing the annuities market remains non-negligible even with a bequest motive, incomplete markets and sufficiently actuarial pricing.[14] The full annuitization result breaks down under these conditions, but it remains optimal to annuitize a high fraction of wealth *at a single point in time* over a wide range of preference parameters.[15]

The intuition of the partial annuitization under incomplete markets result is that **individuals need to hold traditional assets that pay a return in those states of the world where annuities are missing or cannot be replicated** (Impavido et al., 2004). Two sources of market incompleteness are particularly relevant for the decumulation phase, namely, that the most commonly available annuity products do not index benefits for inflation and the inability in some markets to access equity returns in an annuitised form (Brown, 2008).

Davidoff et al. (2005) high optimal partial annuitization result is a fundamental theoretical refinement of Yaari (1965). It is nevertheless still at odds with the low level of annuitization observed in real markets. Recent work has focused on coming to terms with the empirical evidence and tackling what has been dubbed the *annuity puzzle*. A variety of rational and behavioral explanations have been put forward to solve the puzzle.

2.2.1 Rational theories

Explanations of the annuity puzzle within the framework of rational economics include poor understanding of annuities and the desire to hold onto liquid wealth to meet either unexpected spending needs and/or the desire to leave bequests. There is a reasonable degree of agreement in the scholarly literature that the optimal degree of annuitization is reduced in the presence of varied institutional settings and market conditions, including informal risk pooling opportunities, as well as under a range of preference parameters. Nevertheless, the puzzle is still not solved. If anything, paraphrasing Milevsky (2013), it can only be said that the puzzle is better understood so many years after the publication of Yaari.

[14] By "sufficiently actuarially fair" Davidoff et al. (2005) mean the weaker assumption that the mortality credit is positive.

[15] This suggests that the decision about when to annuitize should be analyzed separately from the decision about how much to annuitize (Blake et al., 2008). The focus of this survey is on the latter.

Individual preferences

The *bequest motive* has traditionally been one of the main suspects in the literature explaining the annuity puzzle. Most research points to the direction that preferences for bequests are empirically relevant (Kotlikoff and Summers, 1981), are deeply ingrained in individual preferences (Abel and Warshawsky, 1988; Bernheim et al., 1985) and affect the level and timing of the demand for annuities (Bernheim, 1991; Horneff et al., 2006). Also, although less established than bequest motives in the literature, a few articles have sought to examine the role of *housing* wealth on decumulation decisions. Davidoff (2009) shows that housing wealth can substitute for annuities and long-term care insurance if people sell their house only if they live a long time or require long-term care. It is then plausible that the purchase of a house is considered a substitute of savings for retirement. As such, the annuity puzzle may in part reflect the fact that homeowners may feel that they have already annuitized an important type of consumption through the ownership of their home.

Institutional features

The size and design of state pensions under zero and first pillars have also been related to the annuity puzzle. There is also evidence that some specific designs of these pillars change incentives to save and consume in retirement.

- *Size*: Bernheim (1991) found that "social security annuity benefits significantly raise life insurance holdings and depress private annuity holdings among elderly individuals" and that "these patterns indicate that the typical household would choose to maintain a positive fraction of its resources in bequeathable forms, even if insurance markets were perfect.
- *Design*: Butler et al. (2013) found that the "availability of means-tested payments creates an incentive to cash out pension wealth for low and middle income earners, instead of taking the annuity. Agents trade off the advantages from annuitization, receiving longevity risk insurance, to the disadvantages, giving up "free" wealth in the form of means-tested supplemental income."

Under the institutional umbrella is also another set of articles exploring the effects of non-market risk pooling substitutes in the decision to annuitize. A widely cited article in this line is Kotlikoff and Spivak (1981). These authors showed that risk pooling within the family is efficient, especially if adverse selection and the transactions costs of entering the formal annuities market are high. Brown and Poterba (2000) show that married couples behave as a two-person annuity market.

Market conditions

A frequently cited explanation is that annuity markets are most attractive to those who expect to live for a long time since they will enjoy the stream of income for more years. To avoid making a loss, insurers price annuities to match the life expectancy of these high-risk people, making annuities unattractive to low-risk people who have shorter life expectancies. Mitchell et al. (1999) and Finkelstein and Poterba (2004) provided evidence of this phenomenon for the US and UK markets respectively.

Friedman and Warshawsky (1990) explored the idea that less than actuarial pricing factors may explain low annuitization levels in United States. They compared the actual annuity prices with model prices or

Money's Worth Ratio (MWR).[16] These authors concluded that the loads and costs embedded in annuities are high and observed that "an explanation for this phenomenon is based either on the actuarially unfair cost of annuities, importantly including the cost element arising from adverse selection, or on the interaction of the unfair annuity cost intentional bequest motive." James and Song (2001) extended the analysis across a number of countries and concluded that "...when discounting at the risk-free rate, MWR's for annuitants are surprisingly high–greater than 95 percent in most countries and sometimes greater than 100 percent. MWR's for the average population member are lower but still exceed 90 percent in most cases..."

Financial markets conditions have been also invoked in the literature. Milevsky and Young (2007) found that the level of annuitization is reduced the lower is the investment volatility of an alternative portfolio. The intuition is that as the relative risk of investing in the alternative decreases, it becomes less appealing to annuitize.

Precautionary savings

There is a line of research suggesting that background risks such as poor health status, particularly when health expenses are made out-of-pocket, may explain a low demand for annuities. Milevsky and Young (2002) wrote: "The real option analogy can be taken a step further by arguing that a deterioration in health status, an increase in interest rates, better asset allocation and liquidity features, possible tax-law changes, or a reduction in actuarial loads will all serve to increase the future annuity payout if the retiree waits and is sufficiently risk tolerant.

More recently Nijman et al. (2014) showed when out-of-pocket medical expenses show up earlier rather than later in retirement the empirically observed low annuitization levels are optimal. If health cost risk early in retirement is low, individuals would do better to save out of their annuity income to build a buffer for health cost shocks at later ages.

2.2.2 Behavioral theories

Although the rational-based explanations had come a long way, the annuity puzzle is by no means settled off as the title of a recent article suggests;[17] nor there is a comprehensive model that considers all the above factors or provides a ranking among them, not least because in reality each explanation would play a different role in specific institutional settings.[18] Further progress has come recently from **behavioral economics**. Benartzi et al. (2011) wrote:

> The notion that consumers are simply not interested in annuities is clearly false. Social Security remains a wildly popular federal program, and those workers who still have defined benefit pension plans typically choose to retain the annuity rather than switch to a lump-sum distribution. Furthermore, when participants in defined benefit pension plans with built-in annuitized payout are offered the opportunity to switch to a defined contribution plan, most stick with what they have. The tiny market share of individual annuities should not be viewed as an indicator of underlying preferences but as a consequence of institutional factors about the availability and framing of annuity options. (p. 161)

[16] In words the MWR is the discounted present value of the annuity's expected future payments divided by its cost. Note that the MWR measure has been criticized recently. Casassus and Walker (2013) argued that it may overestimate the value–for–money obtained by annuitants, since it does not adjust for liquidity or risk factors. They computed an adjusted MWR and found that, in the case of Chile, the ratios using the traditional methodology are biased upward 7 percent on average.

[17] See "The Annuity Puzzle remains a Puzzle" by Nijman et al. (2014).

[18] Post et al. (2006) is one of the few papers that incorporates some explanations simultaneously. They reinforced the idea that family risk sharing and actuarial unfairness jointly account for low levels of annuitization.

Behavioral economics considers the annuitization decision as a very complex decision, vulnerable to a number of well documented human biases. Salient among these biases are framing, loss aversion, defaults and peer effects.

Framing

Presented with the option of an annuity in an "investment frame" rather than a "consumption frame" individuals judge it a poor or risky investment compared to alternatives. Brown et al. (2008) wrote that:

> **In a consumption frame, annuities are viewed as valuable insurance, whereas in an investment frame, the annuity is a risky asset because the payoff depends on an uncertain date of death**. Survey evidence is consistent with our hypothesis that framing matters: the vast majority of individuals prefer an annuity over alternative products when presented in a consumption frame, whereas the majority of individuals prefer non-annuitized products when presented in an investment frame. To the extent that the investment frame is the dominant frame for consumers making financial planning decisions for retirement, this finding may help to explain why so few individuals annuitize.

Agnew et al. (2008) also report on the effects of framing that:

> When compared to subjects in the neutral treatment, women and men are significantly less likely to choose the annuity when presented with information negatively framing the annuity option, while only men are significantly more likely to choose the annuity option when presented with information negatively framing the investment option.

Loss aversion

Individuals over-emphasize the risk of "losing" from an annuity (dying early), rather than living a long time and being a "winner." Hu and Scott (2007) claimed that:

> Mental accounting and loss aversion can explain the unpopularity of annuities by framing them as risky gambles where potential losses loom larger than potential gains.

Gazzale and Walker (2009) offered two plausible behavioral biases:

> Our first hypothesis is a risk-ordering bias: retirees effectively overweight the early risk (an early death) relative to the later risk (a longer-than-anticipated retirement). Our second hypothesis is an endowment effect stemming from loss aversion.

Defaults and peer effects

Butler and Staubli (2011) wrote that annuity payout choices are significantly influenced by default options and peer effects. They mention that:

> Several small pension funds displayed almost no variation with respect to the annuitization decision: all retirees choose either lump-sum or the annuity. Pension fund managers usually explain this phenomenon with peer effects and an implicit standard option ("it has always been done like that"). (p. 21-22)

Butler and Teppa (2007) provide evidence that is strongly suggestive of the importance of default options on annuity choice in Switzerland. They show that:

> A majority of the retired individuals in Swiss occupational plans choose the annuity, despite the fact that the first pillar already provides a basis annuity stream in old age...The sponsor's default option, in most cases the annuity, is also found to be highly influential in the decision to annuitize.(p. 1962-63)

Other biases

There are a number of other biases mentioned in the annuitization puzzle literature:

- *Hyperbolic discounting*: individuals excessively discount the value of receiving income in the future, as opposed to the present.
- *Overconfidence*: individuals are excessively pessimistic in relation to their individual life expectancy.
- *Lack of self-control*: some people actually spend all their retirement savings within a few years of retirement.
- *Complexity* and the use of *heuristics*: individuals may under-annuitize their wealth because they are applying simple "rules-of-thumb" regarding how much to annuitize.
- *Poor financial literacy*: most people are not sufficiently competent to manage the drawdown of their investments in old age.

The behavioral economics literature goes beyond providing explanations and also suggests ways in which the existence of annuities are welfare improving. For instance, annuities act as powerful pre-commitment device because they help individuals control spending in retirement. The literature also provides normative suggestions on how to improve decumulation products in order to overcome behavioural biases. In a recent article, Beshears et al. (2013), reporting on a large-scale study in which individuals were given various hypothetical annuitization choices, found that (emphasis added):

> ...**We find that allowing individuals to annuitize a fraction of their wealth increases annuitization relative to a situation where annuitization is an all or nothing decision**...Frames that highlight flexibility, control, and investment significantly reduce annuitization. A majority of respondents prefer to receive an extra "bonus" payment during one month of the year that is funded by slightly lower payments in the remaining months. Concerns about later-life income, spending flexibility, and counterparty risk are the most important self-reported motives that influence the annuitization decision.

Finally, in another important paper studied the role of early decision framing, as a type of commitment device (Beshears et al., 2006). Early decision regulations help long-run preferences prevail by allowing consumers to partially commit to their long-run goals, making it harder for a momentary impulse to reverse past decisions. This will come back next chapter in the context of behavioral design of the decumulation phase in Switzerland and Denmark.

2.3 Lessons for pension system design

Summing up, Yaari's model conveys the message that rational individuals would fully annuitize under a set of assumptions that may not hold in reality. Davidoff et al. (2005) showed that under more realistic assumptions, the full annuitization implication is not guaranteed, but a high degree of partial annuitization is still optimal. The sequel scholarly work incorporated rational and behavioural reasons that may explain the lower levels of annuitization observed in real markets but there is still less than a consensus about exactly how much of financial wealth should be partially annuitized.[19] Also, the setup of the models on annuitization is one of individual decision-making over the life cycle. Extrapolating

[19] The lack of consensus goes beyond the level of annuitization. It spreads over to a discussion about the optimal age to partially annuitize and the optimal type of product.

from that environment to implications for national pension systems is not straightforward.[20] Brown and Nijman (2010) make this point succinctly:

> Unfortunately, beyond a general consensus that neither zero nor complete annuitization is optimal, it is difficult to pin down an optimal level of annuitization that is appropriate for any one individual, let alone every individual in a heterogeneous population.

It may seem then that the state-of-the-art economic research reviewed above gives room for only a few minimal guiding principles on the role of annuitization in pension system design:

1. There is no consensus on the exact proportion of annuities in the retiree portfolio but the extremes (i.e. full and zero annuitization) are less than optimal at retirement over a range of preference specifications and institutional features.
2. This in turn suggests that the optimal design of the decumulation phase lie in a compromise, where longevity risk is insured at some level without fully sacrificing liquidity to cover for unexpected shocks (like health shocks) and/or bequest motives.
3. The design of the decumulation phase in pension systems would depend on country-idiosyncratic circumstances where the determinants of the demand for annuities weight differently, like how large a role the government plays in providing a safety net and medical insurance, the extent of market imperfections, etc.
4. There is room for innovation in decumulation product design, as some simple nudges and frames could make a huge difference in decision-making.[21]

These minimum principles also echo recent reform proposals. Salient examples are the set of proposals by Brown and Nijman (2010) to improve the decumulation phase in the Netherlands and the roadmap for the good design of defined contribution pension plans by the OECD (2013a), among others.[22]

2.4 Decumulation products and risks

Retirees face a plethora of risks at retirement and during retirement besides longevity risk. Among the most widely cited are conversion risks related to variations in the interest rates used to valuate annuities, inflation risks and investment risks. As mentioned above these risks were absent on Yaari's pioneering analysis because he assumed that markets were complete and therefore financial instruments exist in his model to optimally hedge against them. In reality markets are incomplete and hedging possibilities are sometimes missing (Davidoff et al., 2005).

This section extends the review to the available decumulation products in the marketplace and makes a link with the risks these products protect retirees for. The analysis is very condensed and focused only on the risks mentioned above (conversion risk, longevity risks, investment risks and inflation risks). Box 2 provides a conceptual overview of these risks.

[20] If, as one can assume in theory, retirees are homogeneous in all relevant variables, the direct implication from the literature would be that governments should mandate a high proportion of pension savings to be annuitized. Needless to say, heterogeneity in preferences is the norm rather than the exception. Furthermore, the decision interacts with design aspects of related social security institutions (state pensions, medical insurance, etc.).

[21] On this Milevsky (2013) wrote recently that "I believe it is high time for someone to be disruptively innovative in the retirement income space...How about another glass of Merlot while we wait?"

[22] See also Maurer and Somova (1999).

Box 2. Risks faced by retirees. The most imminent risk at retirement is that of running out of money to finance consumption needs. This can spring from several reasons. One is getting a lump-sum and spend it recklessly in the first years after retirement. Beyond this obvious reason, there are many other risks facing retirees that are related to running out of savings. This box expounds upon some of them.

There are risks at the transition to retirement and risk during retirement. The former are called *conversion risks* and are due to making the transition to retirement at an unfavorable point in time under unfavorable market conditions. This risk is also called *interest rate risk*, because it results from the unpredictable cost of annuities due to swings in interest rates. Defined Benefit plans whose pension benefits are set by a formula based on years of contributions by definition protect retirees against conversion risks in the sense that these risks are transferred to the current and future contributing generations. Defined Contribution plans are actuarially fair and therefore do not protect retirees against these risks. Among the risks *during* retirement are the following:

- *Investment risk* is the risk inherent in financial markets that investments may not perform as expected. Poor returns immediately before or during retirement can have a significant effect on the fund available for financing consumption needs at retirement. Pension systems that guarantee a fixed payment in retirement transfer this risk to the sponsor or the life annuity company.
- *Inflation risk* is the risk that inflation will reduce the purchasing power of benefits in payment. This risk affects all types of pension systems and decumulation products unless indexation to inflation is granted. Real annuities protect against this risk but these products are expensive and only scarcely available around the world.
- *Longevity risk* is the risk that participants will live longer than expected by current actuarial mortality tables. This risk has two components:
    1. *Micro-longevity risk* is the risk for an individual due to the fact that, for given death probabilities, an individual's remaining lifetime is a random variable. This component can be diversified away through pooling. As mentioned elsewhere, standard annuities protect retirees against this risk.
    2. *Macro-longevity risk* reflects uncertainty in life expectancy as a consequence of longer term deviations from deterministic mortality projections. This risk is common to a cohort and therefore cannot be diversified away. It can only be shared by some types of collective arrangements (Bovenberg and Mehlkopf, 2014).

There are other risks faced by retirees not tackled here, like expenditure risks, liquidity risks, counterparty risks and political risks. For a thorough review see Rocha et al. (2011).

2.4.1 The optimal decumulation product

The literature argues that heterogeneous preferences would be better served with a menu of options that includes a combination of decumulation products as opposed to a one size-fits-all approach. For instance consider the following selected quotations (emphasis added):

> **A rational person seeking to optimize his future consumption pattern, who relies on the funds accumulated during the working career to provide income for the rest of his life, would choose a combination of financial products as well as life annuities**. Besides a preference for time, risk and bequest, the decumulation strategy will depend on pre-existing periodical and certain pension income, such as the income from the statutory first pillar pension corporate defined benefits payments, or from other annuity contract purchased earlier in life...Maurer and Somova (1999).

> ...policy makers need to bear in mind the two main points that have emerged from the discussion of pensioner risks and the shortcomings of different annuity products. The first is that although there is a need to ensure that retiring workers opt for an adequate level of annuitization, **care must be taken to avoid forcing an excessive level of annuitization**. The second is that because of the serious shortcomings of all types of retirement products, ideally, **a combination of payout options should be favored**, covering different products as well as different payout options over time...Rocha et al. (2011).

> The design of the payout phase needs to strike a balance between flexibility and protection from longevity risk...**The main recommendation for a default arrangement for the payout phase is to combine programmed**

> **withdrawals with a deferred life annuity**. This combination achieves a balance between protection from longevity risk, flexibility, liquidity, possibility of bequests, and access to portfolio investment gains. An attractive and potentially economical compromise would be to combine variable programmed withdrawals with a deferred life annuity bought at the time of retirement that starts paying at old ages...OECD (2013a).

In particular, the optimal decumulation product *depends on the individual desired income and hence consumption profile in retirement* (Blake et al., 2008). There is evidence that most individuals prefer an upward sloping consumption profile in real terms (Keasey et al., 2006). The market has responded by introducing various types of annuity products with an equity component in order to benefit from the equity risk premium. Variable annuities and CREF annuities are salient examples. Individuals preferring a flat profile in real terms can achieve this using an index-linked or real annuity or phased withdrawal. Those preferring a falling profile can get this using a nominal annuity or phase withdrawal that generates declining real income over time. The next section describes these and other products available in the marketplace.

2.4.2 Decumulation products

There are three basic decumulation products available to retirees in voluntary and mandatory markets. All other products are variations or combinations of these three, which we call hybrids below (Antolin et al., 2008; Maurer and Somova, 1999; Milevsky, 2013; Rocha et al., 2011). Note that not all of the products and options covered in this section are available at national pension systems as will be reviewed in the next chapter. In particular, there are only a few voluntary markets and national pension systems that offer real or inflation-linked annuities. Also, the degree of popularity among these products varies widely across countries.

Lump-sum

The most simple option is a **lump-sum**, which is a one time payment of all accumulated savings at retirement. A potential advantage of lump-sum payments is the ability of retirees to self-annuitize. The main disadvantage is that a successful self-annuitization strategy is complex and difficult to achieve. In addition, individuals may spend the money in a reckless manner, eventually resorting back to family or state for protection. Therefore, lump-sums do not protect retirees against longevity risk. A more subtle exposure is to conversion risk. This is because at retirement, the financial instruments backing up pension savings have to be converted into cash to pay for the lump-sum.

Phased withdrawals

Second, there are **phased withdrawals** (PWs), also known as programmed withdrawals or systematic income drawdown plans, which are products whereby the individual sets up an amount to be withdrawn on a frequent basis while the rest is kept earning returns. The withdrawal rate might be determined according to a fixed benefit level payable until the retiree dies or the funds are depleted, or it could be set using a variable formula, where the retiree withdraws funds according to a rule linked to life expectancy (Dus et al., 2003). The main benefits of PWs are that individuals keep the property rights of their savings (so opening room for bequests), that the decision is reversible and that it provides some control over

assets; but they share along with lump sums the serious drawback of lacking longevity risk protection.[23]

Annuities

The third product is an **annuity**, which provide a life-long stream of payments, transferring longevity risk to an insurance company. Annuities are pooled products where there is redistribution to survivors from those who die. The standard product is a *fixed* stream in *nominal* terms but there are many variants that meet different needs, like the lack of stock market exposure, bequest motives, etc.[24] The main examples are the following:

- *Single premium* (one time payment) or *annual premium* (gradual installments).
- *Immediate annuity* (payments start immediately at retirement) and *deferred annuity* (payments starts at a pre-specified time after retirement age).
- *Single annuity* (payments are conditional on the survival of one individual) or *joint and survivor annuities* (payments are conditional on the survival on more than one individual, usually the spouse; the payouts may decrease after the death of the first partner in order to account for reduced needs); or *group annuities* (annuities paid by companies that set up a pension scheme for their employees).
- *Life annuity* (the annuity payment ends when the annuitant dies) or alternatively a *temporary life annuity* (the payment ends with the death of the annuitant, but not later than a fixed number of years).
- *Fixed annuity* (payments are constant through time) or *escalating annuity* (payments increase at a pre-specified rate).
- *Participating* or *with-profits* annuities (benefits depend on the provider's surplus), *investment-linked annuities* or *unit-linked annuities* (benefits reflect the return of an underlying portfolio).
- Annuities with guaranteed periods:
  - *Minimum Guaranteed Period of Payment* (MGPP): the insurer guarantees the payment of pensions during a minimum number of years chosen by the worker, even if the annuitant dies before. The worker designates a beneficiary for the event of an early death.
  - *Minimum Guaranteed Reimbursement* (MGR): the insurer guarantees to continue paying pensions until the cumulative sum of pensions paid equals the price of the annuity (initial premium) in nominal terms, even if the annuitant died before.
- *Real annuities* (RA) are guarantees indexed to prices (inflation or wages or both). Inflation, investments risks, and longevity risks are transferred to the annuity provider in exchange of credit or insolvency risk. Inflation-linked annuities provide an important hedge when inflation risk is present (Koijen et al., 2006).
- *Variable annuities* (VAs) insure against longevity risks like a fixed annuity but in addition earn market-linked returns. The term "unit-linked" comes from the fact that the annuity provider pays out *annuity units*–as opposed to cash payments–. On a periodical basis (i.e. usually monthly

[23] PWs usually come with maximum and minimum limits which represent two countervailing forces: the tax authorities trying to reduce tax abuse, and the pension authorities trying to avoid depletion of the fund during the individual's lifetime (Antolin et al., 2008).

[24] Adding these features usually come at the cost of foregoing part or all of the mortality credit.

or as specified in the contract) the annuity payment is adjusted up or down in tandem with the performance of an underlying portfolio, which is typically a family of funds with equity, bonds, real estate, etc.[25] Investment-linked annuities provide an important hedge when there is time-varying risk premia (Koijen et al., 2006).

- *CREF annuities* are variable annuities that also transfer macro-longevity risks to the holder. This can also be achieved through "participating" or "with-profits" annuities that share investment and mortality risks. The difference is that these rely to a greater extent on discretionary decisions by the insurer, while CREF annuities use a formula based on objective parameters (Bovenberg and Lundbergh, 2014; Valdes, 1998).

  The CREF product was created in 1952 and has been marketed since then by a non-profit multi-employer occupational pension plan named TIAA-CREF that serves US college and university professors. The CREF product is not fully replicable in the market.[26]

  CREF annuities recalculate the price of its units annually using a fixed formula, which accounts for the difference between the actual rate of return earned by the underlying portfolio and the projected interest rate; the difference between the actual mortality experience of the plan members and the expected mortality for that group according to the life table used; and changes in expected mortality.[27]

Box 3. A commercial perspective on the modern annuity. Companies competing for market share in the retail market have strong incentives to listen to their clients and develop products that suit their needs. This Box summarizes on a series of documents produced by Prudential, a leader in the insurance and retirement products in the United States, in which they report on in-house research regarding the main needs of their clients and the product solutions they had developed in response. Most of the material of this box and many more resources can be accessed at `http://www.prudential.com/incomechallenges/home.html`.

According to extensive in-house research Prudential found that there are four main features that they clients demand in a retirement solution product:

- Downside protection
- Guaranteed lifetime income
- Upside potential
- Flexibility

These needs hint that the modern annuity–as defined by commercial companies in United States in the retail market–is a variable annuity, with certain minimum lifetime income guarantees and built-in flexibility. For example, the individual can withdraw an amount in excess of the guaranteed income payments–but this reduce future payments proportionally–. This control allows the individual to potentially grow assets, access money when needed, and possibly leave money behind for inheritance purposes. These products also offer the choice to extend the guaranteed to a surviving spouse. Up to now the market for this type of products has grown up to 100 billion usd.

Some other recent innovations in the annuity market are:

- *Medically underwritten annuities*, provide larger payouts to individuals able to demonstrate that they have shorter than average life expectancy due to health-related conditions.

[25] Moreover, the annuitant selects a threshold or hurdle rate that must be achieved before payments will increase. If markets do better than the hurdle, the cash flow increases. Otherwise, the cash flow shrinks (Milevsky, 2013).

[26] As CREF grandfathered the variable annuity product, CREF is not affected by some of the regulation that came later. Indeed, the variable annuities designed later (by other providers) are forced to offer guarantees on macro-longevity risk and are subject to a cap on costs (Bovenberg and Lundbergh, 2014).

[27] A board of trustees exercises discretion about this.

- *Zip-code underwriting annuities* take advantage of the substantial geographic variations in average longevity by applying differential pricing.
- An *Advanced deferred life annuity* or (ADLA), proposed by Milevsky (2005), envisages an inflation-protected annuity that would be purchased at retirement or even earlier. But in contrast to a traditional annuity, income payments start only at some advanced age, providing insurance against the risk of living exceptionally long.

  The deferral period reduces the cost of the longevity insurance provided by the ADLA just as a large deductible can reduce the cost of homeowner insurance. Although a few insurance companies have very recently begun to offer ADLA-type products with benefits fixed in nominal terms, no company has thus far launched the type of inflation-protected product proposed by Milevsky.

Hybrid products

Finally, there are **hybrids** that allow individuals to combine pooled and non-pooled products as well as add options about when and to what extent include a life annuity in the portfolio (Maurer and Somova, 1999). The standard structure of hybrids is three-pronged:[28]

- *Annuity component*: at retirement a deferred annuity is purchased with pension savings. The regular payments start at an agreed age in the future and may either replace or complement a withdrawal plan.
- *Withdrawal component*: at retirement the individual agrees the payment rule and frequency of payments.
- *Guarantee component*: the are different guarantees that may be offered such as minimum return guarantees or MGPP/MGR guarantees.

An example of a successful product in the retail market is Prudential's **IncomeFlex Target**. This product is merchandised by that company as a solution that *helps participants accumulate assets in the journey to retirement and convert those assets into guaranteed income.* See more in `http://www.prudential.com/incomechallenges/overview.html`.

2.5 Further design topics

This section explores two specific design issues in light of economic theory:

- The role of specific purpose withdrawals, if any.
- Provided that partial lump-sums are allowed, how should they be designed.

2.5.1 Specific purpose withdrawals economics

Specific purpose withdrawals (SPWs) are usually advocated as a means to provide liquidity for individuals facing emergencies or specific financial hardship, like being drowning in debt or facing eviction. Retail companies like Prudential clearly recommend its clients to establish an emergency fund, especially during ages 25 to 45 (emphasis added):[29]

[28] Most hybrid products offered in the marketplace are *integrated products* and therefore include also an *investment component* during the accumulation phase. It is important to bear in mind this because not all national pension systems have well integrated accumulation and decumulation phases.

[29] See `http://www.prudential.com/view/page/public/31236` for the full life-cycle financial planing advice from this company. It should be stressed that not all companies provide this type of advise. For instance, in its "Guide to Retirement" 2014 Edition, JP Morgan warns clients: "*Be cautious: Higher initial withdrawal rates may not be sustainable in extended poor markets. Consider a dynamic approach that adjusts over time to more effectively use your retirement savings.*" See slide 24 of the following presentation for the full set of advise `https://www.jpmorganfunds.com/blobcontent/647/343/1272924627455_`

> ...Financial and tax planning are frequently done in a vacuum without consideration of the changing risks that one faces over one's lifetime. The passage of time alters the nature of the risks....The early working years are years when your career is developing and your largest financial burdens are likely a mortgage, supporting a growing family and the looming costs of college. During these years, it's important to **establish an emergency fund**...
>
> ...The starting point for financial planning during this phase is establishing an emergency fund of approximately six months of income. **This fund is your self insurance in case you lose your job or have an unexpected health event that costs more than your health insurance covers**. The discipline of having an emergency fund is a constant during your entire work life, although it may be possible to taper and eventually eliminate this fund as you near retirement...

A relevant question is therefore if there are sound economic grounds to allow this type of withdrawals during the accumulation phase. The Nobel Prize winner Franco Modigliani must had thought so when he patented a method for issuing 401(k) credit cards, with the aim of making it easier for workers to withdraw savings from their retirement accounts to cover short term consumption needs.[30]

In a series of publications Valdes (2002, 2004, 2014) points out that the answer indeed comes from the theory originally developed by Modigliani and co-authors. Indeed, Gourinchas and Parker (2002) showed that Life Cycle Theory (LCT) is consistent with *buffer stock savings* early in working life due to income uncertainty over the life cycle. It is optimal for households to accumulate *liquid* savings until certain threshold age and from that age onward to save in illiquid form, mainly for retirement purposes. The threshold age is reached between 35 to 40 years (Cui, 2008). This is pretty much in line with the recommendations on the Prudential website cited above.

Two important insights from Gourinchas and Parker (2002) are of paramount importance for future chapters:

- Their findings clearly show that the case for having an emergency fund depends on the extent of future uncertainty. This in turn suggest that the institutional background matters. For instance whether health expenses are paid out of pocket or covered by the state and/or whether unemployment insurance is available, are features that are expected to impact the optimal size of precautionary savings (i.e. the size of the buffer).[31]
- According to LCT it is the young and the liquidity constrained that are expected to show the higher demand for a SPW. The high demand by the young is not borne out by empirical evidence in the case of 401(k) plans, which is the case more extensively studied, but this is explained by vesting and tax rules (Love, 2006, 2007). The high demand by liquidity constrained is confirmed in the data again for the 401(k) case (Lu et al., 2014).

Regarding optimal design the literature is scarce. There are studies available on the effects of allowing SPWs in replacement rates, particularly for the 401(k) case in the United States–Poterba et al. (1999) and Hurd and Panis (2006) being classic references– as well as the effects of these loans on participation rates (Beshears et al., 2008; Love, 2007) but it is hard to find optimal design analysis from first principles. Valdes (2002, 2004) and more recently Adriaansen (2014) may be the only references. Beshears et al. (2014) forthcoming paper promises to be an important reference, but only the abstract is available when this thesis in being written.

`JP-GTR.pdf`. In the context of this chapter this should be interpreted as a warning that withdrawals could be a significant drag to retirement savings if adequacy considerations are not included in the design.

[30] Cited in Lu et al. (2014).

[31] The results from a recent study show that precautionary savings account for approximately 30 percent of savings using Dutch household savings data (Mastrogiacomo and Alessie, 2014).

The analysis in Valdes (2002, 2004) proceeds as follows. By definition precautionary savings need to be available when the event occurs. Mandatory pension savings are usually only available until retirement, precluding its use for precautionary motives. In economic terms, this lack of liquidity is akin to an *implicit tax* that reduce the set of consumption plans attainable by workers and, as with any other tax, it has the potential of creating a dead-weight loss. Allowing partial liquidity within certain limits and restrictions may then yield Pareto improvements.

The implicit tax affects workers differently in a regressive manner. It is higher for workers with little or no voluntary wealth, since they have no substitutes for the liquidity that is denied to them. Illiquidity is less burdensome for wealthy workers with higher stock of pension savings. The illiquidity tax is also minor for those who have good insurance plans that cover most of the economic consequences of ill health, fire, and other risks, either as part of the compulsory social security system or as part of labor compensation as in employer-sponsored benefits.

The author argues against *full access* to mandatory savings on the grounds that improvident workers[32] would deplete their stock of savings, but endorses some form of *partial liquidity*, i.e. limited loans from the stock of their pension savings provided that a number of strict conditions are met. His normative recommendations are reproduced in Box 4. The bottom line is that efficient SPWs design should:

1. Set adequacy constraints.
2. Ensure the scheme is ring-fenced against political pressures.
3. Avoid cross subsidies.

Box 4. The design of SPWs. Valdes (2002, 2004) provides the following normative recommendations regarding SPWs:

1. All active members who comply with certain requirements and who have not yet retired should be given the right to request "emergency" loans. To ensure genuine liquidity, these should not require the member to demonstrate the existence of the emergency.
2. Loans should be set against the individual fund or account. When a covered worker reduces his/her net individual fund (subtracting consumer loans), (s)he would also reduce his benefits entitlement.
3. The interest rate charged on this loan should be the consumer credit interest rate plus a penalty. The profits from each loan repayment received before pension age would revert to the individual account and would increase the worker's pension benefits.
4. The repayment mode of unpaid loans should be that the worker must forgo the corresponding number of monthly payments of old age or survivor pensions at the start of the pension period without reducing the replacement rate for subsequent months.
5. There should be an upper limit on credit, defined in terms of a certain number of monthly pension payments, perhaps 12 months, where the amount of the pension would be estimated on individual basis for each worker. Each loan should also surpass a certain minimum amount to reduce unit administrative costs.
6. Members should be allowed to seek consumer credit over and above the amount suggested in the previous point but subject to a higher penalty rate, perhaps 10 percentage points above the consumer credit interest rate. The additional credit would also be subject to another ceiling, maybe another 12 months of pensions.

In Valdes (2014) the author presented recently a proposal based on the principles above for Chile. He puts forward that allowing SPWs could encourage informal workers to join the formal pensions plans and for workers already in the plan, to increase their contribution density. This may be consistent with the experience of the 401(k) plans as detailed in Beshears et al. (2008). The proposal can be found at: `http://www.comisionpensiones.cl/?wpfb_dl=42` (in Spanish).

[32] Those workers that would not had saved enough for retirement in the absence of a mandatory or a quasi-mandatory program, i.e. the myopic or irrational workers.

Valdes (2002, 2004, 2014) also show that consumer credit is not a perfect substitute for partial liquidity of mandatory saving, for three reasons:

1. Access to mandatory saving allows participants to increase the total amount of resources that they can command in times of need.
2. If plan participants can get access to their mandatory saving at an interest rate close to the rate earned by saving, then partial liquidity would enable them to replace interest payments to consumer lenders with much lower interest payments to their own individual pension account.
3. Any worker who withdraws the maximum allowable sum on a permanent basis loses the option of being able to withdraw money when the need arises.

The author concludes that (emphasis added):

> The implication for **provident workers** is clear. Because they are provident, they **do not want to increase their present consumption** and, therefore, the first two aspects above do not lead them to consume more. In addition, the third aspect above leads provident workers to withdraw from their plans only sparingly, **so that they would reach the maximum allowable withdrawal only in times of great need**.
>
> In the case of improvident workers, who are likely react to partial liquidity by permanently increasing the stock of consumer debt that they carry, the balance is different. For them, the first two aspects are indeed advantageous. **The third aspect, however, pushes the improvident worker to withdraw less than the full allowable amount**. Competition between the gains afforded by the third aspect and the losses associated with the first two aspects is likely to lead improvident workers to an intermediate policy. **If the interest rate on the allowable withdrawal were higher than the interest rate on consumer credit, then improvident workers would use up consumer credit first. Only when that was exhausted would they make withdrawals from their own pension funds**.

Beshears et al. (2008) explore the economics of 401(k) loans in the United States. They build the following two period model in which a loan is taken out in period 1 and in period 2 the consumer repays the loan and liquidates all 401(k) balances for consumption, assuming the consumer has already decided upon a current level of expenditure. Let B denote 401(k) balances before the loan is taken, L the loan amount, r_p the risk adjusted rate of return on asset in the savings plans, r_L the interest rate charged on the 401(k) loan, r_A the interest rate charged on an alternative source of credit, Y the labor income in the second period, and τ the tax rate.

With a 401(k) loan, after-tax consumption in the second period, C_L is:

$$C_L = Y(1-\tau) - L(1+r_L) + [(B-L)(1+r_P) + L(1+r_L)](1-\tau)$$

If an alternative source of credit is used, after-tax consumption in the second period is given by:

$$C_A = Y(1-\tau) - L(1+r_A) + B(1+r_P)(1-\tau)$$

Subtracting these equations yields the following expression:

$$C_L - C_A = L[(r_A - r_P) + \tau(r_P - r_L)]$$

If the last expression is positive then the 401(k) dominates the alternative source of credit. Based on this very simple model Beshears et al. (2008) identify the following list of mechanisms at work behind the

potential effects of 401(k) loans and point out that further research is needed to put sign on them:[33]

- *Enrollment effect*: the existing of a loan option may increase 401(k) participation. The best guess of the authors is that this effect should have a positive sign.
- *Contribution rate effect*: conditional on enrollment, the loan option may increase average 401(k) contribution rates. The best guess of the authors is that this effect should have a positive sign.
- *Borrowing cost effect*: the existence of a loan option may reduce borrowing costs. The sign of this effect depends on the intensity of confounding income and substitution effects.
- *Credit availability effect*: the existence of a loan option may increase the likelihood of borrowing, since the option make 401(k) savings liquid. The best guess of the authors is that this effect should have a negative sign.
- *Repayment crowd-out effect*: the repayment of a loan may crowd-out existing savings flows. To the extent that loan repayment replaces existing contribution the sign of this effect is negative.

Love (2007) reports that plan features such as vesting, matching, and withdrawal penalties in 401(k) plans exert a substantial effect on optimal saving and participation decisions. Compared with matching and withdrawal penalties, vesting has a smaller effect, but it can still reduce the participation rates of the young by as much as 15 percentage points. He also shows that the effects of these features depend critically on assumptions about risk aversion and the elasticity of intertemporal substitution. As expected, more risk-averse individuals tend to be less responsive to plan incentives. An important piece of information for future chapters is the empirical evidence of 401(k) participation and loan uptake shown to be counter-cyclical (Butrica and Smith, 2014; Ghilarducci et al., 2012).

Adriaansen (2014) explores the issue of using pension savings for housing finance. A number of important insights come from this work. Housing can be seen either as a consumption good or as an investment good. Consistent with this, there are two motives why people may decide to *substitute* pension wealth for housing wealth:

- *Arbitrage motive*: Individuals may prefer to save more via their owner-occupied home than in the pension system for arbitrage reasons, i.e. due to the after-tax expected return on pension savings compared to the after-tax mortgage interest rate, and risk considerations.
- *Intertemporal consumption motive*: Individuals may choose to consume more today and less in retirement (i.e. they use pensions savings for repayment of their mortgage loan).

In the former case individuals gain from arbitrage only if the interest rate on mortgage loans exceeds the return on pension savings, a result in line with Beshears et al. (2008) findings.[34] In the latter case people can gain from consuming more today and less during retirement if they are sufficiently impatient. In line with Valdes (2002, 2004), a system of withdrawals can therefore be welfare enhancing, but in this case the gain does not come from removing the inefficiency created by the lack of liquidity of pension savings for some individuals, but from building an optimization program where such withdrawals are allowed at the outset.

[33] The list only includes the effects that the authors believe to be sizable. For the full list see Beshears et al. (2008).

[34] This applies whether the individual retrieves money from pension savings in one withdrawal at the house purchase or regular withdrawals during the working period.

Some adequacy provisions should be imposed as also suggested by Valdes (2002, 2004). Otherwise, as indeed Adriaansen (2014) notes, then withdrawals can be used for arbitrage purposes and then the realization of the gains will be subject to uncertainties that the individuals may not necessarily be in a better position to hedge than for instance, pension funds.[35] The importance of setting adequacy provisions is magnified when behavioral economics weights-in. In their abstract, Beshears et al. (2014) mention (emphasis added):

> U.S. defined contribution savings accounts–401(k) plans and Individual Retirement Accounts (IRAs)–are more liquid than retirement savings accounts in most other countries...**This leakage is sometimes desirable** (when it funds legitimate spending needs, like a medical emergency or investment in human capital) **and sometimes self-defeating** (when it is driven by planning mistakes and self-control problems)...
>
> ...Our analysis evaluates the optimality of the U.S. defined contribution savings system, using a model that includes both legitimate spending shocks (e.g., costly medical emergencies and other sources of financial hardship) and self-control problems. **The self-control problems are modeled as the consequence of present bias**...We derive the socially optimal level of illiquidity in retirement savings accounts...
>
> ...Our model implies that average societal well-being (i.e., population average utility) would rise if defined contribution accounts came in two forms: a relatively liquid account (much like existing DC accounts with a modest or non-existent pre-retirement withdrawal penalty) and an illiquid account that cannot be drawn down until retirement (or disability)...Savings would be spread across these two accounts. **Savings in the liquid account would be used to fund pre-retirement spending, serving as a rainy day fund for short-term financial emergencies**. Savings in the illiquid account would be locked away until retirement...

A recent paper by van Ooijen et al. (2014) provides additional insights on using pension savings for housing as well as long-term care (LTC). They report that:

- Retirees in the Netherlands face limited uncertainty about health expenditures but that nonetheless, the elderly, on average, keep large amounts of assets even at a very old age.
- A sizable fraction of the Dutch elderly has accumulated a small buffer of financial wealth that is sufficient for small incidental expenditures but insufficient for large expenditures such as long-term care (LTC).[36]

Among other proposals, van Ooijen et al. (2014) put forward the idea that the government should facilitate the use of housing assets to finance LTC and that the accumulation of housing equity should be encouraged by allowing individuals to use part of their pension savings to pay off mortgage debt, that is, *by allowing a PLS at retirement* for that purpose; or by discouraging home equity borrowing before retirement, that is, *not allowing SPWs for housing purposes during the accumulation stage*.[37]

[35] For instance, regarding the future value of the house.
[36] This predominantly holds for renters.
[37] The italics are my own interpretations.

2.5.2 Operative models for SPWs

A recent public consultation conducted by the United Kingdom pensions regulator provided a framework of three different models to consider:[38]

- *Loan and repayment model*: allow individuals to borrow from their pension fund, pretty much in the sense of the proposal above by (Valdes, 2002, 2004) and the analysis in Adriaansen (2014) and to the current 401(k) scheme in United States.
- *Permanent withdrawal model*: allow access to funds without repayment obligations–possibly in limited circumstances, such as in cases of hardship. This model operates in New Zealand.[39]
- *Feeder-fund model*: create a more flexible savings product linking liquid savings products and pension savings together into a single account. Although not exactly fitting in this description, Singapore maybe the closest example.

Interesting examples that emulate some of these models can be found in the pension systems of Canada, Malaysia, Mexico, New Zealand, Philippines, Singapore, Switzerland, the United States and some African nations. The next chapter covers some of these cases. Finally, note that neither model follows exactly the normative considerations proposed by Valdes (2002, 2004).

2.5.3 Partial lump-sum economics

The literature on partial lump-sum (PLS) design, that is, on the possibility to cash out certain percentage of pension savings *at* retirement is scarce, probably reflecting the lack of academic consensus mentioned before on the exact proportion of annuities, lump-sums and other products in the retiree portfolio. On the other hand, there are many real world examples of countries allowing PLS at retirement (more on this next chapter). Therefore a relevant question is what is the optimal design? The few articles available come from practitioners and policy-oriented international institutions advising client countries in the design of pension systems, as opposed to academic articles. In particular, Walliser (2000) contain some early thoughts that deserve attention and further analysis.[40]

Walliser (2000) posits that at a minimum the goal of the design of partial lump-sums is *to limit the potential cost arising from government support for the elderly*. This is known in some countries as *double dipping*. An actionable rule that follows from that maxim is that an individual should only be allowed to withdraw a **free-disposal surplus**, defined as an amount in excess of the savings sufficient to finance a pension larger than a reference sum fixed by legislation.

There is no general guideline as to how exactly to set the threshold. One option is to fix the line just above the government's minimum welfare level provided by the state pensions as Walliser (2000) suggests. A less conservative approach would be to set the threshold at a higher level, say for instance X percentage of the reference welfare level like in Chile.[41] Brown and Nijman (2010) proposals for the Netherlands

[38] The consultation also considered another option built upon an already existing option in the UK, namely to allow early access to the 25 percent tax free lump sum already available at the time in the UK but given the recent regulatory changes that option is not relevant any longer. The UK Government concluded that early access to pension savings should not be considered at that time in view of the *limited evidence that early access would have a positive impact on pension saving*, and the extensive private pension reforms that were being put in place, most notably the introduction of automatic enrollment from October 2012. Once these reforms are implemented, the the government may revisit this issue.

[39] Presumably, the illiquid account in the Beshears et al. (2014) model will fall into this category.

[40] Two other references are Valdes (1998) and Mackenzie (2006).

[41] For example, in Chile partial lump-sums are allowed only if the remaining balance in the individual account is sufficient to finance a pension equal to at least 70 percent of the average real wage of the worker in the 10 years preceding retirement and 80 percent of the maximum pension with solidarity support (*Pension Maxima con Aporte Solidario*, or PMAS). See next chapter and Valdes-Prieto (2009) for more details.

to (1) reduce the mandated annuitization amount to an amount sufficient to meet basic needs; and (2) provide more flexibility in annuity and non-annuity choice above the minimum amount; can also be accommodated within the framework of the free-disposal surplus paradigm.

2.5.4 Further lessons for pension system design

The are a number of messages to be gleaned from this section. One that resembles previous findings in this chapter may be that the extremes, represented in this case (*i*) by no SPWs or PLS (i.e. full illiquidity of pension savings), and (*ii*) full access of pension savings for reasons other than accumulating a pension (full liquidity), seem to be suboptimal. For the relevant middle ground, there is little academic guidance on the optimal design of PLSs and SPWs in pension systems. Therefore there is again an open question of exactly what is the optimal level of liquidity of pension savings, but according to Beshears et al. (2014) the optimal level of illiquidity is expected to be high.[42]

There appears to be a sound economic case for special purpose withdrawals in pension systems, based on the important work of Gourinchas and Parker (2002), although the strength of the argument should be qualified depending on the institutional structure of each country. SPWs are more important for the young and for individuals or groups bitten by liquidity constraints or lack access thereof to alternative financial institutions credit. The work of Love (2007) and Beshears et al. (2008) show that SPWs may be particularly important at the extensive margin, that is, when the objective is to increase participation, and to a lesser degree at the intensive margin, that is to increase density of contributions (conditional on participation). This maybe important for groups whose participation in the pension system is traditionally voluntary, like the self-employed.[43]

The analysis in Adriaansen (2014) makes clear that accessing pension savings for dowpayment purposes or paying a mortgage– being for intertemporal consumption substitution or for arbitrage motives–*during the accumulation stage* has different economic dimensions than a withdrawal to avoid imminent eviction, which may be qualified as an emergency, although both situations are related to housing. The former case is better understood in the context of the SPW feeder-fund model, while the latter in the context of the loan & repayment or the permanent withdrawal model. Furthermore, the topic of using housing to pay for a remaining mortgage at retirement could be a legitimate use of a PLS *at* retirement. Future chapters covers these cases, supplementing in that way previous work.

At this juncture it is important to mention that the theoretical analysis and recommendations in Valdes (1998, 2002, 2004), Adriaansen (2014), Beshears et al. (2008), Love (2006, 2007), Lu et al. (2014) and Beshears et al. (2014) are formulated in an *individual accounts DC system*. **For collective schemes other considerations may need to be included in the design**. This is the primary domain of this thesis (see Chapter IV). Before jumping into that, Chapter III will delve more into these issues from an international perspective.

[42] Recall that only the abstract of this work is available at the time this thesis is being finalized, but the statement that it is expected that these authors will conclude that *the optimal level of illiquidity is high* comes from the conclusions slide of a presentation of one of the coauthors. The presentation can be retrieved at `http://www.princeton.edu/jrc/conferences/third-conference/Laibson_Slides.pdf`.

[43] The issue of participation and density of contributions is relevant for the 401(k) plans in United States as well as for countries where informality is pervasive as for example Mexico, Colombia and other countries in Latin America, including to a lesser extent Chile.

Chapter 3

International experience

3.1 Introduction

This chapter explores selected features of the decumulation phase in eight countries: Australia, Chile, Denmark, Netherlands, Singapore, Switzerland, United Kingdom, and United States. The main goal is to supplement the literature review by providing real world examples of five decumulation phase design features in these countries: (i) role of annuities and lump-sums; (ii) behavioral design elements; (iii) decumulation products and risk protection; (iv) partial lump-sum design; and (v) special purpose withdrawals. Each of these topics is presented in a separate section below, after a general review of the institutional background. Each section contains an overview of the main issues and a country-specifics section. This is finally supplemented by a potential lessons for the Netherlands section at the end of the chapter.

3.1.1 Institutional background

This section provides a brief introduction to the pension systems for the eight countries covered in the chapter, inasmuch as the selected information is useful for the rest of the chapter. The tables in this section classify countries according to the dominant feature for each topic.[1] Further details as well as salient exceptions to the general classifications are emphasized in the analysis and also in the Appendix at the end of this chapter.

In terms of *relevance*, taken together, pension assets under management in the eight countries in the sample represent 81.6 percent of the OECD area total pension assets and 53.6 percent of global pension assets as of December 2011 (OECD, 2013a). These figures are definitely driven at the aggregate level by the inclusion of the **United States** in the sample (see Table 3.1). By itself the **United States** holds half of the pension assets under management in the OECD area. From an individual country level perspective, pension assets under management are important in all countries– and in some even more than in **United States**– again with a lot of variation, from 50 percent of Gross Domestic Product in **Denmark** to 160 percent in the **Netherlands**.

[1] To give an example, in the **Netherlands** there are DB, DC and Hybrid pension schemes, but the classification and analysis focuses on hybrids as this is the dominant scheme.

	AUM / GDP	AUM / AUM OECD	Gross RR females	Net RR females	Gross RR males	Net RR males
AU	91.7	6.53	55.5	70.0	60.2	75.6
CHL	60.0	0.71	36.6	44.1	45.5	54.1
DN	50.1	0.80	83.7	82.4	83.7	82.4
NL	160.2	5.51	91.4	103.8	91.4	103.8
SGP	70.0	0.79	34.4	37.7	38.5	42.1
SW	110.7	3.41	57.6	76.6	58.4	77.8
UK	95.8	11.23	37.9	48	37.9	48.0
USA	72.2	52.62	41.0	49.9	41.0	49.9

Definitions 1: "AUM" refers to Assets under Management or the value of Pension Assets; "GDP" is Gross Domestic Products; "RR" stands for Replacement Rates.
Definitions 2: The replacement rate (RR) measures how effectively a pension system provides a retirement income to replace earnings, the main source of income before retirement. The gross replacement rate (Gross RR) is defined as gross pension entitlement divided by gross pre-retirement average lifetime earnings. The net replacement rate (Net RR) is defined as the individual net pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners.
Definitions 3: The following acronyms are used for the countries: Australia (AU), Chile (CHL), Denmark (DN), Netherlands (NL), Singapore (SGP), Switzerland (SW), United Kingdom (UK) and United States (USA).
Note 1: When there is no difference between the replacement rates among males and females it means that the OECD do not report these figures by gender for that country.
Note 2: The ratio of pension assets to GDP is as of June 2012, while the ratio of pension assets to total pension assets in the OECD 34 economies indicator is as of December 2011. This is the most recent consolidated comparable data from the OECD Global Pension Statistics.
Source: OECD (2013a) and OECD (2013b) and the references therein.

Table 3.1: General information on size and replacement rates

In terms of *representativeness*, the sample countries exhibit a very interesting variation in pension system design. Table 3.2 shows that **Singapore** do not follow a multipillar structure as advocated by international institutions such as the World Bank. Indeed, **Singapore** runs an all-encompassing social security system, where the different objectives of the different pillars–poverty prevention, consumption smoothing, voluntary savings, etc.–are amalgamated in one program administered by the state.

First pillars are in general run under PAYG principles administered by the state while second pillars are funded and mostly decentralized to the private sector. Only in **Australia** and **Chile** it can be said the second pillar is *fully* funded. The social security program in **Singapore** is based on fully funded individual accounts while in the **Netherlands** the second pillar is funded. In **Chile** and **Switzerland** pension funds are sole purpose entities while occupational pension funds are common across these countries.

	Multipillar	R-S (P1-P2)	F-M (P1-P2)	Administration (P1-P2)	Organization (P2)	Private sector (P2)
AU	Yes	DB-DC	PAYG-FF	State-Private	Individual Accounts	Occupational
CHL	Yes	DB-DC	PAYG-FF	State-Private	Individual Accounts	Sole-Purpose
DN	Yes	DB-Hybrid	PAYG-F	State-Private	Collective scheme	Occupational
NL	Yes	DB-Hybrid	PAYG-F	State-Private	Collective scheme	Occupational
SGP	No	DC	FF	State	Individual Accounts	Multi-Purpose
SW	Yes	DB-Hybrid	PAYG-F	State-Private	Collective scheme	Sole-Purpose
UK	Yes	DB-DC	PAYG-F	State-Private	Individual Accounts	Mix
USA	Yes	DB-DC	PAYG-F	State-Private	Individual Accounts	Mix

Definitions 1: Reading across the column headings, when there is a parenthesis it means that there are two entries. Usually the first entry is P1, which refers to information about Pillar 1; while P2 refers to Pillar 2.
Definitions 2: Also on the column headings, "R-S" refers to Risk-Sharing arrangement and therefore classifies countries as Defined Contribution (DC), Defined Benefit (DB) or hybrids, correspondingly. "F-M" stands for Financing-Method and therefore classifies countries either as PAYG, Fully Funded (FF) or Funded (F). The column "Private Sector" classifies countries according to the type of pension contract. In that column, "Mix" refers to a industrial design where both, sole-purpose companies as well as occupational pension funds co-exist. Singapore does not fit well into the table because it has an all-encompassing social security system (i.e. no pillars according to the World Bank definition; see Note 1 below).
Definitions 3: The following acronyms are used for the countries: Australia (AU), Chile (CHL), Denmark (DN), Netherlands (NL), Singapore (SGP), Switzerland (SW), United Kingdom (UK) and United States (USA).
Note 1: The column "Multipillar" classifies countries according to the World Bank definitions of pension system pillars. See World-Bank (1994) and Holzmann (2000).
Source: OECD (2013a) and OECD (2013b) and the references therein.

Table 3.2: Pension system structure

In terms of *risk-sharing arrangements* the sample covers the representative cases of Defined Benefit (DB) and Defined Contribution (DC)–both of the individual type like in **Australia**, **Chile**, and **Singapore**, and collective types, like the CDC schemes in the **Netherlands** and occupational plans in **Denmark**. It also encompass mandatory second pillars like in **Chile** and **Singapore**, quasi-mandatory like in **Denmark**, the **Netherlands** and **Switzerland** as well as voluntary schemes, like in the **United Kingdom** and **United**

States.[2] The case of the **Netherlands** has also been classified recently as Defined Ambition (DA), that is, a hybrid comprising elements of both, DC and DB schemes. Notional DC are also represented by the second pillar in **Switzerland**.[3]

A further classification refers to the *administration* or funds. The sample includes countries where the administration of resources in the main pillar has been outsourced to the private sector like in **Australia**, **Chile**, **Netherlands**, **United States** and **United Kingdom**, and others where the administration is made by a government agency like in **Singapore** or a mix like in **Denmark**.

Table 3.3 shows information on the presence and relative importance of zero and first pillar pensions as well as their designs[4]. With the exception of **Singapore**, all countries in the sample provide a state pension and only the **Netherlands** and **United States** do not means-test it. These countries provide a universal flat benefit that is less important relative to the second pillar benefit that in most other countries in the sample. It is worth to bear in mind for what comes later in the chapter that **Australia** provides a moderately high state pension while **Switzerland** provides a relatively generous benefit.

	State Pension	Means tested	First Pillar Benefit	Importance
Australia	Yes	Yes	38.80	Moderate
Chile	Yes	Yes	17.00	Low
Denmark	Yes	Yes	45.20	Moderate
Netherlands	Yes	No	36.70	Moderate
Singapore	No	No	—	—
Switzerland	Yes	Yes	65.40	High
United Kingdom	Yes	Yes	87.50	High
United States	Yes	No	19.00	Low

Note: The First Pillar Benefit refers to the percentage contribution of components of the pension system to weighted average pension wealth.
Source: OECD (2013a) and the references therein.

Table 3.3: Importance of public pensions

Finally, an important dimension is that of the *taxation* approach to pension savings and benefits. Table 3.4 shows that the sample covers all the range of tax treatments, from exemptions all over the life cycle like in **Singapore** to tax concessions all over like in **Australia**. In the middle of that range, the sample includes countries that approach taxation of pensions in the normal EET or classical expenditure approach like **Chile**, **United States** traditional plans and income tax, pre-paid approach or TEE also in the **United States** (Roth IRA plans).

	Contributions	Returns	Benefits
Australia	Concesionally taxed	Concesionally taxed	Concesionally taxed
Chile	Exempt	Exempt	Taxed
Denmark	Exempt	Taxed	Taxed
Netherlands	Exempt	Exempt	Taxed
Singapore	Exempt	Exempt	Exempt
Switzerland	Exempt	Exempt	Taxed
United Kingdom	Exempt	Exempt	Taxed
United States	Exempt / Taxed	Exempt / Exempt	Taxed / Exempt

Note: The first letter corresponds to the treatment of contributions, the second to accruing income, and the third to withdrawals.
Source: OECD (2013a) and the references therein.

Table 3.4: Taxation approach to retirement savings, returns and pension benefits

[2] In these two countries second pillar savings are policy induced (i.e. tax induced) but not mandated.

[3] The second pillar contributions, called, old-age credits, are credited to a notional retirement account that accumulates notional interest set by the Swiss Federal Council. For more details see the appendix.

[4] Recall from the previous chapter that this is potentially one of the main determinants of the annuitization levels observed in second and third pillars (Bernheim, 1991; Butler et al., 2013)

3.2 The role of annuities and lump-sums

3.2.1 Overview

Table 3.5 depicts a general overview of the role of annuitization and lump-sums in the sample. On one side of the spectrum, the **Netherlands** shows as the only country that mandates full annuitization at retirement.[5] The design of the decumulation phase looks relatively rigid as there are no partial annuitization possibilities in the Netherlands. The mandate to purchase a life annuity is extensive to the three pillars of the pension system although the annuity product has different characteristics depending on the pillar. The first pillar offers a real annuity; the second pillar a conditionally indexed annuity, depending on the funding position of the collective fund; and the third pillar offers a nominal annuity. Partial lump-sums are not allowed although there is some flexibility through the so-called high-low options under the annuity framework.

At the other side of the spectrum, lump-sums seem to be a staple of the decumulation phase in **Australia**. Indeed, Australia is usually put forward as the prime example of a liberal approach,[6] but Table 3.5 shows that this country is not alone on this matter. **Switzerland** and the **United States** also allow retirees to cash out all their pension savings at retirement and this will be possible in the **United Kingdom** in 2015 (without a tax surcharge). There is a group of countries in the sample that lie in a middle ground, allowing for partial annuitization and/or partial lump-sums. This is the case of **Chile**, **Denmark** and **Singapore**.

	Mandatory annuitization	Full lump-sums allowed	Partial lump-sums allowed
Australia	No	Yes	Yes
Chile	No	No	Yes
Denmark	No	No	Yes
Netherlands	Yes	No	No
Singapore	No	No	Yes
Switzerland	No	Yes	Yes
United Kingdom	No	Yes	Yes
United States	No	Yes	Yes

Note: The United Kingdom information incorporates the recent legislative changes although not all changes have been implemented yet.
Source: Official government sites, Rocha et al. (2011), OECD (2013a) and the references therein.

Table 3.5: Annuitization and lump-sums in the second pillar

It is useful to contrast the options allowed by regulation and the preferences of the participants, especially where some flexibility is built in the design. Looking at Table 3.6, the following highlights can be drawn:

1. The **Netherlands** high take-up rate should not be a surprise given that annuitization is mandatory.
2. **United Kingdom** is special case as the high annuitization observed in the past is expected to go down after the recent regulatory changes.
3. The three countries aforementioned as allowing full lump-sums show very different levels of annuitization. **Australia** and the **United States** stand as countries where full-lump sums are allowed and participants indeed show a low annuitization level, although for very different reasons. In contrast, **Switzerland** exhibits high levels of annuitization in spite of full lump-sums being allowed.

[5] It should be stressed though that the Netherlands is not alone in the world on this design. Some countries outside the sample only allow annuities at retirement as well. See Antolin et al. (2008) for a thorough review. Nevertheless, the **Netherlands** might be the only country where this requirement extends to all pillars.

[6] There has been a heated debate in Australia about this and many well known economists have been very critical. For instance, in a recent submission document by the Centre of Excellence in Population Aging Research, CEPAR, it was mentioned that "the decumulation phase of the Australian retirement income system is the least developed and thought-out dimension of Australia's retirement income system." See (Bateman et al., 2014).

4. **Chile** and **Singapore** provide interesting contrasting cases. The former shows high annuitization levels while the latter low annuitization levels. Both countries allow lump-sums as long as some minimum requirements are met. As in the case of Singapore, in Chile decumulation products are strictly defined by regulation. Unlike Singapore, in Chile there is more than one option in a way that approaches the guidance from the economic literature covered in the previous chapter.

	Annuitization level	Full annuity take-up rate
Australia	Low	2 to 10
Chile	High	70
Denmark	Middle	50
Netherlands	Very high	100
Singapore	Low	36
Switzerland	High	80
United Kingdom	High	80
United States	Low	less than 2

The take-up rate refers to the precentage of retirees fully annuitizing their pension savings in any given year.
The figure for Singapore is as of end of 2006, as reported by (Koh et al., 2008).
Source: Official government sites, Rocha et al. (2011), OECD (2013a) and the references therein.

Table 3.6: Annuitization levels

3.2.2 Country specifics

Low annuitization countries

In **Australia** *lump-sum* payments are the most chosen payout of retirement savings, reaching 80 percent of the total in the 1990s. They currently represent a little more than 50 percent of total benefits paid.[7] Clements et al. (2013) put this down to historical grounds, strong preferences for flexibility among the population, as well as remaining debt and mortgages at retirement. Disney (2009) adds that there are strong behavioural interactions between the design of the first pillar benefit and the taxation of pension benefits.[8]

The **United States** institutional setting is such that the first pillar has low relative importance as a percentage of the total pension benefit and second pillar savings are not mandatory nor quasi-mandatory. The latter point is reflected in the fact that there is only very general regulation on decumulation options and products.[9] In particular, in the second pillar, the available decumulation products and options vary depending on the type of plan. DB plans usually allow lump-sum payouts when the employee changes jobs and at retirement while there is no *compulsory* arrangement to pay an annuity and lump-sums are quite frequent in DC plans.[10]

Singapore provides an interesting case study because the decumulation options are strictly defined by regulation. Furthermore, a combination between a lump-sum payment and a deferred annuity is compulsory at retirement. From this point of view the low annuitization figures may seem puzzling but they are not so much when considering two elements in the decumulation design:

[7] There is some data showing that lump-sums have have recently receded. For instance see Rocha et al. (2011). Nevertheless this information is based on a simple proportion of annual benefits paid as lump-sum and non-lump-sum. A comparison of lump-sums as a proportion of cohort assets shows that lump-sums are not necessarily losing importance (Bateman et al., 2014).

[8] The first pillar means-test discourages the use of the second pillar savings as a stream of resources over retirement while incentivizing early spending, sometimes on means test-exempt owner-occupier housing (Bateman et al., 2014).

[9] Recently, the federal government, following a 2010 request for information, has begun to issue regulations and guidelines encouraging retirement plans and participants to take advantage of partial annuitization products and strategies.

[10] Indeed, according to Gale (2008), less than 2 percent of savings are taken in the form of annuities. The Congressional Research Service (2005) reports that 85 percent of the 61.1 million workers age 21 or older who were included in a retirement plan at work participated in a plan that offered a lump-sum distribution as a payment option.

1. First, *retirement adequacy is not the only objective of the Singapore Social Security system.* The system allows for a series of withdrawals during the accumulation stage such as death and disability insurance, catastrophic medical care, housing, and education.

2. Second, *rules are such that only participants with a minimum required balance can access the decumulation product defined by regulation.* Indeed, the Central Provident Fund regulates how retirees can access their money via the so-called Minimum Sum Scheme (MSS). Asher (2013) reports that in 2011 only 45 percent of active members could set aside the require MSS.[11]

High annuitization countries

The annuity take up rate in **Switzerland** is on average 80 percent, and although there is a lot of variation by plan, it does not go down of 40 percent. This is surprising when considering that the first pillar pension in Switzerland provides a relatively important coverage form longevity risks. The high annuitization rate has been related to the cultural attitudes of Swiss workers, who are financially conservative and prefer guaranteed incomes for life (Butler and Teppa, 2007). The choice architecture in Switzerland may also be part of the rationale (see next section).

In **Chile** the annuity market is also notably developed, to the point that there has been discussions about the "high level of annuitization and what to do about it."[12] Indeed, at least half of chileans annuitize at normal retirement age and the figure almost reaches 100 percent for early retirees. This is usually attributed to the competitive structure of the pensions market and effective information to the workers, in combination with effective product design and regulation. In particular, Rocha et al. (2011) emphasize four design elements:

1. First, restrictions on lump-sum payments increase the demand for all retirement products, including annuities.

2. Second, previous to the 2008 reform, the absence of a first pillar benefit implied considerable exposure to investment and longevity risks. This may had induced the demand for the protection provided by life annuities.

3. The actuarial factor in the calculation of PWs is likely to reduce the preference for PWs, especially among low-income workers.

4. The separation of the accumulation and decumulation stages into two industries implies that the marketing of retirement products has been one-sided.[13]

According to Table 3.6 the **United Kingdom** would be classified as a high annuitization country. Current annuitization levels are similar to those in Switzerland. Nevertheless, recent analysis produced independently by the *Pensions Policy Institute*, the *Pensions Institute*, and the *Institute for Fiscal Studies* convene that the high level of annuitization will recede in favor of other more flexible decumulation products in the coming years as a result of the recent legislative changes. The Appendix at the end of this chapter provides an overview of the recent structure as well as the main changes to the pensions landscape in the United Kingdom.

[11] As Asher (2013) points out, this suggests that the majority (55 percent) did not meet even the stipulated basic income requirements, let alone being able to maintain their pre-retirement living standards. Also, McCarthy et al. (2002) report that the scheme has engendered an "asset rich and cash poor" phenomenon at retirement.

[12] See this article by Moshe Milevsky: http://www.thinkadvisor.com/2013/05/28/milevsky-solving-chiles-annuity-puzzle.

[13] Pension funds (AFPs) focus on the accumulation phase and do not market PWs actively. In contrast, life insurance companies depend on the annuity business and have marketed their products aggressively.

Mid-level annuitization countries

Denmark is a middle table case with about half of workers annuitizing at retirement. It is an interesting case in comparison with Netherlands because of some common design characteristics. Indeed, like in the **Netherlands**, Denmark pension funds are occupational in nature, rendering participation quasi-mandatory. Unlike the Netherlands, there is a wide array of decumulation products allowed by regulation in Denmark. There are life annuities, term annuities, unit-linked annuities, phased withdrawals and lump-sum payments. Some plans offer different combinations of these products.

The annuity take up rate in Denmark is 50 percent, while 35 percent is devoted to phased withdrawals and 15 percent is taken through lump-sums. Presumably this distribution reflects the heterogeneity in demand, but there is no research available to support this claim.

3.3 Behavioral elements

3.3.1 Overview

This section addresses which behavioral elements are embedded in the design of the decumulation phase that maybe related to the choices made by retirees. Table 3.7 classifies countries according to some domains over which the design can enlist compulsion, soft compulsion (i.e. choice under certain limits and options defined by regulation), as well as behavioral features such as defaults, frames and nudges.

A notable message from Table 3.7 is that most countries are located either under the no compulsion or soft compulsion headings.[14] Interestingly, two cases of behavioral design stand out in countries where full lump-sums are allowed but nevertheless the annuitization rate is moderate to high, as analyzed below.

No compulsion	Behavioral features	Soft compulsion
United States	Switzerland	Chile
Australia	Denmark	Netherlands
United Kingdom		Singapore

Source: Official government sites.

Table 3.7: Behavioral design elements

3.3.2 Country specifics

In **Switzerland**, there are three design characteristics that are different from other countries:

1. *Defaults*: although Swiss workers can choose form a menu of products, from a fixed nominal (joint-survivor) life annuity, a lump-sum, to combinations of these two options, the annuity option is usually the default in most pension plans for workers that do not make an active decision. Butler and Teppa (2007) find that most retirees take annuities if that is the default, but that lump sums are more often taken where that is the default.

[14] Most of the examples of behavioral economics in action actually come from the accumulation phase, like enrollment, asset allocation defaults, nudges to increase voluntary savings, etc. Also, there have been notorious advances in product design at the retail level–see for instance Turner (2013)–but most of these products are not part of the menu of mandatory second pillars, yet.

2. *Framing*: annuities are deliberately marketed under the consumption frame rather than the investment frame (Butler and Teppa, 2007). If annuities are framed as investments, they are considered a risky asset whose payoff depend on the uncertain lifespan length (Brown, 2008).

3. *Timing of the decision*: In case of taking a lump-sum, workers have to give notice three years in advance of their decision to the fund (Butler and Teppa, 2007). Early decision regulations help long-run preferences prevail by allowing consumers to partially commit to their long-run goals, making it harder for a momentary impulse to reverse past decisions (Beshears et al., 2006).

Two of these behavioral design elements are also present in **Denmark** but the difference with **Switzerland** is that the decision to annuitize is made much earlier in the accumulation process. It is possible subsequently to change a lump sum or programmed withdrawal choice into a life annuity, but not the reverse is not allowed.[15] In **Singapore** the decision is also being made before retirement, at age 55, although the choices are strictly defined by regulation as mentioned before, so the behavioral element in the design starts and ends there.[16]

Note that these behavioral features are not in a vacuum. There are important interactions between the behavioral design and other types of incentives to compel retirees into certain option. For instance, in Switzerland, where the annuity take up rate is the highest in the sample, the behavioral design comes hand-in-hand with tax concessions.

3.4 Decumulation products and retirement risks

This section copes with the exposure to the main risks retirees face in the transition from the accumulation to the decumulation phase and during the decumulation phase as well as the products available to mitigate these risks.

3.4.1 Overview

Table 3.8 provides a very broad view on exposure of retirees to micro-longevity risk, macro-longevity risk, investment risk, inflation risk and conversion risk in the sample countries.[17]

Country / Type of risk	Micro-longevity	Macro-longevity	Investment	Inflation	Conversion
Australia	Optional	No	Optional	Optional	Provisions
Chile	Optional	No	Optional	No	Provisions
Denmark	Optional	Yes	No	No	No
Netherlands	No	Yes, shared	Yes, shared	Yes, shared	No
Singapore	No	No	No	No	No
Switzerland	Optional	Yes, shared	Yes, shared	Yes, shared	Regulated
United Kingdom	Optional	No	Optional	Optional	Provisions
United States	Optional	Yes	Optional	Optional	Provisions

Note: "Available" means that there is an financial instrument allowed by regulation and offered in the market to get protection from the risk in turn. "Mandatory" means that there is no other option, the retirees are protected from the risk in turn by regulation. Finally, both terms, "Partial" as well as "Conditional" means that the protection is not full, but that the risk in turn is shared either with the sponsor or other participants in the system.
Source: Official government sites.

Table 3.8: Risk exposure of retirees

[15] This should be framed in the context that all annuities are deferred annuities in Denmark. Actually they are collective deferred annuities bought during the accumulation phase.

[16] There is also a default in Singapore which is to get an annuity from the CPF, as opposed of getting it from private sector providers, but this is a dimension of choice different than the product choice, which is the focus of this chapter.

[17] These risks where defined in Box 3 of Chapter II. For a thorough revision see Rocha et al. (2011).

Some general comments on how Table 3.8 was constructed are due before proceeding to the analysis.

- First, note that there are different reasons why retirees could be exposed or not to a certain risk:

  (a) Retirees can be protected from certain risk by regulation, in which case the table states that there is no exposure at all. This is the case for instance in **Chile** when it comes to inflation risk, given that all annuities are indexed to price inflation by law. Another example is micro-longevity risk exposure in the Netherlands. Given that retirees are forced to take an annuity, they are not exposed to this risk.

  (b) Even in the absence of a mandatory protection, there can be no exposure when the technology to share the risk or transfer it to retirees is not available. This is mostly the case for macro-longevity risk with some salient exceptions.

  (c) In cases where the regulation gives ample leeway for the retiree to choose among different decumulation products, then exposure to certain risks may be available but whether the retiree takes it or not is another issue. It is optional. In the table there are many examples of this in the realm of micro-longevity and investment risks.[18]

  (d) Finally, there are instances where there is a technology available to share the risks in such a way that there is a partial or conditional protection. For instance, in the **Netherlands** and **Switzerland** indexation is conditional and investment risk is shared between generations.

- Second, in the case of conversion risks most countries have provisions to minimize it or provide minimum guarantees, as opposed to a full insurance mechanism. These provisions vary from country to country but are mainly related to life cycle glide paths and duration matching close to the retirement age. Other countries, like in **Switzerland**, regulate this risk. In other countries, there is no risk exposure by design (i.e. DB schemes).

With these clarifications in mind, some specific takeaways from Table 3.8 are:

1. *Inflation risk exposure is pervasive.* Only in Chile protection against inflation is mandatory in the sample countries. In other countries, like in **Australia** or the **UK**, real annuities are offered in the market but the take up is usually negligible. The **Netherlands** and **Denmark** conditionally aspire to index pension guarantees, but this is not required in the law and rules are that that inflation risk is shared by participants.[19]

2. *Investment risk exposure is scarce.* For instance, in **Singapore** regulation precludes variable annuities (VAs) and therefore investment risk exposure is banned de facto.[20] Table 3.9 provides supplementary information on variable annuities.[21] On the other hand, unit-linked VAs are available and are a popular product in **United States** and therefore the retirees that choose that option get exposure. Note that there are nevertheless other designs that allow sharing investment risks, as in the case of the **Netherlands**, where indexation depends on predefined funding ratio thresholds and it is therefore a function of investment returns.

[18] Protection from micro-longevity risk is available across the board because standard life annuities are an option in all jurisdictions included in the sample. Nevertheless, from previous sections we know that when given the freedom, most individuals avoid annuities and in that case the protection is not "purchased." This is clearly the case in **Australia** and **United States**, given the low annuity take-up rates in these countries.

[19] Bovenberg and Mehlkopf (2014) remind readers that in the United States and the United Kingdom, inflation-linked bonds are traded, and several other countries introduced them recently. The markets, however, are typically neither deep nor liquid. Moreover, the inflation index that is traded (e.g.,national price inflation) may differ from the index that is relevant to retirees.

[20] Recall that exposing savings to financial market risks allow pensioners to participate in the normally higher investment returns of equities and real assets. Indeed, if variable annuities that offer exposure to stock markets are not available annuities become less attractive (Bovenberg and Mehlkopf, 2014).

[21] Table 3.8 refers mainly to unit linked variable annuities. See the previous chapter for definitions.

3. *Most countries set up provisions to minimize conversion risks.* Only the **Netherlands** and **Denmark** protects retirees against this risk because benefits are computed using a DB formula. In **Switzerland**, the annuity conversion rates are strictly regulated. In **Chile** this risk is minimized in two ways. One is through a life-cycle glide path during the accumulation stage that matches the duration of the retirement savings portfolio with that of annuity providers towards the retirement age, and also by allowing product combinations that let individuals to "time" their annuitization decision. Both design traits can also be found in developed retail markets like the **United Kingdom** and **United States**.

4. *Macro-longevity risk is mostly borne by sponsors or life insurers.* The upshot is that the financial instruments to hedge macro-longevity risk are not available across the board.[22] Only in two cases there is a design to share that risk at the pension system wide level. One is **Denmark** through its deferred collective annuities scheme. The second is the **Netherlands**, where macro-longevity risk is partially shared between the current retirees and the current and future workers through its impact on the funding ratio. Finally, in **United States**, the CREF product shares that risk among its constituents but coverage is only targeted to workers in the educational sector.[23]

Variable annuities	Allowed	Take-up	Unit-linked	GB	Bonus
Australia	Yes	Negligible	Yes	Yes	Yes
Chile	Yes	n.i.			
Denmark	No	n.a.			
Netherlands	No	n.a.			
Singapore	No	n.a.			
Switzerland	No	n.a.			
United Kingdom	Yes	Low	Yes	Yes	Yes
United States	Yes	Low	Yes	Yes	Yes

Notes: "n.a." stands for not applicable; "n.i." means no information available.
Notes: In United States variable annuities have liquidity options and most of them are cashed out. Note that among the people that annuitize, variable annuities are popular in USA. The table still classifies take up as low because it takes the larger view of considering the whole retiree population. Considering that only about 2 percent of people annuitize, then the variable annuity take up is indeed low.
Source: Official government sites.

Table 3.9: Supplementary information on variable annuities

3.4.2 Country specifics

There is a lot of heterogeneity on the products available, popularity and even in the jargon used in each country to refer to these products. To support the points made in the previous section below an overview of products available and therefore risk coverage for each country is presented.

Australia

As mentioned before, retirement savings in Australia may be paid as a lump-sum, a temporary income stream, a lifetime income stream, or any mix of these products. Table 3.10 summarizes the options in the jargon used in Australia for these products.

In order to better illustrate the income streams products available in Australia two dimensions are distinguished. First, products are either pensions or annuities. Annuities are provided by life insurance

[22] For pension funds and other issuers of annuity contracts, macro longevity risk is a relevant concern. Unexpected increases in life expectancy raise the market value of their liabilities and harm their solvency position. For a thorough discussion see Bovenberg and Mehlkopf (2014).

[23] Recall that CREF annuites are not fully replicable in the market. See footnote 26 in Chapter II and Bovenberg and Lundbergh (2014) for more details.

companies. Pensions refer to phased withdrawals and are provided by superannuation funds. Second, each category comes in two guises, account based and non-account based:

- *Account-based products* are plans that entitle individuals to vary the amount they withdraw while also letting them choose an investment strategy.[24]
- *Non account-based* products are a simple purchase of income on a regular basis over the period of the contract. The most common types are lifetime, fixed term and market linked.

Type of income Stream	Category	Common product names
Pensions	Account based	Allocated pensions Market linked pensions
Pensions	Non account based	Lifetime pensions Fixed Term pensions
Annuities	Account based	Allocated annuities Market linked annuities
Annuities	Non account based	Lifetime annuities Fixed Term annuities

Source: Government official websites (http://www.dss.gov.au/our-responsibilities/seniors/publications-articles/retirement-income-streams?).

Table 3.10: Nomenclature of retirement income products in Australia

The main types of account and non-account products are shown in Table 3.11 and described below:

	Account-based		Non-Account based	
	Income streams	**Market Linked**	**Lifetime**	**Fixed-Term**
Account based	Yes	Yes	No	No
Insurance company based	No	No	Yes	Yes
Annual income payments are guaranteed	No	No	Yes	Yes
Investment choice	Yes	Yes	No	No
Fixed term	No	Yes	No	Yes
Access to capital	Yes	Yes	No	No
Recipient can vary annual income received	Yes	Yes	No	No
Residual capital value allowed	N/A	No	No	No
Death benefit payable	Yes	Yes	Possible	Yes

Source: APRA.

Table 3.11: Features of decumulation products in Australia

- *Fixed-term income streams* are products payable for a time period ranging from 1 to 25 years. Some variants provide investment risk protection but longevity risk is left uncovered.
- *Life expectancy income streams* are hybrid products similar to fixed-term income streams plus a minimum term payout guarantee set according to life expectancy at purchase time. This product only covers longevity risk partially, as they also include a maximum term equal to the time it takes from purchase until the beneficiary reaches 100 years.
- *Allocated income streams* are products based on accounts offering a range of investment choices. Investment and longevity risks are born by beneficiaries. In spite of this, it is the most popular among income stream products, representing 80 percent of the total.[25]
- *Market-linked income streams* are a form of variable annuity. They come with a term period based on life expectancy at retirement[26] and it is investment account-based. Unlike allocated streams

[24] The qualifier "account" comes from the fact that individuals have an account which "balance" changes every month according to the chosen investment strategy. For instance, an "allocated pension" is a type of account-based income stream (defined below).

[25] A reason for its popularity maybe that individuals are allowed to withdraw all or part of their superannuation money any moment.

[26] The maximum term available is 100 years.

though, market-linked streams are less flexible when it comes to liquidity, which may explain why the have not proved popular.

- *Lifetime income streams* are lifetime annuities. The payment often increases with inflation. A guarantee period variant exists that allows to keep paying to a secondary beneficiary if the main beneficiary dies within the guaranteed period.

Chile

Chilean workers can choose from four retirement products defined by regulation: a phased withdrawal (PW), an immediate life annuity (ILA), and two hybrids based on these two products in combination with a deferred annuity (DA).

Phased withdrawals are managed through the pension fund administrators (AFP), who set the benefit according to a government formula that converts pension savings into a monthly payout in a quasi-annuity form. The PW benefit paid to a retiree of age x in year t is given by:

$$PW_{x,t} = \frac{PS_t}{12 * NUC_{x,t}}$$

where $PW_{x,t}$ is the monthly benefit under the PW system which depends PS_t or the individual pensions savings, and $NUC_{x,t}$ refers to the government's estimate of the necessary capital required to finance one unit of pension payout, given the retiree sex, age, and family composition (Pino, 2005). Payouts are adjusted in tandem with the variation of the Consumer Price Index every twelve months. Under this option the individual still assumes investment risks, while maintaining ownership of their funds.

Pensioners with PWs may maintain their mandatory balances in funds C, D or E. Recall that there are five funds, from A to E, where contributions during the accumulation phase are invested under a life-cycle structure. A is the fund with the most risk exposure and E is the fund with the less exposure. The prohibition from selecting the riskier funds A or B does not apply for any portion of the balance that exceeds the amount necessary to finance a pension greater or equal to 70 percent of the average taxable wage of the last 10 years and greater or equal to 150 percent of the minimum pension.

An interesting innovation introduced in 2008 is an actuarial adjustment to PWs to account for longevity risk for retirees who do not qualify for the solidarity pillar.[27] This adjustment increases the probability that pensioners have enough resources until they reach 105 years of age, to receive an income equal to at least 30 percent of the first PW or 30 percent of a reference annuity. The reference annuity is defined as the value of an annuity an individual would receive on the earlier of his or her retirement and the official retirement age.

Immediate life annuities are provided by life insurance companies and are freely priced according to age, gender, and market conditions.[28]Married couples are required to buy joint life annuities. The reversion rate for joint life annuities is 60 percent for the surviving dependent beneficiary. All annuities are indexed to prices (fixed real annuities) and variable annuities are in the menu since 2004 but there are no readily available statistics on the take up rate of this product. Therefore, retirees have no exposure

[27] This is an actuarial calculation that depends on the life expectancy of the family group which is entitled to a pension and the discount rate applied by AFPs. The formula for calculating the discount rate to calculate PWs is set in the law and must correspond to an interest rate vector calculated each year, and is the result of adding the value of the temporary structure of interest rates (in real terms) and an excess return over and above the risk-free return.

[28] Life annuities cannot be acquired unless the payout is higher than the first pillar pension (PBS). Workers who do not meet this condition must use a PW at the PBS level from their own account until the balance is exhausted.

to inflation risk in the Chilean pension system while in principle, investment risk exposure may also be acquired.[29]

Hybrid products are available in Chile in two forms:

- *Temporary Phased Withdrawal* plus a *deferred annuity*. Figure 3.1 provides a graphical illustration. TPWs involve a fixed draw down re-adjustable for inflation for a predefined number of years, followed by a DA.[30] The regulation establishes that:
  - The relative size of the TPW and the DA should be defined jointly at the time of retirement, and the balance split accordingly between the AFP and the insurance company (LIC).
  - The TPW payout cannot be lower than either the PBS or the eventual annuity and cannot be higher than twice the level of the eventual annuity.

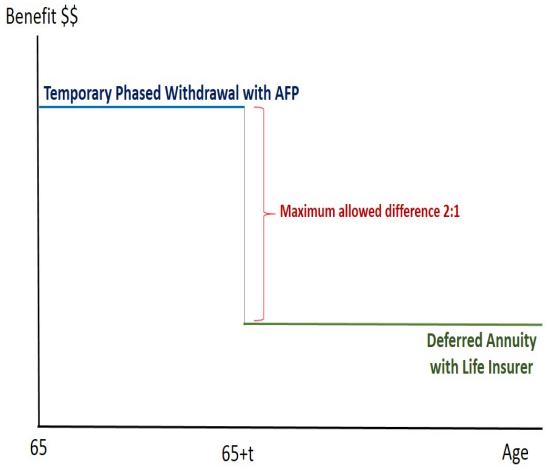

Figure 3.1: Schematic representation of a TPW + DA

- *Phased Withdrawal* plus an *Immediate Life Annuity*. Figure 3.2 provides a graphical illustration. This option allows individuals to simultaneously use part of the individual account balance to get a life annuity greater or equal to the PBS, while maintaining the remaining mandatory balance in their AFP under a PW. For this option the riskier funds A or B are only accessible to individuals who have contracted a life annuity greater or equal to 70 percent of the average taxable wage of the last 10 years and greater or equal to 150 percent of the minimum pension and only for the excess relative to that reference.

Denmark

There is a wide array of decumulation products for second–and third pillar–savings in Denmark. There are life annuities, term annuities, unit-linked annuities, phased withdrawals and lump-sum payments. Some plans offer different combinations of these products.

[29] Note that individuals can only get a variable annuity provided they first bought an inflation-linked annuity that guarantees payouts for the same amount of the payouts of the public minimum pension guarantee. In this way, if individuals want to take some risks on their pension payouts, they will have at least a minimum pension guaranteed in the form of an inflation-linked annuity.

[30] This way, individuals maintain ownership and assume the financial risk for only the portion of their funds that remains in the AFP and for a limited period of time, but not the longevity risk, which is assumed by the annuity provider offering the deferred life annuity, along with the financial risk for that period.

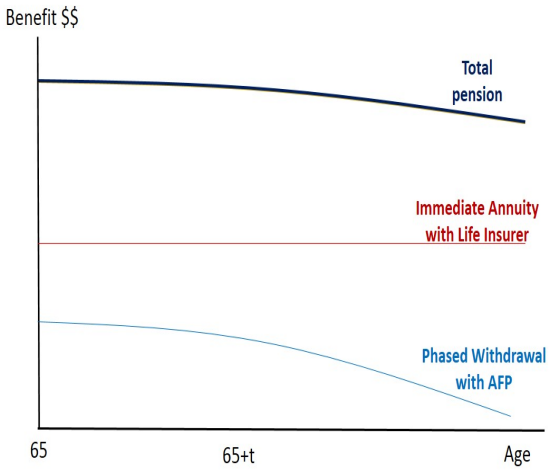

Figure 3.2: Schematic representation of a PW and IA

Annuity contracts in Denmark come in the form of *deferred group annuities*, which are deferred annuities with a preset minimum conversion factor that reflects guaranteed minimum interest rate and unisex life tables.[31] Currently the technical interest rate is 1.5 percent.[32] These annuities also include a profit sharing component by which annuity payments are increased by bonus payments if the actual investment performance exceeds the guaranteed return or if the mortality is higher than expected. In this way macro-longevity risk is shared among participants. The bonus policy is decided at the fund level.

Recently, *unit-linked annuities* have been offered although still not very popular. Non-group benefits are also available in some plans. For instance ATP allows a *lump-sum* payout only when when pension savings are small. *Phased withdrawals* are offered by some occupational plans and are a popular option in this category. Lump-sums and phased withdrawals can be converted into annuities at any moment.

Netherlands

As mentioned earlier, the general rule for all three pillars in the Netherlands is that at age 65 individuals are required to purchase a life annuity. With regards to inflation risks, most pension schemes have the *ambition* to award indexation. However, indexation is not required by law and pension funds only do it on a conditional basis, that is, the board of the pension fund may index by less than full or not even at all if this is deemed necessary to maintain the financial health of the fund.

Many boards follow the so-called policy ladders, which are rules that map the indexation of benefits in payment–as well as contributions to the current workers in the case of hybrids–to the funding ratio of the pension fund.[33] The policy ladder design also shift investment and macro-longevity risks to workers. If current old cohorts live longer than expected, the funding ratio falls, and this affects the quality of indexation of the deferred annuities of the young cohorts.

[31] The minimum guarantees are embedded options that members and policyholders have the right to exercise if market rates fall below the guaranteed rates (Rocha et al., 2011)

[32] ATP, the pension manager of the first pillar supplementary funded pensions plan, introduced a new pension accrual system in 2008 based on swap interest rates.

[33] See the appendix for more information on the policy ladders.

Finally, the DB part of pension contracts ensures that pensions benefits are immune to conversion risks. Note that those funds in the Netherlands that operate under DC principles are not immune to conversion risks but that these risks usually are minimized through a life cycle glide path and duration matching around retirement.

Singapore

There is only one decumulation product allowed by regulation. It could be defined as a **lump-sum plus a deferred annuity**:[34]

1. *Lump-sum component.* At age 55 the balance accumulated in the Special Account in excess of a designated minimum amount can be taken as a lump-sum. The minimum amount retained is called Minimum Sum Scheme (MMS) and is channelled to the Retirement Account.[35]
2. *Deferred annuity component.* There are in turn two types of plans that the worker may choose at age 55. The price is set by the CPF and is based on gender and age.
   (a) *Standard Plan*: the worker exchanges its MMS for nominal annuity with payments beginning at age 62[36]. This annuity has a premium refund feature that provides some bequest value during the early part of retirement.
   (b) *Basic Plan*: the worker may purchase a deeply deferred life annuity to start paying at age 90, with the remaining retirement account balance used for monthly drawdowns until age 90.

Retirees can purchase a life annuity on the open market or at the Central Provident Fund (CPF), but the annuity pricing from the CPF is subsidized through investments in special issue government bonds paying above-market interest rates, plus a bonus 100 basis points. Joint-life and index-linked or escalating annuities are not available in Singapore.

Switzerland

Upon retirement, Swiss workers can withdraw their savings either as a fixed nominal (joint-survivor) life annuity, a lump sum or a combination of these two options. Indexation is at the discretion of the provider and subject to its financial position. Deferred annuities, fixed-term annuities and phased withdrawals are not available for savers in the mandatory schemes. Annuities prices do not depend on gender or marital status. This means that *micro longevity and investment risks protection is granted, but inflation risks are borne by retirees.*

Switzerland regulates conversion risks. A regulated conversion rate is applied to annuities from mandated old-age credit accumulation. Currently the conversion rate is 6.4 percent. Annuities include dependent children benefits of up to 20 percent of the benefit for each child younger than 18 (or below the age of 25 if still dependent) as well as survivor benefits equal to 60 percent. Pension funds are free to set the conversion rate in the less-regulated super-mandatory part of the second pillar, and currently most do so at a lower rate.

[34] See the Appendix for more information on the structure of the Singaporean social security system.
[35] The MMS was initially set at SGD30,000 (around 17,800 euros) but has increased steadily over time to the current SGD148,000 (around 88,700 euros).
[36] This is set to increase to 65 by 2018.

United Kingdom

The regulation of the decumulation phase is one of the areas currently facing dramatic changes[37]. Before 1995, the law required retirees to take their entire DC account balance through a life annuity. Since then, income drawdowns have been permitted, subject to upper and lower limits on the annual amount. Until 2011, retirees had to annuitize by age 75, but the laws have since been further liberalized to a minimum income requirement (MIR). Individuals can currently choose one or a combination of four options at retirement:

1. A *cash lump-sum*, allowing 25 percent of pension savings to be taken as a one-off tax-free lump-sum[38]. For individual's with pensions savings below a threshold defined by the government it is possible to take the whole fund as a lump-sum, with up to 25 percent being tax-free and the remainder being taxed as income under a pay-as-you-earn tax scheme (PAYE)[39]. In specific:
    - An individual aged 60 and over, with overall pension savings of less than SP18,000, may be able to take them all in one lump sum–this is called *trivial commutation*.
    - Regardless of their total pension wealth, if individuals are aged 60 or over, they may be able take a *small pot* worth less than SP2,000 as a lump-sum.
2. An *annuity*, taxed as income at the corresponding marginal rate. Currently, around three quarters of those reaching retirement with DC pension savings use them to buy an annuity. There are several types of annuities in the market:
    - *Standard lifetime annuities* with rates based on average health and mortality assumptions.
    - *Enhanced annuities*, at higher rates, as they take into account potentially life-shortening medical and/or lifestyle conditions.
    - *Fixed-term annuities*, usually five or 10 years.
    - *Investment-linked annuities*, depending on investment returns.
3. An *income drawdown* product, allowing individuals to withdraw part of their pension savings while leaving the remaining invested. There are minimum and maximum amounts available for withdrawals are set by government.
4. A *flexible drawdown* by which individuals showing financial sufficiency above the MIR are able to withdraw unlimited amounts from their income drawdown product, subject to income tax at their marginal rate.

The annuities mentioned above can be enhanced with different features available in the market like joint protection, increasing or guaranteed income period. Variable annuities were introduced in 2006. The annuity market in the UK is one of the most developed in the world, with a take-up of 75 percent and more than 400,000 annuities are purchased each year. Nevertheless, important changes were announced in April 2014 that will surely change the landscape in the coming years[40]:

[37] The main sources of information are various reports from the *Pensions Policy Institute*, the *Pensions Institute*, and the *Institute for Fiscal Studies*, cited in the main references section below.

[38] For members of occupational pension schemes, the exact amount may depend on the specific rules of the fund.

[39] PAYE is a withholding tax on income payments to employees. Amounts withheld are treated as advance payments of income tax due. They are refundable to the extent they exceed tax as determined on tax returns. PAYE include withholding the employee portion of insurance contributions or similar social benefit taxes.

[40] The UK government estimates that as a result of the reforms being currently enacted, annuity purchases will decline from current levels of 75 percent DC savers to around 50 percent, but there is controversy about the effects.

- Between April 2014 and March 2015, the rules for choosing products different than annuities are being relaxed:
  - The *trivial commutation* limit is increasing from SP18,000 to SP30,000. The size of a *small pot* that can be taken as a lump sum would increase from SP2,000 to SP10,000 and the number of personal pots that can be taken under these rules would increase from two to three.
  - *Capped drawdowns*: before April 2014 it was only allowed to take up to 120 percent of what the individual could get through an annuity. This limit is increased to 150 percent.
  - *Flexible drawdowns*: before April 2014 if the individual have a secure yearly income of over SP20,000 a year then unlimited amounts can be withdrawn, as mentioned above. This limit is being reduced to SP20,000.
- From April 2015 onwards, all restrictions on accessing *private DC savings* will be phased out, so that anyone from age 55 onward could access their DC savings as a lump-sum without facing any additional tax charge over their marginal rate.

United States

The available second–and third pillar–decumulation products vary by type of plan in United States:

- *DB plans*. As expected, DB plans offer an annuitized stream of benefits upon retirement. DB plans usually allow lump-sum payouts when the employee changes jobs and at retirement. These plans are increasingly loosing share vis-a-vis DC plans.[41]
- *DC plans*. There is no *compulsory* arrangement to pay an annuity and lump-sums are quite frequent. Indeed, according to Gale (2008), less than 2 percent of savings are taken in the form of annuities.

In spite of the low annuitization level, the large US population is enough to ensure a relatively sizable market. Most types of annuity products are available, in particular variable annuities (VA) are the most popular with around 70 percent of total sales, medically underwritten, real, advanced life deferred, and life care.[42]

Some occupational plans transfer macro-longevity risk to retirees. Famously, the Teachers Insurance and Annuity Association (**TIAA**) offers a product pooling mortality among participants through its companion organization College Retirement Equities Fund (**CREF**). Annuity payments are linked to participant's mortality, and historical experience is used as a guide in the annual adjustment to the mortality participation factor. Specifically, the pay out is adjusted each year based on realized earnings (compared to an assumed 4 percent rate of return), realized mortality (compared to assumed mortality) and changes in projected future mortality. Macro-longevity risk is ultimately carried by the contingency reserves of the company. The contingency reserves are the property of TIAA and it is a management decision on how make use of these reserves in case of extreme increases in longevity (Bovenberg and Lundbergh, 2014).

[41] Poterba (2014) gives account of the Department of Labor surveys in 1985, 1990, and 2010 on pension coverage. In 1990, 59 percent of the employees at large and medium private establishments were covered by DB plans. In 2010, only 30 percent were covered.

[42] It is important to note that VAs in the USA are savings vehicles which allow the saver to withdraw lump-sums in any amount at or during retirement as well as leave a bequest. Only about 3 percent of VA are never cashed out (Milevsky, 2013).

3.5 Partial lump-sum design

Seven countries in the sample allow partial lump-sums at retirement but only **Chile** and **Singapore** establish clear *free-disposal surplus* criteria for accessing purposes (see Table 3.12).

	Partial lump-sums (PLS)	Free-disposal surplus (FDS)	Criteria
Australia	Yes	No	n.a.
Chile	Yes	Yes	Minimum replacement rate
Denmark	Yes	No	n.a.
Netherlands	No	No	n.a.
Singapore	Yes	Yes	Absolute amount defined yearly
Switzerland	Yes	No	n.a.
United Kingdom	Yes	No	n.a.
United States	Yes	No	n.a.

Note 1: "n.a." means not applicable.
Source: Official government sites, Rocha et al. (2011), OECD (2013a) and the references therein.

Table 3.12: Partial lump-sum design

In **Chile** *partial lump-sums* are allowed only if the remaining balance in the individual account is sufficient to finance a pension equal to at least 70 percent of the average real wage of the worker in the 10 years preceding retirement and 80 percent of a zero pillar reference pension level called maximum pension with solidarity support. As explained before, in **Singapore**, at age 55, the balance accumulated in the individual savings account in excess of a *designated minimum amount* can be taken as a lump-sum. The minimum amount retained is called Minimum Sum Scheme and is used to buy a deferred annuity.

The rest of the countries fall in one of two categories:

- The most de-regulated countries like the **United States** do no provide any legal guidance beyond the fact that the individual is free to choose between any percentage of the pension pot, from zero to 100 percent, as a lump-sum. The UK moved recently in this direction.
- Other more conservative countries mandate some combination of decumulation products whereby they set a minimum to be taken as a lump-sum. Maximum criteria are sometimes also imposed, but mostly as an outcome of design at the occupational or company level.[43] This is for instance the case of **Switzerland**, whereby pension funds are required by law to allow at least 25 percent of pension savings to be taken as a lump-sum, but some plans establish a maximum of 50 percent of pension savings.

In the **Netherlands**, in spite of the compulsory annuity rule, recent reforms introduced some flexibility through the so-called *high-low income streams* (Nijman and Brown, 2012). The design is very different than the cases analyzed above in two aspects:

- High-low constructs are annuities with added flexibility regarding the timing of payments around the retirement age. Therefore, high-low constructs are not PLS.
- In jurisdictions where they are allowed, PLS are drawn from second pillar savings, while the high-low options are such that there is an interaction between the different pillar savings in an actuarially compensatory way.

The two options under the high-low scheme are the following:

[43] Such limits are simply the result of the joining of two countervailing forces–the tax authorities trying to reduce tax abuse, and the pension authorities trying to avoid depletion of the fund during the individual's lifetime (Antolin et al., 2008).

1. Second pillar pension wealth can be used to generate an income stream at the level of AOW income to "bridge" AOW income in an actuarial fair way for people who retire before the statutory age. In Figure 3.3, A represents the normal pension benefit at age 65 while B is the benefit shape over time when bridging AOW income at age 62. This option is not available for low income workers (Nijman and Brown, 2012). Otherwise, it may in practice constitute a full lump-sum option for these type of workers.[44]

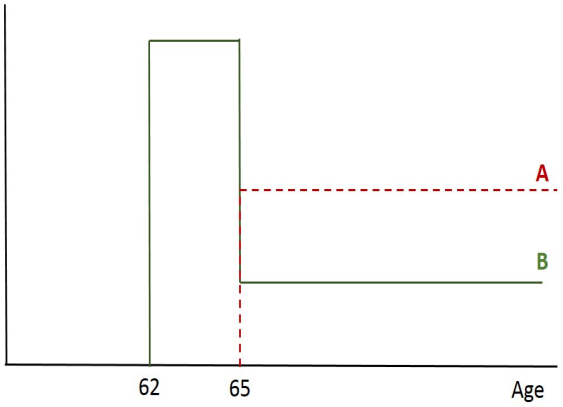

Figure 3.3: High-low option 1

2. Future second pillar annuity pension payments can be brought to the present to get a higher payment for the first five or then years and a reduced pension thereafter. The low payment amount must not be less than 75 percent of the high payment amount. In Figure 3.4, A represents the normal pension benefit at age 65 while C is the benefit shape when opting for a high-low income stream.

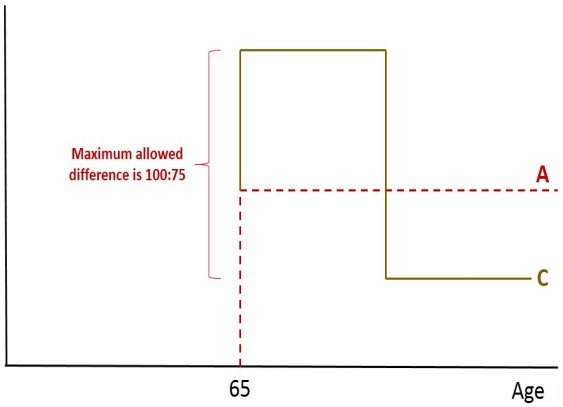

Figure 3.4: High-low option 2

3.5.1 Taxation of PLS

Another important element in the design of partial lump-sums is its tax treatment (see Table 3.13). Most countries in the sample support retirement savings by means of deferred taxation under an EET

[44] For more in this see Nijman and Brown (2012) and Sanders et al. (2013).

approach, where contributions and investment returns are tax exempt while withdrawals in retirement are taxed.[45] **Australia** and **Singapore** are salient examples of deviations from the EET approach.

	Taxation approach	Tax on partial lump-sums?	Tax rate
AU	ttt	Yes	MITR rate if coming from untaxed source
CHL	EET	Capped	Tax free up to a limit
DN	ETT	Yes	Flat rate 40 percent
NL	EET	n.a.	n.a.
SGP	EEE	Tax free	n.a.
SW	EET	Yes	MITR that varies by canton
UK	EET	Yes	MITR
USA	EET / TEE	Yes / Tax free	MITR if coming from tax deferred source

Note 2: "MITR" stands for marginal income tax rate; "n.a." means not applicable. The following acronyms are used for the countries: Australia (AU), Chile (CHL), Denmark (DN), Netherlands (NL), Singapore (SGP), Switzerland (SW), United Kingdom (UK) and United States (USA).
Source: Official government sites.

Table 3.13: Tax approach to partial lump-sums

No country in the sample taxes lump-sums at a surcharge over the marginal income tax rate (MITR). The **United Kingdom** was the only case where a surcharge is currently applied, but this penalty is being phased out, effective in April 2015. Indeed, most countries in the sample where partial lump-sums are allowed, with the exception of **Denmark**, give the same treatment to annuities than to lump-sums. **Chile** is also an exception in the sense that it provides tax relief up to a certain limit.

3.6 Special purpose withdrawals

Table 3.14 compiles information on the availability, characteristics and operation of SPWs in the sample countries. Only **Chile** and the **Netherlands** do not allow SPWs.[46]

	SPS	Taxed	All-purpose	Housing	Health	Other	Loan & repay	Permanent	Feeder
AU	Yes	Yes		X	X			X	
CHL	No								
DN	Yes	Yes	X					X	
NL	No								
SGP	Yes	No		X	X	X			X
SW	Yes	Yes		X			X		
UK	Yes	Yes							
USA	Yes	No		X	X	X	X		

Definitions: The following acronyms are used for the countries: Australia (AU), Chile (CHL), Denmark (DN), Netherlands (NL), Singapore (SGP), Switzerland (SW), United Kingdom (UK) and United States (USA).
Source: Official government sites.

Table 3.14: Special Purpose Withdrawals

3.6.1 Taxation of SPWs

Out of the six countries that allow SPWs only **Singapore** and the **United States** do not tax that decision.[47] In the former case the exemption is consistent with its EEE approach to pension savings. In the latter, presumably, the absence of taxation has to do with an objective of encouraging participation in the

[45] Tax relief on contributions and returns is granted during the accumulation phase to provide an incentive for people to save for retirement. Taxation of the pension benefit is made with the aim of fiscal neutrality over the lifetime.

[46] In the Netherlands, although not exactly a substitute for SPWs, such withdrawals were facilitated through a supplementary third pillar earnings-related savings plan called *Life-Course Savings Scheme*, but this program is being phased out on the grounds that it was used (and abused) for early retirement.

[47] In Australia, terminal medical condition grounds for SPWs are tax free.

401(k) plans (Beshears et al., 2008). In the **UK** a tax penalty of 10 per cent is charged in case of early withdrawal of second pillar pensions.[48]

Taxation is particularly heavy in **Denmark**. SPWs in that country incur a 60 percent tax rate plus administrative costs if it is made before the age of 60. This may explain why historically on average only about 2 percent of individuals withdraws funds in any given year.

3.6.2 SPWs models

Permanent withdrawal

Australia and **Denmark** follow the *permanent withdrawal model*, by which there are no repayment facilities. This is consistent with very narrow valid grounds to apply for funds in the former and with heavy taxation in the later. In the Australian case, retirement savings are required to be "preserved"–that is, not used by the worker until a "preservation age" currently set at 55 years, but SPWs are allowed under so-called "compassionate grounds," which include:

- Pay for medical treatment for the individual or a dependent.
- Terminal medical condition.
- Make a payment on a loan to prevent the individual from losing the primary house.
- Modify the home or vehicle for the special needs of the individual or a dependant because of a severe disability.
- Pay for expenses associated with a death, funeral or burial.

The amount that the individual can withdraw on compassionate grounds is discretionary and limited to what is "reasonably needed." A withdrawal on compassionate grounds is always paid as a lump sum.

Feeder-fund

Singapore operates the closest example of a *feeder-fund model* by which individuals contribute to a savings product with liquidity options around a single account. The background is that retirement adequacy is not the only objective of CPF. The CPF can be seen as a savings platform for wide reasons, including precautionary, education, housing as well as savings for retirement. Consistent with this, withdrawals are allowed over the accumulation phase and only a remaining balance is devoted to retirement.

Withdrawals for 1997-2011 averaged 74.9 percent of contributions (Clements et al., 2013). The two most important forms of SPWs are made for:

- *Housing*. There are two main schemes, the Public Housing Scheme (PHS) and the Residential Properties Scheme (RPS).
  - PHS: individuals are allowed to withdraw from their ordinary account (OA) the minimum between the purchase price or the market value of the property. In addition, OA savings can

[48] There are so called *special exceptions*, such as using the money to pay for medical bills that total more than 7.5 per cent of adjusted gross income or up to SP6,500 to pay for a first home purchase, in which case there is a waiver on the penalty. However, these withdrawals are still considered to pay marginal income taxes.

be used to service the mortgage payments for the duration of the loan with a maximum of 30 years.

  - RPS: individuals are allowed to withdraw more than 160 percent of the value of the purchased property from their OA to pay for the purchase price as well as mortgage payments.

- *Health care.* Individuals need to keep a minimum balance of SGD43,500 (around 26 thousand euros) in their Medisave Account (MA). At retirement or during retirement, only the excess is transferred to their SA or AR accounts. In addition, members must set aside the Medisave Required Amount of SGD40,500 (around 24.5 thousand euros) in the MA at age 55 for medical expenditures during retirement.

Most individuals withdraw money under these schemes in **Singapore** and are henceforth left with a diminished balance for retirement purposes. According to data presented by Koh (2014), 44 percent of members cumulative CPF contributions are withdrawn to purchase homes and to service mortgages, leaving only 29 percent of these contributions in the OA and the SA for retirement. He also points put that only 6 percent points of the total contribution of 36 percent points go to the SA for retirement. The bulk of the contributions of 23 percent points go to the OA account which can be withdrawn prior to retirement for other purposes. Singapore case has been severely criticized for creating an *asset rich but cash poor phenomenon* (McCarthy et al., 2002).[49]

Loan & repayment

The 401(k) plans in the **United States** are an example of a *loan and repayment* model. In a nutshell 401(k) plans include pre-retirement liquidity mechanisms that include hardship withdrawals, allowing the withdrawal of a worker's own contributions for limited conditions; certain types of non-hardship withdrawals such as the withdrawal of employer profit-sharing contributions; and complete access to savings upon termination of employment with the current employer. Hardship and non-hardship withdrawals and loans are at the prerogative of the plan sponsor. They are generally subject to income tax and a 10 percent penalty tax, but there are various exemptions to the penalty (Lu et al., 2014). More specifically, the main features of 401(k) liquidity options are the following:

- Employees can take out loans from their pension scheme and withdrawals are available in the following cases of hardship at the provider's discretion:
  - Primary home purchase
  - Higher education costs
  - To prevent eviction or home repossession
  - Severe financial hardship
  - Medical expenses
- Loans are limited to no more than 50 percent of pension savings or USD 50,000 (whichever is the lower), with interest charged and a maximum loan repayment period of 5 years.

[49] See also Asher (2000, 2013) and Chia and Tsui (2003) for more on how the design on that country may be compromising adequacy of pensions.

- The loan is not considered as being taxable income nor is it subject to an early-withdrawal penalty.[50] However, if the loan is not repaid within a set period of time, the loan is treated as a withdrawal, owing income taxes and a 10 percent penalty.

According to VanDerhei et al. (2013), 21 percent of all employees eligible for a loan had taken out the option in 2012, a figure that has been very stable over the years. The average outstanding loan amount was USD 7,153, and the median was USD 3,858. This imply significant pre-retirement "leakage:" for every 1 dollar contributed to the accounts of savers under age 55, 0.40 dollars simultaneously flows out of the 401(k)/IRA system, not counting loans (Argento et al., 2014). An important issue besides the uptake rate is about the default rate. Lu et al. (2014) report that only 1 in 10 loans fail to repay and that this occurs mainly when switching jobs.

Switzerland also runs a *loan and repayment* model but confined to housing loans. Individuals can access their pensions savings before retirement only for the purpose of financing owner-occupied property up to three years before retirement. Up to age 50, an individual can withdraw *all* its vested benefits in the occupational plan. After age 50, the maximum amount that can be withdrawn equals the amount that was available at age 50, or half of the amount that is currently available, whichever is larger. An early withdrawal can be repaid voluntarily, but a withdrawal is possible only every five years. The entire amount of the early withdrawal must be repaid if the property is sold. Early withdrawals are taxable, but any taxes paid are refunded, without interest, if the amount is repaid.

3.7 Lessons from the international experience

There are some insights that appear to hold across the countries in the sample. Below these insights are organized by topic.

3.7.1 On the role of annuities and lump-sums

- The **Netherlands** design looks relatively rigid compared to all countries in the sample. Indeed, no other country mandates full annuitization in all pillars of its retirement system. Some flexibility exists through an interplay between different pillar savings under the annuity framework, through the so called high-low payouts.
- Where both annuities and lump-sums are available to retirees, a great majority prefer the latter. This is for instance the case of **Australia** and **United States**.
- As suggested by theory, behavioral designs such as the default product option, the frame and timing of the annuitization decision seem to matter, as the cases of **Denmark** and **Switzerland** exemplify.
- Other design aspects such as the taxation approach as well as the interaction with other pillars also seem to matter as suggested by theory.

3.7.2 On product design

Chile and **Singapore** provide interesting role models for the **Netherlands**:

[50] If there is a withdrawal before age 59 and a half the withdrawals is treated as income plus a penalty tax rate of 10 percent.

- **Chile** allows for hybrid products and impose clear trade-offs for retirees choosing PWs instead of annuities or hybrids.[51]
- **Singapore** is a good example in one specific matter, namely, the option of purchasing a product with advanced age longevity insurance, close in design to an advanced deferred life annuity.

3.7.3 On the role and design of SPWs and PLS

Regarding PLS, a salient rule of thumb from the international experience is that usually 25 to 30 percent is allowed by regulation to be cashed out at retirement. As mentioned in the previous chapter, further research is needed to check if that rules makes sense from an economic perspective. Also, besides **Chile**'s free-surplus disposal design and the 100-75 design–coupled with a prohibition for low earners to access the high-low constructs in the **Netherlands**–, no consideration is usually made about the adequacy of the remaining annuity portion and therefore there is room for improvement across the board. In particular, the case of **Singapore** has been severely criticized of falling short expectations with regards to adequacy.

SPWs are more frequent in pension systems than usually thought. The 401(k) in the **United States**, the CPF in **Singapore** and the housing loans scheme in **Switzerland** are examples of different models in action. Neither model follows exactly the normative prescriptions in Box 4. Therefore conclusions are only tentative and policymakers should take into consideration the main lessons from the previous chapter. In particular, recall that:

- *The extremes may be sub-optimal.* Recall Beshears et al. (2014) analysis for the 401(k) in the United States.
- *The institutional background matters.* Recall two examples analyzed before:
  - In Switzerland workers can deplete their pension savings stock for housing purposes, but this may be shielded by a generous first pillar benefit, which may not be the case or may not be fiscally possible in other jurisdictions.
  - A second example is Singapore where the high level of liquidity goes hand-in-hand with very high contributions to the system.
- *Incentives matter.* It is relevant to set up the right incentives for repayment (Valdes, 2002; Walliser, 2000)–including behavioral nudges, defaults and frames (Beshears et al., 2014)–.

[51] Recall that there is a mandatory actuarial adjustment to PWs that imposes a decreasing consumption path in retirement.

3.8 Appendix: Further institutional details

This Appendix details further institutional features about the pension systems for the eight countries covered in the chapter. The review follows the five pillar framework developed by the World Bank (Holzmann, 2000; World-Bank, 1994).

3.8.1 Australia

Australia's pension system is comprised by an unusual combination–by international standards[52]– of a basic means-tested zero pillar (the "Age Pension"), a mandatory occupational second pillar (the "Superannuation Guarantee") and a "Voluntary Superannuation" third pillar supported by tax exemptions and private savings. On average, 61.2 percent of total mandatory savings come from the second pillar and 38.8 percent from the zero pillar. This is a much more tilted reliance on the second pillar than the average OECD country (22.7 percent) (OECD, 2013a).

The **Age Pension** (AP) is a public non-contributory scheme paid on a PAYG basis from general revenues to qualifying residents. It was established in 1908 as a universal transfer that progressively moved into a means tested scheme with residence and age eligibility criteria. Bateman and Piggott (2010) consider that the AP "is a poverty alleviation instrument which excludes the rich, rather than a safety net targeting the poor." Overall expenses on the zero pillar represent little more than 3 percent of GDP.

The AP is a flat benefit indexed to the greater growth of male average earnings, the consumer price index, and a pension and beneficiary living cost index. The level of the benefit is currently equivalent to 27.7 percent of average male full-time earnings for singles and 41.3 percent for couples. This level is revised every two years. Eligibility criteria includes a qualifying age, currently 65 years independently of gender,[53] ten years of continuous residence, and a means test– which includes both an asset and an income test subject to a claw-back rate of 40 percent. The design of the means tests has important interactions with the annuitization level chosen by Australians, a point that has been extensively discussed in recent years.[54]

The **Superannuation Guarantee** (SG) is a fully-funded individual accounts system with mandatory participation.[55] More than 90 percent of the private sector occupational schemes operate under DC principles. There are currently more than 300 registered funds. Superannuation funds are privately managed trusts which fall either under the jurisdiction of the Australian Prudential Regulatory Authority (APRA) or the Australian Taxation Office (ATO). Pension funds under ATO are known as self-managed superannuation funds and those under APRA take one of four forms: (i) corporate; (ii) occupational; (iii) public sector; and retail funds. The contribution is paid by the employer and it is currently set at 9.25 percent of wages.[56] Coverage is extensive (95 percent of workers).

Finally, the **Voluntary Superannuation** pillar also works through the infrastructure of superannuation funds. There is a fully deductible annual limit irrespective of age for tax-advantaged contributions. Some employers have access to the so-called "salary sacrifice" arrangements under which their (employee) contributions are treated as employer contributions for tax purposes and are therefore taxed at 15 percent

[52] It is unusual because of the lack of an earning-related pay-as-you-go first pillar.

[53] This age is currently legislated to increase by six months every two years from 2017 until it reaches 67 by 2023.

[54] More on this below. For a detailed analysis see Disney (2009)

[55] The word "superannuation" refers to an occupational pension scheme, while the word "guarantee" refers to the fact that the employee gets a guaranteed contribution from the employer to a superannuation fund.

[56] This contribution will increase gradually to 12 percent by 2020.

instead of their marginal tax rate. About one third of superannuation fund members take advantage of the third pillar.

Tax treatment

Australia's approach to taxing pensions is uniquely characterized as a ttt scheme[57], featuring preferential flat tax rates on contributions and interests earned by pension funds, with benefits being partially tax free depending on complex rules.

- *Contributions* are taxed depending on the following classification:
  1. Concessional or pre-tax contributions, which includes superannuation contributions, are taxed at 15 percent.[58]
  2. Non-concessional or after-tax contributions, which refers to voluntary contributions and salary sacrifice schemes, are not taxed up to an annual limit but with a three years averaging permitted[59].
- *Investment returns are taxed* independently of the contribution source (i.e. concessional or non-concessional) at 15 percent, together with a lower rate of tax on capital gains.
- *Some benefits are tax exempted and others are taxed*, depending on age, pillar, type of decumulation product and source. In order to describe the main rules it is important to first define the taxable and tax-free components of pension savings:
  - Taxable component: Concessional contributions are taxable at withdrawal. If the superannuation fund paid tax at the rate of 15 percent then at retirement this is called the "taxed element." If the superannuation fund did not pay tax on some of the taxable portion of the individual account, this sum of money is called the "untaxed element."
  - Tax-free component: Non-concessional contributions are tax free.

  The taxation rules therefore only refer to the taxed component. The main rules are easier to understand by age and type of product:
  - For *individuals younger than the preservation age*:
    * Income stream: the taxed and untaxed elements are both taxed at the marginal rate.
    * Lump-sum: the taxed element is taxed at the marginal tax rate or 21.5 percent whichever is lower; while the untaxed element is taxed at the marginal tax rate or 31.5 percent whichever is lower.
  - For *individuals aged between the preservation age and 60 years*:
    * Income stream: the taxed element is taxed at the marginal tax rate less a tax off-set of 15 percent; while the untaxed element is taxed at the marginal tax rate.

[57] The small case "t" represents taxation at a preferential rate as distinct from the capital "T," which represents a taxation at corresponding marginal tax rates.
[58] A surcharge of 15 percent is applied to contributions for higher-income workers based on a threshold defined every year.
[59] Non-concessional contributions that exceed a threshold defined every year are taxed at a penalty rate of 46.5 percent.

    - *Lump-sum*: the taxed element is taxed at the marginal tax rate or 16.5 percent, whichever is lower; while the untaxed element is taxed at the marginal tax rate or 31.5 percent, whichever is lower.
  - For *individuals older than 60 years*:
    - Income stream: the taxed element is tax free; while the untaxed element is taxed at the marginal tax rate less a 10 percent tax off-set.
    - *Lump-sum*: the taxed element is tax free; while the untaxed element is taxed at the marginal tax rate or 16.5 percent, whichever is lower, unless the lump sum is more than the untaxed plan cap, in which case it will be taxed at the top marginal rate.

Note that the AP is regarded as taxable income under all the options above. Nevertheless there are ways out of the tax payments.[60] The recent *Henry Tax Review* recommended that the tax on superannuation contributions should be abolished and that the tax rate on investment returns should be halved to 7.5 percent.

Also, as many analysts have noted, there are strong behavioural interactions between the design of the AP and the taxation of pension benefits. According to Disney (2009):

- The principal place of residence is given concessional treatment under the income test and is exempt from the asset test of the AP for home-owners.
- In contrast, rental properties are subject to income tax and moving to rental accommodation by pensioners may render them subject to the income test.
- It follows that the combination of the tax treatment of housing and of retirement saving assets gives a strong incentive for older taxpayers to invest the maximum in their primary residence and to get their benefits as a LS before reaching age 60.

It is therefore not surprising that roughly two-thirds of wealth of the median older household in Australia is held in the form of housing.

Variant career regulation

Early and late retirement are allowed in Australia for the superannuation benefits. As the system is based on individual DC accounts, the adjustments are actuarially fair[61]. Access to benefits is currently possible for retirement on or after the *preservation age*[62]. Individuals who are still working can also access their benefits from their preservation age, but only in the form of a non-commutable income stream[63]. Late retirement is also allowed under current rules. Employers are required to keep contributing to the superannuation guarantee arrangements for workers that delay retirement.

3.8.2 Chile

Chile's pension system is usually a reference among other reasons because it complies closely with the World Bank design recommendations for multi-pillar systems (World-Bank, 1994). It comprises three

[60] For instance, beneficiaries are exempt from paying any income tax if they only receive the Age Pension as income.
[61] The Age Pension is not paid earlier than the normal retirement age of 65. This age is legislated to increase to 67 by 2023.
[62] This age is legislated to increase to 60 in the future.
[63] A non-commutable income stream is one that cannot be converted into a lump sum.

components: a poverty prevention pillar, a mandatory contribution pillar and a voluntary savings pillar.[64] The current system was created in 1980 and it was overhauled in 2008, although without deviating from its fundamentals. On average, 17.0 percent of total mandatory savings come from the first pillar and 83.0 percent from the second pillar. This is a much more tilted reliance on the second pillar than the average OECD country (22.7 percent) (OECD, 2013a).

The first pillar or **solidarity pillar** consists of a non-contributory pension called the Basic Solidarity Pension (*Pension Basica Solidaria*, or PBS), and a complement to the contributory pension called the Solidarity Pension Payment (*Aporte Previsional Solidario*, or APS). The PBS is a public pension targeted to individuals that belong to the 60 percent poorest of the population[65]. The APS is equal to the PBS but subject to a clawback provision of 29.4 percent of the private pension. The APS is exhausted when the private pension equals 3.4 times the PBS in steady state. This level is known as the maximum pension with solidarity support (*Pension Maxima con Aporte Solidario*, or PMAS).

The second pillar is a nationwide **DC fully-funded mandatory individual accounts pillar** managed by single-purpose, for profit firms called Pension Fund Administrators (AFPs). The mandatory contribution to individual accounts is 10 percent of earnings. A ceiling on contributions applies equal to almost three times average earnings. Administrative fees are levied on top of this contribution.

The **voluntary savings pillar** provides tax incentives to encourage people to make voluntary contributions through various financial instruments: voluntary pension savings accounts managed by the AFPs, mutual funds, life insurance products with savings, etc. This pillar was redesigned during the 2008 reforms but it has not yet taken off.

Tax treatment

Chile taxes pension savings under a classical expenditure approach, that is, a EET scheme: contributions and the accrued investment returns are tax-free, while benefits are taxable upon withdrawal. This is the most common scheme among OECD countries and also the most recommended by the specialized literature (Whitehouse, 1999).

For third pillar products, workers have some choice options regarding the tax treatment of their voluntary contributions. The contributions may be paid from pre-tax income with the assets and accumulated income subject to taxation upon withdrawal, or contributions may be made out of after-tax income and are tax-free at withdrawal. The 2008 reform introduced a special subsidy for low-income workers contributions to voluntary savings accounts as well as tax incentives to promote employer-sponsored matching contributions pension plans.

Variant career regulation

Early retirement is allowed at any age as long as the accumulated savings are enough to finance a pension above particular thresholds:

- The benefit must be at least worth 80 percent of the PMAS.

[64] This section is focused on the pension system for salaried workers. There are two other important pension schemes of much lesser scale: the army and the police pension schemes. Also, the focus is entirely on the system that started operations in 1981, ignoring a parallel government-run system for the so called "transition generations."

[65] Individuals from other income brackets who deplete their retirement income can also benefit from this pillar.

- A minimum 70 percent replacement rate is reached, relative to earnings in the ten years prior to drawing the pension.

It is possible to defer pension claiming after normal retirement age. Because the system is of the DC individual capitalization form, the adjustments are made on an actuarial basis.

3.8.3 Denmark

The Danish pension system is praised as the best ranking in the world according to the Melbourne-Mercer Global Pension Index. It consists of a three pillar system with high degree of sophistication and well-known innovative features. The pension system is also recognized to be very well integrated with unemployment and other social assistance, giving raise to a model called *flexicurity*. On average, 45.2 percent of total mandatory savings come from the first pillar and 54.8 percent from the second pillar. This is a much more balanced reliance on the different pillars than the average OECD country (OECD, 2013a).

The first pillar comprises two tiers, a universal social pension and a funded supplementary pension:

1. The **social pension** (SP) is a benefit from the age of 65[66] financed on a PAYG basis from general revenues. It consists of two parts: (*i*) a flat universal pension that is subject to a residency test and an employment earnings test, as well as (*ii*) a supplement that is paid to qualifying people subject to an income test. The full basic amount is earned after 40 years of residence and is reduced pro-rata by the number of years of residence missing to 40. The benefit is adjusted annually in line with average earnings.

2. **The ATP scheme** or Labor Market Supplementary Pension Fund is an individual accounts, fully funded scheme created in 1964 to supplement the social pension.[67] It is financed through fixed contributions (as opposed to a percentage of income) decided by the *social partners* as part of collective agreements, two-thirds paid by employers and one-third by workers. Contributions depend on the number of hours worked, e.g. for a full time employee with 37 hours per week which represent approximately 1 percent of the average national wage. This results on average, after 40 years of contribution, in a benefit of around 7 percent.

Contributions to the ATP are divided in two parts: a guaranteed contribution and a bonus contribution, with 80 percent going to the guarantee and 20 percent going to an investment fund. The member acquires a guaranteed nominal pension based on the guaranteed contribution,[68] while the bonus contribution is allocated to a collective reserve.

The collective reserve constitutes an investment fund aimed for the future indexation of pension rights and to offset the risk of actual longevity experience exceeding expected experience. The larger the reserve, the greater is the capacity to take risk with the reserve pot–and so the greater the expected long-term return. ATP's bonus policy stipulates that pensions may be increased if the funding ratio (total assets divided by guaranteed benefits) exceeds 120 percent. All pensions and all pension rights are

[66] To be increased to 67 by 2022.

[67] ATP also manages two funds that are considered part of the second pillar, the Special Pension Savings Scheme and the Employees Capital Fund funds. For more details on these funds see Rocha et al. (2011) and Vittas (2008).

[68] Starting in 2015, ATP's nominal guarantees would be updated at 15-year intervals (Ambachtsheer, 2014). Effectively, the 80 percent of the contribution to be annuitized each year would be granted a 15-year return guarantee based on market bond yields at that time. So, for example, a 20 year-old worker would effectively receive a return guarantee to age 35 on 80 percent of his/her contribution in that year. Following that contribution originally made at age 20, at age 35, a new return guarantee to age 50 would be provided. Only at age 50 would the actual amount of the deferred annuity to be paid starting at age 65 be calculated, using the term structure of interest rates and best-estimate longevity projections at that time.

increased by the same percentage, which is determined by the overflow of the reserve pot (Bonenkamp et al., 2014).

The Social Pension benefits comes in the form of a fixed annuity indexed annually to average earnings. The ATP pension benefit is a deferred life annuity payable from age sixty-five. Pension rights are nominal with conditional indexation, as rights are adjusted by way of bonus allowances based on the financial status of the ATP.[69]

The second pillar or **labor market pension scheme** is comprised occupational plans legally organized as non-profit life insurance companies with a structure defined by collective agreements (Lundbergh, 2014). This confers the second pillar a condition of quasi-mandatory and explains a very high coverage. Most plans operate under DC rules although with DB components like minimum returns and minimum conversion factor guarantees. The third pillar comprises **voluntary personal pension plans** under tax advantages. These are administered by life insurance and pension companies as well as banking institutions under a DC architecture although minimum guarantees are also common in the third pillar.

Tax treatment

Denmark approach to pension savings taxation follows a pure comprehensive income tax, or an ETT scheme:

- *Contributions* by workers are fully deductible.[70] For contributions financing PWs, payments have to phased over at least 10 years and no more than 25 years in order to access the deduction.
- *Investment returns* are taxable at a flat rate of 15 percent. This applies to both the ATP and occupational pension plans. This is a preferential rate compared with an average of approximately 29 percent for assets in taxable accounts.
- *Annuities and PWs* are subject to personal income taxation and the payout is therefore taxed every year, while lump-sums are subject to a one time flat rate of 40 percent at payout.

The Danish Ministry of Finance launched recently a commission to study the pension system with a focus on simplifying the taxation rules on pension savings.

Variant career regulation

There are various routes leading to early retirement:

- *Anticipatory pension*: awarded to persons aged 18 to 65 depending on their working capacity.
- *Partial early retirement* is an option currently being phased out and only available to people born before 1959.
- *Voluntary early retirement*, which is linked to unemployment insurance. It covers individuals from 60 (increasing to 62 during 2019-22) until the normal pension age. To qualify, individuals must have been members of the unemployment insurance fund for 25 years within the last 30 years and have paid voluntary early-retirement contributions. The benefit amount corresponds to the rate

[69] ATP's bonus policy stipulates that pensions may be increased if the funding ratio (total assets divided by guaranteed benefits) exceeds 120 percent.
[70] This means that the value of tax deduction is equal to the marginal tax rate that the person is subject to.

of unemployment benefits, subject to a limit of 91 percent of the maximum rate of unemployment benefit (differentiated for full- or part-time workers).

Late retirement is possible for the public old-age pension but only up to ten years. The increment for deferring pension for a year is the ratio of the period of deferral to average life expectancy at the time the pension is drawn.

3.8.4 Netherlands

The Dutch pension system is also lauded as one of the best designed systems in the world. For some years it was ranked number one according to the Melbourne-Mercer Global Pension Index, until the Danish scheme stepped into the ranking. It currently ranks second. Like most systems reviewed in this chapter, it consists of three pillars, combining elements from both the DC and the DB world in a highly sophisticated manner. On average, 36.7 percent of total mandatory savings come from the first pillar and 63.3 percent from the second pillar. This is closer to the average OECD country than the other countries in the sample (OECD, 2013a).

The first pillar, or **AOW pension**, is a universal flat pension at a level that is related to the minimum wage. This pension layer is financed on a PAYG basis from general revenues. The flat-rate pension benefit guarantees around 70 percent of the statutory minimum wage. It builds up by 2 percent for each year of residence between ages 15 and 64, leading to a 100 percent entitlement at retirement age.[71] The AOW is administered by the Social Insurance Bank (SVB), which is operationally independent from the government.

The second pillar is a funded supplementary earnings-related plan. There is no ceiling to pensionable earnings but contributions are paid only on salaries above a level called the *franchise*.[72] Only a salary exceeding the franchise brings additional pension rights on top of the AOW. Normally, the franchise is at the same level as the AOW benefit, which is different for single people and couples. Still, franchise arrangements are part of the negotiated labor contract. Contributions are administered by non-profit pension funds, which are organized in three forms:

- The first is the industry-wide pension fund, organized for a specific sector of industry (e.g. construction, health care, transport). Participation in an industry-wide pension fund is mandatory for all firms operating in the sector.
- Second, a corporate can opt out only if it establishes a corporate pension fund that offers a better pension plan to its employees than the industry-wide fund.
- The third type of pension fund is the professional group pension fund, organized for a specific group of professionals such as physicians or notaries.

According to the Netherlands Central Bank statistics, corporate plans cover the highest proportion of workers (around 85 percent), albeit the bulk of AUM is in industry-wide funds (around 70 percent). Professional funds represent a very small share both in terms of clients (around 1 percent) and AUM (less than 5 percent). If a corporate pension fund or an industry-wide pension fund is in place, participation is mandatory and governed by collective labor agreements. Although there is no statutory obligation to set up pension plans for employees, collective agreements mean that around 95 percent of workers

[71] Retirement age is legislated to gradually increase to 67 in 2023 and to be adjusted to life expectancy thereafter.
[72] Pensionable salary will be capped at 100,000 euros per year starting in 2015.

are covered. These renders the Ducth pension pillar its usual classification of *quasi-mandatory*. Dutch pension funds are independent trusts with their own governance and administrative structures.[73]

The dominant risk-sharing arrangement has traditionally been that of DB, but in recent years there has been a significant transformation to hybrid and collective DC structures (CDC), and a minority made the full transformation to DC (Kemna et al., 2011; Ponds and Riel, 2007). The typical hybrid plans kept its DB benefit accruing structure but incorporates DC elements:

- *DB elements*: the yearly accrual of pension rights is specified using a "deferred anuuity" formula as in traditional DB plans. In an average-wage plan, individuals accrue pension rights yearly based on a percentage of the salary earned in each year of their working life, usually indexed to inflation or wage growth. The accrual rate vary by plan but it is on average 2 percent and it is independent of age, gender, health and income level.[74]
- *DC elements*: the yearly indexation and contributions are flexible, related to the financial position of the fund. Therefore benefits and contributions moves in tandem with investment returns.[75]

These characteristics render DB nominal annuity promises an ambition rather than a guarantee, as in pure DB schemes. Depending on developments in the funding ratio, a hybrid plan would affect the quality of indexation and/or contributions. These steering mechanisms are governed by a set of rules called the *policy ladders*. Such rules typically take a non-linear form where the degree of indexation is zero below some minimum funding ratio and 100 percent of wage or price inflation above some maximum funding ratio and increases linearly between the minimum and maximum level.[76] Figure 3.5 provides an illustration. Full indexation is given when the nominal funding ratio is–typically–higher than 125 to 135 percent; no indexation is given when the funding ratio falls below 105 percent; and partial indexation is given when the funding ratio is between these thresholds.

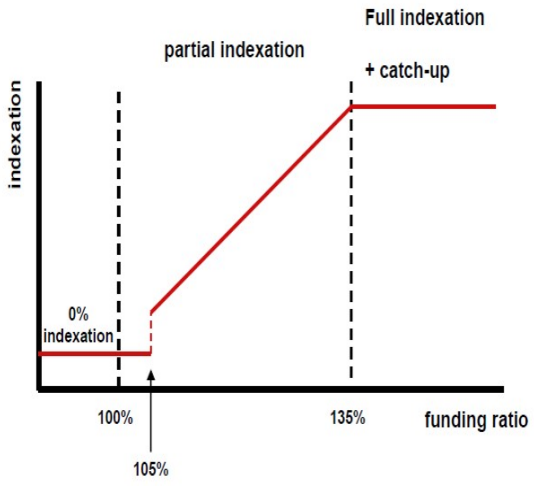

Figure 3.5: Policy ladders illustration

CDC plans are similar to hybrid plans except that contributions are fixed for at least five years and benefits are cut when the funding ratio falls below certain predetermined level (Kemna et al., 2011). Box

[73] The governing board of a pension fund traditionally consisted of representatives of employers and trade unions, although more recently also retirees and independent specialists can become board members. These representatives act as fiduciary trustees (Bovenberg et al., 2014).

[74] Most plans have now moved to average-wage by now. The DB formula takes into account the retirement benefit of the public scheme.

[75] Hybrid plans regulation envision the smoothing of financial shocks in 10-year recovery periods. This enables sharing the impact of the shock with current workers and even future participants in the plan.

[76] For a much more detailed analytic description of the economic nature of Dutch pension plans than is possible here see Ponds and Riel (2007), Ponds and Riel (2009), Cui et al. (2011), Broeders and Ponds (2012), Nijman (2013) and Bovenberg et al. (2014).

5 presents some other important characteristics of Dutch second pillar collective funds that are relevant, specially for the discussion in the coming chapter.

There is a current discussion in the Netherlands on how to move to a so-called *Defined Ambition* (DA) risk-sharing structure. In a nutshell and at the risk of oversimplifying a sophisticated innovation, the DA scheme would imply a move towards better defined property rights (i.e more individualization) as well as the introduction of enhanced CREF-like variable annuities. For a thorough description of the proposal see Bovenberg et al. (2014) and for a theoretical analysis see Bovenberg and Mehlkopf (2014).

Box 5. Key Characteristics of Dutch pension Funds (based on Kemna et al. (2011). The following are key features of Dutch pension plans:

1. *Uniform accrual rate*. Workers build up around 2 percent of their pensionable wage every year of service as new pension rights.
2. *Uniform contribution rate*. All workers pay the same contribution rate, which is set yearly such that the annual contribution match the present value of new accrued liabilities by workers, based on each additional year of service, plus buffer requirements and indexation goals.
3. *Uniform indexation rate*. The accrued benefits of all plan participants are indexed yearly in a uniform way. The actual indexation rate is conditional on the financial position of the pension fund.
4. *Uniform asset mix*. Pension fund wealth is held in one asset mix.
5. *Uniform reduction in nominal benefits*. While DB plans have conditional indexation, the nominal level benefits does not change. In contrast, in CDC plans, nominal benefits–both accrued and in payment status–can be reduced if needed. Any such policy would like be imposed as a uniform percentage reduction for all plan members.

The third pillar consists of voluntary personal pension products, which are tax-favored up to a ceiling. Third pillar savings products are offered mainly by insurers, although since 2008 tax-exempt accrual pension saving has also been possible through bank accounts, called *banksparen*.[77] Individuals purchase a capital sum insured before retirement and then convert this to an annuity upon retirement (Cannon et al., 2013). The regulation for third pillar benefits is less stringent than for second pillars benefits and there are several choices for retirees, most of them tailor-made to needs and risk profile. The industry offers two types of products:

- *Annuity insurance*: A fixed term, consistent and periodical payment for either a fixed period of years sold by insurers and banks, or having a lifelong payment period offered only by insurers.
- *Retirement saving plans*: A lump sum payment to purchase annuity. The interest components can remain free from taxation, if certain conditions on premium payments are met. This product can be offered by banks and insurers. The insurance product adds a death benefit protection.

The legislation allows for variable annuities but these are hardly offered in the market (IMF, 2011).[78] There is currently a discussion in the Netherlands to have smaller percentage mandated annuities and some flexibility to use remaining pension wealth for specific costs (maintenance of durables, health care etc.). The legislation on variable annuities for the third pillar will also be probably reviewed in the near future.

The government has recently established three committees to investigate lessons to be learned from

[77] Pension funds are not permitted to operate within the third pillar.
[78] Note that the second pillar contract have equity exposure trough conditional indexation but no variable annuities are offered in third pillar contracts.

the recent financial crisis and suggest improvement areas. These committees reported and made policy recommendations in the beginning 2010.[79]

Tax treatment

Netherlands approach to pension savings taxation follows an EET approach. No tax is levied on pension contributions or investment returns but benefits are subject to income taxation.[80] In addition, marginal tax rates are lower during retirement than employment and benefits are only taxed when received. Pension funds are exempt from corporation tax while insurance companies pay corporation tax on profits.

Variant career regulation

The AOW pension is not payable before age 65. In 2005, the tax-favoured status of early retirement plans between ages 60 and 65 was abolished. It is also not possible to defer the basic old-age pension scheme after 65.

Early and late retirement are possible in the second pillar. The rules on pension deferral vary between occupational plans. In the typical case an individual is allowed to claim second pillar benefits as early as age 62, or can delay beyond age 65, and the adjustment is actuarially fair for the average participant. The only restriction is that the lower income should at least be 70 percent of the higher income.

In Figure 3.6, A represents the normal pension benefit shape at 65 years old; E corresponds to the option of bringing part of the future pension to the present under an actuarial adjustment available since since age 62; and D represents the opposite operation, moving forward part of the pension further after age 65, also under an actuarial adjustment. For deferral, the level of annual income is then recomputed at an actuarially fair basis, implying roughly a 7-8 percent higher annual income for every year that an individual postpones claiming (Nijman, 2014).

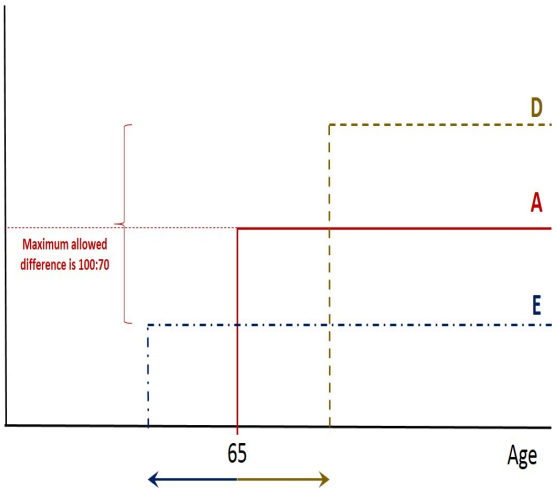

Figure 3.6: Early retirement in the Netherlands

It is possible to combine the occupational pension scheme with work. Indeed, some schemes allow a member to draw a pension and continue to work with the same employer (OECD, 2013a).

[79] See OECD (2010) for a good account of the main proposals of these committees.
[80] Tax relief is legislated to be capped at 100 thousand euros starting 2015.

3.8.5 Singapore

Singapore established a comprehensive social security system as early as 1955. This means that all pillars are amalgamated into a single, all encompassing pillar. It is a mandatory DC scheme built under individual accounts and operated by a unique public entity, called Central Provident Fund (CPF). The CPF not only administers pension savings, but also health care, home-ownership, family protection and tertiary education financing for children.

Contributions are split onto 3 accounts before age 55, the Ordinary Account (OA), the Special Account (SA), and the Medisave Account (MA). At 55 a new account specialized in retirement savings is created, the Retirement Account (RA). Two-thirds of the contributions are channeled to OA, which can be used for housing and investment schemes; 19 percent to the MA, which can be used for hospitalization expenses and catastrophic health insurance; and the remaining is channeled into the SA, which can be used for retirement and other purposes.

Contribution rates vary with age, and therefore the allocation to the three accounts also vary by age. Table 3.15 provides the full picture. These contribution rates apply to wages up to an income ceiling which has varied over the years, but that is currently set at SGD5,000. Currently, CPF savings in the OA and the SA are paid a government-set interest rate of 2.5 percent and 4 percent respectively.

Worker Age	**Contributions:**			**Credited to:**		
	Employer	**Worker**	**Total**	**OA**	**SA**	**MA**
<= 35	16.0	20.0	36.0	23.0	6.0	7.0
> 35-45	16.0	20.0	36.0	21.0	7.0	8.0
> 45-50	16.0	20.0	36.0	19.0	8.0	9.0
> 50-55	14.0	18.5	32.5	13.5	9.5	9.5
> 55-60	10.5	13.0	23.5	12.0	2.0	9.5
>60-65	7.0	7.5	14.5	3.5	1.5	9.5
> 65	6.5	5.0	11.5	1.0	1.0	9.5

Note: AS of from 1 January 2014.
Source: The source of this information is `http://mycpf.cpf.gov.sg/Members/Gen-Info/Con-Rates/ContriRa.html`.

Table 3.15: CPF contribution and allocation rates

Incentives for voluntary savings were introduced much more recently. There are two main programs in place:

- *Supplementary Retirement Scheme* (SRS): this is an individual employee account with an authorized SRS operator to which both worker and employer can contribute on a favorable tax basis.[81]
- *Section 5 plan*:[82] this is a trust fund to which only an employer can contribute on a favorable tax basis. There is a maximum contribution defined as the amount actually computed to produce no more than the following benefits on retirement: (2.25) times (last total salary) times (years of service) less (total employer contributions to CPF).

[81] There is a maximum contribution that varies according to whether the worker is Singaporean or foreigner with a permanent residence visa (15 percent) or foreigner (35 percent) with the same salary ceiling as the contributions to the CPF.

[82] A savings plan approved by the Inland Revenue Authority of Singapore under Section 5 of the Singapore Income Tax Act. Hence the name.

Tax treatment

Singapore approaches retirement savings taxing under an EEE system. Indeed, contributions (subject to a wage ceiling), interests income, and withdrawals are free of tax. Regarding the programs for voluntary savings:

- *SRS*: the employer contribution is deductible for the employer and not taxable for the worker, while the worker contribution is deductible. From the perspective of the worker the taxation scheme of this savings plans is done under the EET principle. The tax over the benefit can be mitigated by purchasing an annuity or spacing out withdrawals over up to 5 years. There is an extra tax penalty of 5 percent for withdrawal before statutory retirement age or before 10 years for foreigners.
- *Section 5 plan*: the contribution is deductible for the employer and the worker. From the perspective of the worker the taxation scheme of this savings plans is done under the EEt principle because only 50 percent of the benefit is taxable. This reduced tax over the benefit can be further mitigated by purchasing an annuity or spacing out withdrawals over up to 10 years.

Variant career regulation

Early retirement is not possible but postponing retirement is allowed. Indeed, it is forbidden to withdraw the pension savings before the normal pension age (i.e. 55), unless it is for approved items such as housing and education. Later retirement after normal retirement age is allowed and during this period people can continue to contribute to the fund. Individuals can also combine pension receipt with continuing to work. The adjustment of the benefit is quasi-actuarial.[83]

3.8.6 Switzerland

The Swiss pension system comprises a state PAYG first pillar; a fully funded, earnings-related second pillar organized at the firm level, mandatory for workers whose annual income exceeds a certain threshold; and voluntary third pillar with fiscal facilities. On average, 65.4 percent of total mandatory savings come from the first pillar and 34.6 percent from the second pillar. This is relatively similar to the average reliance on the second pillar across OECD countries (22.7 percent) (OECD, 2013a).

The first pillar, called **AHV/AVS**,[84] provides a basic subsistence level of income based on the number of years during which contributions have been made and average income between age 20 and retirement age. *Contributions* to the first pillar come from a payroll tax on all earned income out of which the employer pays half (currently 8.4 percent). The State grants a child care contribution to married couples with children.

Benefits are financed in part by these contributions and by an earmarked share of value added taxes and general government revenues. The benefit level is subject to upper and lower limits:

- A minimum of CHF13,680 per year is guaranteed, conditional on having contributed at least 45 years to the system.
- A maximum level, which is equal to twice the minimum pension.

[83] Recall that this is a DC system but with a fixed accrued interest on contributions, much in line with an Notional DC.
[84] AHV stands for "old age insurance" while AVS is a small trust fund with reserves to pay for about one year of payouts.

Benefits are indexed to wages and prices (with equal weights) after retirement.[85] Additional *means-tested supplemental benefits* are available when pension savings and other sources of income are insufficient to cover basic living costs in old age subject to certain eligibility conditions.[86]

The second pillar, called **BVG/LPP** operates through private sector funds which are predominantly of the DC type. It is designed to be integrated with the first pillar and as such it only provides insurance above a minimum level already covered by the AHV/AVS, although it also imposes a maximum. The regulation defines a mandatory and a super-mandatory part in terms of the pensionable salary, known in Swiss parlance as *coordinated earnings*:

- The so-called *mandatory part* applies to incomes higher than a minimum threshold of 30 percent of average earnings (currently CHF20,000) and a maximum level equal to three times the maximum pension benefit from the public pillar, or about 110 to 120 percent of average earnings (currently CHF82,080). Employers are legally required to create pension plans to insure this range of incomes, subject to strict regulations.
- The *super-mandatory part*, corresponds to the income levels above the upper threshold. This part is much less regulated and employers are not required to set up pension plans to insure these levels of income, but usually do as part of their human resources fringe benefit packages.

The BVG/LPP law specifies minimum requirements along several dimensions for the mandatory part:

- a minimum interest rate for old age credits;
- a statutory conversion factor at which the accumulated pension capital has to be translated into an annuity;
- and stringent requirements on the degree of funding, investment structure, as well transparency issues on pension funds.

The structure of *contributions* to the occupational pension plans, also called *old-age credits*, is very different compared to other countries:

- Old-age credits are earnings based on and vary with age and gender.
- The employer is required to pay at least half of the old age credits.
- Old-age credits are credited to **notional retirement accounts** and accumulate notional interest. The Swiss Federal Council determines the minimum rate of interest. The interest rate is currently 1.75 percent.

Finally, under the **voluntary savings pillar**, two different types of savings plans offered by banks or insurance companies:

- The 3A pillar or *Tied Pension* is a restricted private pension plan only available for individuals earning an income. Contributions are tax-deductible up to a limit set every year. No withdrawals are permitted until retirement. A maximum of five years of extra contributions can be made after the ordinary retirement age.

[85] Adjustments are made every two years with early adjustment in the case of a CPI increase of more than 4 percent.

[86] Eligibility is limited to individuals that receive an old-age or disability pension, live in Switzerland and have Swiss or EU citizenship or have been living in Switzerland for at least 10 years. The supplement is the difference between a definition of *recognised expenditure* and *calculated income*. The latter includes other pension benefits, earned income, return on assets. On average the supplemental pension currently amounts to CHF36,000 for singles and CHF51,000 for couples.

- The 3B pillar or *Flexible pension* is unrestricted pension plan for all people. There is no limit to the amount an individual may contribute into this type of plan but tax advantages are relatively lower than its 3A counterpart. Withdrawals are allowed before retirement age only for certain specific purposes like buying or building a residential property, going abroad to live permanently, or setting up a business. In case of withdrawal these savings are taxed at a preferential rate.

Tax treatment

The tax treatment of long-term savings follows an EET structure. The annuity is subject to normal income tax rates. Furthermore, income from other sources, for example from the first pillar, increase the effective marginal tax rate under the annuity option. The lump-sum is taxed only once (at retirement). The tax rate applied to the lump-sum varies across cantons.

Variant career regulation

Early and late retirement are allowed but the rules are different depending on the pillar.

- *First pillar*: early retirement is only possible 1 or 2 years before reaching retirement age with a reduction in the amount of the pension of 6.8 percent for each year. According to the OECD, this reduction is equivalent to an actuarial adjustment of 4.5 percent for the additional year in which benefits are taken and of 2.3 percent, for the missing qualifying year (OECD, 2013a).
- *Second pillar*: early retirement can be claimed from age 58. Each pension fund define the terms of early retirement. As a general rule, the conversion rate is reduced by between 0.15 and 0.20 of a percentage point for each year of early retirement. According to OECD computations, the 0.2 point reduction is equivalent to an actuarial adjustment, as conventionally measured, of 2.95 percent per year of early retirement (increasing with the extent of early retirement). Including also the loss of contributions and credits as a result of early retirement, the theoretical benefit is 7.1 percent (one year) and 6.35 percent (five years) lower per year of early retirement (OECD, 2013a).

Late retirement in the first pillar is also allowed by a maximum of 5 years. Deferral will cause the pension to increase according to the following schedule: 5.2 percent for a 1 year deferral; 10.8 percent for two years; 17.1 percent for three years; 24.0 percent for four years; and 31.5 percent for five years. There are no restrictions to starting the pension during this time.

The pension benefit from the second pillar can be deferred until age 70. Each pension fund define the terms of late retirement. As a general rule, the conversion rate is raised by 0.2 of a percentage points for each year the retirement is deferred according a recommendation of the Federal Social Insurance Office (pension funds decide freely on the percentage points).

3.8.7 United Kingdom

The structure of the UK pension system has an unmatched level of complexity. The main foundations were laid in the 1940s but since the 1960s there has been continuous reform layering. Furthermore, UK has recently legislated radical changes to the design of its decumulation phase that are still to be implemented. Some of these changes are still work in progress in terms of the fine print. This section provides an overview with the most recent information at hand.

The UK pension system comprises four interlocked pillars:

- *Pillar zero and pillar one* are usually analyzed together because both are administered by the government through the National Insurance (NI) system. Pillar zero is comprised by the **Basic State Pension**(BSP) and the **Pension Credit** (PC), while *Pillar one* is the so-called **State Second Pension** (S2P).[87] Both pillars operate on an unfunded PAYG. The BSP and the S2P are notionally contributive while the PC is funded from general revenues. Benefits from both pillars are indexed to inflation.

    1. The zero pillar BSP consists of a universal flat benefit estimated at around 16 percent of average earnings (OECD, 2013a). The BSP is paid when the individual reaches the State Pension Age (SPA). The SPA is currently 65 years of age for men and 61 for women.[88]

    2. The zero pillar PC is a means-tested benefit available for low income earners on top of the BSP. The PC has two components:

        – The *Guarantee Credit* (GC), is the main means-tested benefit currently paid to those aged 61 and above. It is paid conditional on income from other sources being below the level of full GC, and provided any hours worked and savings held are below specified limits. It is currently about 25 percent of median earnings.

        – The *Savings Credit* (SC), payable from age 65. It aims to ensure that those who have made some private provision for retirement, or have made provision in excess of the BSP, including the S2P, will be better off than those who have made no provision. It depends on marital status and a complex formula related to the GC, the BSP and the S2P.

    3. The first pillar S2P aims to provide supplementary benefits related to lifetime earnings.

- *Pillar two* is a **public-private partnership** of individualised pension provision. This means that it is also administered by the government but individuals can opt-out to join a workplace or occupational pension plan.[89] It is funded through employee and employer contributions. There are DB, DC or hybrid schemes. A salient characteristic is auto-enrollment, which was introduced for the largest employers from October 2012 and will be in place for all employers by February 2018.

- *Pillar three* consists of **personal pension plans** or **stakeholder pension plans** encouraged by tax relief. These plans are arranged by employers and usually operate under individual accounts DC schemes. Personal pensions is the name given to pension plans for the self-employed while the concept of stakeholder pensions was introduced to include other participants[90]. There is another scheme of low-cost, individualized savings accounts called **NEST** (National Employment Savings Trust). Employers who do not offer an occupational pension or a stakeholder or other qualifying pension scheme are able to auto-enroll their employees above an earnings threshold into NEST.

A new **single-tier state pension** (STSP) will replace the current BSP and the S2P from April 2016. Under the STSP anyone earning above a lower earnings limit would accrue entitlement to a flat-rate amount of future state pension income. The amount is still to be defined but it will be set at a level above GC.

[87] Previously known as the State Earnings Related Pension (SERPS).

[88] The women SPA is rising to 65 by November 2018. From than point both men and women SPA face an increase schedule to 66 between December 2018 and October 2020, to 67 between 2034 and 2036 and to 68 between 2044 and 2046.

[89] Before the recent reforms it was possible for members of DB schemes to replace some S2P with private pension provision. This was known as contracting-out. The Pensions Act 2007 abolished contracting-out in DC schemes from April 2012. As of April 2014, contracting out has been completely eliminated.

[90] There are some differences particularly when it comes to regulation of stakeholder plans. The main difference between these and other types of personal pension are that management charges in each year are limited by a maximum charge cap and providers are not permitted to charge exit penalties.

Another difference with the current system is that 35 years of contributions will be required for an individual to receive the full pension (instead of 30), and there will be a minimum qualifying period which is yet to be set but will be not more than 10 qualifying years.[91]

The second and third pillars can also be expected to mutate in the near future. Recently the *Department for Work and Pensions* launched a public consultation looking into proposals for a new model of occupational pensions whereby the risk is shared between the employee and the employer. The aim is to transform the pension landscape into the **Defined Ambition** hybrid world, much in the sense mentioned before for the case of the Netherlands.

Tax treatment

The benchmark for the UK approach to the taxation of pension savings is an EET scheme:

- *Contributions*: pension contributions by individuals and employers receive tax relief and employer contributions are exempt from national insurance contributions (NICs), subject to both an annual allowance and a lifetime allowance.
  - The *annual allowance* (AA) is a rule that defines that contributions receive tax relief on a given year up to the greater of SP3,600 or 100 percent of annual taxable earnings. If contributions are higher than the AA, the excess will be taxed at the rate of 40 percent. The current AA is SP40,000.
  - The *lifetime allowance* (LTA) regulates the amount of tax relief over the entire lifetime. Any pension savings in excess of the LTA, will be taxed at the LTA charge of 25 percent if the benefits are taken as a pension, or 55 percent if taken as a lump-sum. The current LTA is SP1.25 million.
- *Investment returns*: no tax is charged on investment growth from pension contributions.
- *Benefits*. Pensions in payment are taxed as income, but individuals are able to take up to 25 percent of their pension fund as a tax-free lump sum on retirement.As mentioned earlier this is currently legislated to change and individuals will be able to access 100 percent of their DC savings as a tax free lump-sum.

Variant career regulation

It is not possible to withdraw an SP before the SPA and therefore early retirement is not possible through the zero and first pillars. Late retirement is allowed. Individuals can choose to defer the payments of their BSP in return for an enhanced pension, through the award of increments, or as a one-off lump-sum. For each 5 weeks of deferral, people can receive an increase of 1 percent in their pension. This is equivalent to an increase of around 10.4 percent for each year people defer. Similar rules are in place for other state pensions including the S2P. However, individuals must defer all state pension benefits–they cannot elect for instance to defer BSP but start receiving S2P. While benefit is being deferred, the amount not claimed is still counted as income for Pension Credit and other means-tested benefits.

[91] The details escape the focus of this overview, but the interested reader is advised to check the notes produced by the *Pensions Policy Institute* at http://www.pensionspolicyinstitute.org.uk/publications/reports/ppi-single-tier-series-the-impact-of-the-governments-single-tier-state-pension-reform.

Since 2005, any deferred benefit for 12 consecutive months can be taken as a one-off lump sum payment. The deferred benefit will accrue interest at 2 percent above the Bank of England Base Interest Rate, and the whole of the resulting lump sum will be taxable at the marginal rate of tax paid by the pensioner on his or her other income.[92]

3.8.8 United States

The United States (USA) pension system is also comprised of three pillars. The first pillar is an extensive coverage public system that provides pensions to retired households and surviving spouses. The second and third pillars are private and work under employer-based retirement schemes.

The first pillar **Social Security** system (SSS) is an earnings related public DB scheme financed on a PAYG basis by general taxes and operated at the national level. It covers nearly 100 percent of Americans. The benefit formula is based on life time earnings. There is also a minimum benefit that is effectively set at the poverty level. Some important features of the scheme are as follows (OECD, 2013a):

- The normal retirement age is 67 for both men and women.[93]
- Eligibility depends on the number of years in which contributions are made with a minimum requirement of ten years of contributions.
- The earnings base for calculating pension benefits is the 35 years of highest earnings, indexed to average national earnings up to age 60 and not indexed thereafter.
- The benefit formula is progressive. The first USD 767 a month of relevant earnings attracts a 90 percent replacement rate. Earnings between USD 767 and USD 4,624 a month are replaced at 32 percent. These thresholds are 22 percent and 133 percent of the national average wage index for 2010, respectively. A replacement rate of 15 percent applies between the latter threshold and the earnings ceiling.
- Pension benefits are adjusted to inflation.
- The spouse and widow benefit is equal to 50 and 100 percent of the primary benefit, respectively.
- There is an additional means-tested benefit for the elderly, known as *Supplemental Security Income*.

The second pillar **private pension system** is completely voluntary[94] and operates nearly exclusively in the context of *employer sponsored arrangements*. On average around 40 percent of working population is covered by these plans, but coverage go up to 60 percent for ages 31 to 60. Gustman et al. (2010) report that approximately two-thirds of respondents age 51 to 56 have some employer-provided pension coverage.[95]

There are two types of private pension plan arrangements: *single employer plans*, which are sponsored and administered by a single entity; and *multi-employer plans*, which cover workers at a number of companies in a common industry. Currently most plans are of the DC fully funded form, funded through employee contributions. Many DC plans allow employees to make before-tax contributions. These

[92] Because of this interest rate premium there can be a financial gain from deferring and taking a lump sum.
[93] This is legislated to increase to 67 by 2022.
[94] Companies receive tax incentives from the government to promote the creation of occupational pension plans; however, it is not mandatory to do it.
[95] Cited in Nijman and Brown (2012).

arrangements are commonly referred as *401(k)* plans in the for-profit sector and *403(b)* plans in the nonprofit and public sectors. Annual contributions to these plans are limited to USD 17,500 in 2014, with a "catch up contribution" of an additional USD5,500 for those over 50.

The third pillar works mostly under the same infrastructure of the second pillar. The privately managed occupational plans generally include voluntary individual retirement arrangements, so-called **IRAs**. These are DC schemes established by individuals in the form of either an individual retirement account or an individual retirement annuity. Some employer-sponsored plans may be implemented through IRAs.

The Social Security Administration provides retirees with a real life annuity benefit. In the second and third pillars the story is very different as these plans are voluntary and there is no strict regulation on their design.[96]

Tax treatment

The US income tax system treats savings from retirement in IRAs and employer sponsored pension plans–including 401(K) plans–on an EET structure. Nevertheless, individuals may opt to receive a TEE treatment, in which case the plans are called "Roth" (Roth IRAs, Roth 401(K) and so on).[97] In the Roth modality, contributions cannot be deducted from taxable income (i.e. contributions are made net of tax), but no tax is charged on either returns or on withdrawals[98].

The taxation of the benefit (annuities or lump-sums) depends on whether the savings was accumulated under a taxed (non-qualified) or tax-deferred (qualified) account–such as IRA or 401(k)–. If savings come from a tax-deferred account, both the income and the capital components of the annuity income are subject to tax. But if they come from a taxed account, the portion of the annuity payments that represent the return of that capital is excluded from tax. In the last case there is a wrinkle because the favorable tax treatment comes to an end once the individual reaches its life expectancy age (say from 85 years old onward).[99] Finally, a few states impose an additional upfront premium tax when annuities are purchased with non-qualified funds.

Variant career regulation

Early and late retirement are allowed in USA:

- *Early retirement* is possible from 62, subject to an actuarial reduction. For each year of retirement before the normal age, the benefit is reduced by 6.67 percent. However, after three years, the reduction falls to 5 percent. This applies to retirees with a normal retirement age over 65.
- Late retirement up to age 70. The actuarial increment for those attaining age 62 in 2012 and later is 8 percent for each year deferred.

[96] Recently, the federal government, following a 2010 request for information, has begun to issue regulations and guidelines encouraging retirement plans and participants to take advantage of partial annuitization products and strategies.

[97] For more details see Poterba (2014).

[98] Because the maximum limits for traditional and Roth accounts are the same, but Roth contributions are made after tax, the amount of retirement income that can be purchased by the contribution of 1 dollar to a Roth account is greater than the amount of retirement income that can be purchased with an equivalent contribution to a traditional account.

[99] For more details see Slemrod and Bakija (2008).

Chapter 4

External effects of allowing PLS and SPWs in Dutch collective pension funds

4.1 Overview

Two key highlights from previous chapters are that there appears to be a sound economic case for a limited degree of liquidity in the form of special purpose withdrawals during the accumulation phase and partial lump-sums at retirement; and that these options are actually quite common in many countries.

A third notable takeaway was that the available literature on the role and optimal design of SPWs and/or PLS was found to be focused on defined contribution individual accounts (IDC) systems, but most pension funds in the Netherlands take a collective form and therefore a relevant question is what further considerations, if any, need to be taken into account in the design. PLS and SPWs in the specific context of the Dutch second pillar collective pension schemes indeed raise some relevant issues :

1. Allowing a degree of liquidity at retirement may avoid over-annuitization. Yet, too much liquidity may result in under-annuitization by plan participants.
2. Granting a degree of liquidity during the accumulation phase may help those entangled in short term financial hardship. However, too much liquidity may jeopardize the primary adequacy objective of the system.
3. Introducing liquidity may increase individual welfare, but it may also evoke external effects through its impact in the funding status of the plan and ensuing actions to restore balance, as well as from strategic behavior of plan participants.

These trade-offs should be carefully weighted. This chapter focuses on the third of these considerations and leaves the rest for future research. The main purpose is to get a better understanding of the external effects. Section II lays out the conceptual backbones needed for subsequent sections. Section III in turn identifies potential sources of external effects stemming from SPWs and PLS. This is supplemented by other relevant considerations besides external effects in Section IV. The approach in this chapter is not quantitatively driven, but some numerical illustrations are reported in Section V. Final remarks are then provided in the closing section.[1]

[1] Most of the background material presented in this chapter is borrowed from the lecture notes for the course Generational Economics Part B, prepared by Prof. Eduard Ponds at Tilburg University, with duly permission and endorsement from him. I also thank Prof. Robert Merton for giving me access to his class materials at MIT, where I got relevant background readings for this chapter.

4.2 Conceptual background on collective funds

Most collective plans operative in the Dutch second pillar work under DB principles and incorporate DC elements, whereby participants share investment risks, inflation risks, and other non-traded macroeconomic risks. In order to get an understanding on the nature of the external effect that may spring from a PLS or a SPW, it is important to dig deeper on the inner workings of collective plans, in particular, on how contributions and benefits are determined and how is risk shared among participants.

4.2.1 Balance-sheet approach

An illustrative starting point is the balance sheet of a stylized fund. In a nutshell:

- The pension fund faces a liability represented by the target benefits it has to pay to plan participants, which is financed by the target contributions of the current and future generations as well as the investment returns obtained from these contributions.
- These contributions are set up ex-ante based on a number of assumptions, for instance, about future rates of return, wage profiles, expected survival probabilities, among the most important.
- Contributions are uniform across participants (i.e. age independent). The deferred annuity accrual is also uniform across participants.
- Under certain circumstances, such as disappointing rates of return, interest rates drops, etc. the fund may ex-post face a deficit or a surplus that has to be borne by the stakeholders of the plans.

There are therefore three critical variables to pay attention to: target benefits, target contributions, and a risk-allocation rule. The underlying mechanism works as follows. Every year workers purchase rights with their contributions to get a deferred annuity that starts disbursements at retirement. Nowadays the typical plan uses an average-wage scheme where workers accrue a uniform percentage (around 2 percent) of pensionable salary for every year of service up to a maximum of forty years of career.

More specifically, for a worker who enters the pension fund at age x_0 and retires at age Γ, the pension that can be achieved at retirement would be:

$$pb_R = \sum_{x=x_0}^{\Gamma} w(x) * \alpha \tag{4.1}$$

where $w(x)$ is the salary as a function of age and α is the accrual rate.

These pension benefits are called *projected benefits*, since they take the future years of service and future salary developments into account. The so-called *accrued benefits* (ab) are defined over the elapsed years of service. A person who enters the pension fund at age x_0 has built up the following accrued benefit by age x_t:

$$ab_{x_t} = \sum_{x=x_0}^{x_t} w(x_t) * \alpha \tag{4.2}$$

The present value of the accrued benefits is known as **Accrued Benefit Obligation**, or ABO for short. The ABO for a worker i of age x at time t, $ABO^i_{x_t}$, is equal to:

$$ABO^i_{x_t} = ab^i_{x_t} * AF = ab^i_{x_t} * \sum_{s=\Gamma-x_t}^{M-x_t} \frac{{}_sp_{x_t}}{(1+r_s)^s} \tag{4.3}$$

where ${}_sp_{x_t}$ is the probability of an x_t-year old person surviving after s time periods; M stands for the maximum attainable age; $\{r_s\}$ represents the term structure at the valuation time; and AF is the annuity factor. Pension funds generally report the value of the accrued benefits of all participants:

$$ABO_t = \sum_{i}^{M} \sum_{x=x_0}^{x_t} ABO^i_{x_t} \tag{4.4}$$

To finance the pension benefits, contributions must be collected from employers and active workers. There are different actuarial methods available for computing the contribution rates. The accrued cost method is the most popular. According to the *accrued cost method* the contribution is calculated as the premium that just covers new pension rights and administration costs. Each year, the newly increased pension liability is fully covered by the premium τ, which is levied over the total pensionable payroll:

$$\tau_t * \sum_{i=1}^{N} w^i_t = \triangle ABO_t = \sum_{i=1}^{N} (ABO^i_t - ABO^i_{t-1}) \tag{4.5}$$

With these elements the balance sheet of the pension fund can be constructed as in Table 4.1 (in present value terms). Define the fund residual as any difference between assets and liabilities at time t as $R_t = A_t - L_t$. The residual would always be equal to zero in the absence of systematic and investment risks. Otherwise there can be surplus $R_t > 0$ or deficits $R_t < 0$ due to mismatch risk, which lead to intergenerational transfers and therefore to intergenerational risk-sharing.

Assets (A)	**Liabilities (L)**
AUM_t	ABO_t
$PV(premium)$	$PV(NewL)$
R_t	**R_t**

Table 4.1: Stylized balance sheet of a collective fund

4.2.2 Value-based approach

A useful economic interpretation of the balance sheet was given by Ponds (2003) and Kortleve et al. (2006), who showed that a pension fund is a zero-sum game in economic value terms. A change in the pension fund investment strategy, for instance by investing more in risky assets, does not create economic value, however it may lead to transfers of value between stakeholders according to the risk allocation rules operative in the fund. Furthermore, these authors interpret the economic value of a funding surplus or a funding deficit as embedded option premiums (see Box 6):

- *Funding surplus.* The economic value of a funding surplus may be seen as the option premium for a *call* on R_t at the end of period T held by the risk-bearing stakeholders.

- *Funding deficit.* The economic value of a funding deficit may be interpreted as the option price for a written *put* option with an exercise price for R_t of zero. This is equivalent to the economic cost of reinsurance against deficits at t = T.

Although a pension fund is a zero-sum game in economic value terms, it is potentially a positive sum game in welfare terms because these institutions aim to offer retirement income products which are not available in the market. Cui et al. (2011) developed a framework wherein pension funds can be evaluated in economic value terms as well as in utility terms. These authors showed that in utility terms a pension fund as a risk-sharing arrangement is more useful than an individual pension saving program without risk-sharing opportunities.

Box 6. The embedded options approach to a funded plan : Consider a funded plan at $t = 0$. Next period the plan has to pay a pension benefit equal to L_1. This pension benefit is funded in t=0 by a contribution sum equal to A_0. The investment of this sum yields an uncertain return equal to R_A. The end-period wealth of the pension fund is A_1, being the sum of initial contributions A_0 plus investment proceeds: $A_0(1+R_A)$.

The end-of-period total wealth A_1 may be larger than the value of the pension liability L_1, resulting in a residual R_1 being positive, $R_1 = A_1 - L_1 > 0$. This positive residual (surplus) will be allocated to the risk bearing stakeholders of the plan who have a call on this residual according to pre-specified risk allocation rules. A negative residual (deficit) occurs when the pension fund wealth falls short of the value of the pension liability, $R_1 = A_1 - L_1 < 0$. The stakeholders who have written a put must absorb this funding shortage.

The pension fund balance sheet can be written in terms of the put-call parity, known from option pricing. The put-call parity states that the pay-out of a risk-free asset, say bonds B, can be replicated by holding a portfolio consisting of a risky asset, say stocks A, plus holding a put on the risky asset and by writing a call on the risky asset where the exercise price of the put and the call both are equal to the (end) value of the risk-free asset B. So $B = A + Put - Call$. A defined benefit liability can be seen as a bond-like asset, so the benefit payout can be replicated by holding an appropriate combination of the pension fund assets and options on these assets. This finding can be used to restate the pension fund balance sheet in terms of a put-call parity. We can rewrite the pension fund balance in terms of the period-end values of the call and the put as follows: $A_1 - L_1 = R_1 = Call - Put$. This expression can be rewritten in economic value terms, resulting in $PV[A_1] - PV[L_1] = PV[R_1] = PV[Call] - PV[Put]$.

These economic values are calculated by a risk-adjusted discounting of the possible outcomes for the variables. Either the deflator technique or the method of risk-neutral valuation to calculate these present values. The term $PV[A_1]$ reflects the economic value at $t = 0$ of the end-of-period wealth of the pension fund: $PV[A_1] = PV[A_0(1+R_A)] = A_o$. The term $PV[L_1]$ stands for the economic value at $t = 0$ of the pension liability that has to be paid in $t = 1$. The terms $PV[Call]$ and $PV[Put]$ reflect the economic value of the period-end pay-outs of the call option and put option. The magnitude of the two variables $PV[Call]$ and $PV[Put]$, which also might be interpreted as option premiums, are determined by the funding policy of the pension fund, being determined by the laid-in contribution sum A_0 and the investment risk; the exercise price of the options, this is the pension liability L_1; the risk free rate; and the length of the period.

4.2.3 The effects of SPWs and PLS: initial considerations

Looking at Table 4.1 and starting from a balanced position $R_t = 0$ it is clear that PLS and SPWs impact the assets side of the balance sheet. The consequences of this on the liabilities side vary depending on the type of withdrawal:

- SPWs are taken by individuals during the accumulation stage. Hence, the individual keeps accruing pension rights while simultaneously withdrawing funds. This can be rationalized as an *exogenous shock* that creates a funding deficit, $R_t < 0$ which triggers changes in the plan's endogenous steering mechanisms to restore balance. The effect on the residual is temporary or permanent depending on the SPW model.
- PLS are taken at retirement which means that individuals have already accrued certain, presumably

full, pension rights. In this situation balance is restored by a commensurate decrease in liabilities, provided the right discount rate is used.

These points hint that the effects of a SPW or a PLS are not exactly the same, although the underlying economics is similar. The zero-sum game nature of pension funds in terms of value is at the heart of the externality. In the absence of individual internalization mechanisms, the intertemporal budget constraint of the pension fund implies that someone has to deal with the consequences of a funding deficit. Indeed, the externality should be related to an increase in the price of the put held by risk-bearers on the funding deficit, hurting the welfare of participants. Finally, the uniform contribution rate and uniform accrual rate features of collective plans in the Netherlands have important redistributive effects of economic value among plan participants. The introduction of SPWs and/or PLS may also alter these redistributive patterns. The subsequent sections delve more into these issues.

Before moving forward it is worth noting that there are other situations that may reduce the size of the assets in the fund besides SPWs and PLS. Two cases in point: a reduction in the accruals and value transfers. Some words on the subtle differences between these shocks that also reduce assets and SPWs and/or PLS could be illustrative of the nature of the issue this chapter is dealing with.

Reduction in accruals

A reduction in the accruals (i.e. AUM) may happen for instance if a pension fund faces a decline in the number of active members. This situation is not uncommon.[2] Is it equivalent than for instance a SPW? The answer is a "qualified no:"[3]

- It is similar in the sense that getting less entrants than expected fit in the "exogenous shock" that reduces assets interpretation given above to SPWs. Indeed, in both situations starting from a balanced position the plan may go into a funding deficit and a potentially similar process to restore balance may be observed.
- But note that in the case of less accruals the situation **affects all participants**. More specifically, it harms all participants if for instance the fund resorts to recovery premiums to restore balance.
- In comparison, a SPW results from an active decision of a plan participant that carries **individual benefits** but that is not neutral to other plan participants. More specifically, it creates a *negative externality*.

Value transfers

When an individual moves to another pension fund there is a value transfer of pension rights between these funds. This is an interesting topic in itself with many ramifications beyond the boundaries of this thesis. From the perspective of this chapter the analysis is confined to the fact that value transfers entail a reduction in the assets of the transferring fund. This feature makes value transfers similar to a SPW or a PLS. Nevertheless, the reduction in assets affects all remaining participants in the fund equally while in the case of a SPW or a PLS the individual that withdraws money gets a benefit while others a negative externality.

[2] See for example this recent note from the Dutch Central Bank: `http://www.dnb.nl/en/news/news-and-archive/statistisch-nieuws-2014/dnb311985.jsp`.

[3] This is consistent with the analysis in Valdes (2002, 2004), which concludes that allowing for SPWs and/or PLS is not equivalent to a contribution holiday to plan participants. See the literature review for more details.

There is an element that was not present in the case of a reduction in accruals, namely, that the assets in the receiving fund are increased and this may be interpreted as a positive externality by the same arguments in this chapter. From a social planner perspective whether those effects cancel each other is an empirical question. Note however that from the individual perspective the transfer can be neutral, positive or negative, depending on the relative rules of both funds. Summing up, value transfers are similar to SPW and/or PLS but not the same.

4.3 Understanding the externality

In an IDC scheme withdrawals have a one-to-one actuarial link to the value of the final pension balance and therefore the individual internalizes directly its decision to reduce its balance by taking a PLS or a SPW. In a collective plan there are some extra layers of complexity because of three potential sources of externalities:

- External effects due to asymmetric information regarding survival probabilities.
- External effects due to the plan rules regarding the distribution of funding deficits, either via recovery contributions, a reduction of benefits (for instance through less indexation) or both.
- External effects stemming from forgone welfare-enhancing opportunities.

4.3.1 External effects due to asymmetric information

As mentioned earlier, the contribution and the accrual rate levied by pension funds is age-independent in the Netherlands. However *the present value* of newly accrued liabilities each year differ between younger and older workers *because of the differences in the time value of money adjusted for mortality risk*. Figure 4.1 below shows the uniform contribution rate τ (flat line) and the course of the present value new accrued liabilities per age (curved line).

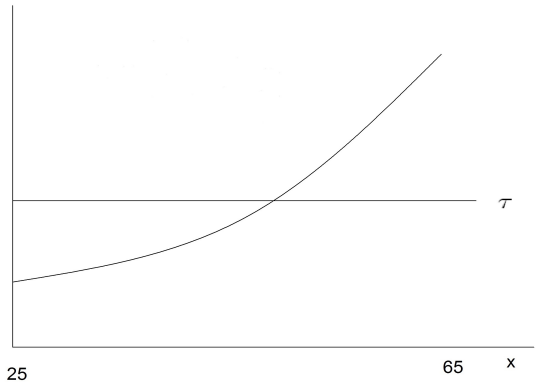

Figure 4.1: Uniform contribution rate and the PV of new accrued benefits

The curved line depicts the actuarially fair contribution, which is determined by:

$$\Delta ab_x * \sum_{s=\Gamma-x}^{M-x} \frac{{}_sp_x}{(1+r_s)^s} \tag{4.6}$$

Looking at Figure 4.1 it is clear that on an annual base younger workers overpay relative to the benefits they accrue, whereas the opposite is true for the elderly. The two lines cross at around 46 years old (Boeijen et al., 2006). Collective second pillar plans in the Netherlands are therefore not actuarially fair, except for the average worker.[4] The same type of graph can be constructed using other traditional criteria instead of the young-old divide, like men-women, low income-high income, highly educated-poorly educated, etc. These various groups of plan members show up differences in survival probabilities while equation 4.6 is based on average survival probabilities.

The combination of uniform pricing of deferred annuities and the uniform contribution rate policy in the Netherlands leads to substantial intragenerational redistribution from workers with a short life expectancy to workers with larger life expectancy–i.e males to females–, and from those with flat earnings profile to high flyers –i.e. low educated to high educated workers and low income to high income–(Aarssen and Kuipers, 2007; Bonenkamp, 2009). Introducing PLS and SPWs may alter the cross-subsidization process, reinforcing redistribution in confounding ways.

Special purpose withdrawals

Regarding SPWs, *adverse selection* effects may appear as the young and the liquidity constrained–usually the low income and/or less educated–take advantage of that option according to the literature review in Chapter II. *Moral hazard* may also be an issue if those with higher probability of default take the SPW, knowing they will resort back to the state in the future anyway. This again can be related to the low educated and flat and low earnings profile type of workers.

Partial lump-sums

The analysis is similar for PLS at retirement. Selection effects may arise because it is expected that the cash out is taken disproportionately by workers who believe or have good reasons to think that they face a lower survival probability, increasing the price of annuities for those that stay in the annuitization pool; while moral hazard may arise if those with lower lifetime resources cash out and then resort to the State for survival at older ages.

To some extent this may also be expected in the Netherlands through the high-low income steams in retirement, although as mentioned in the previous chapters the high-low constructs are not exactly a PLS,[5] but a way to increase temporarily the annuity payment in exchange for a lower payment in the future. There are not readily available official statistics on the high-low uptake but the experience of ABP clients is that apparently only a negligible number of participants ask for this option at retirement, but this needs more exploration.

4.3.2 External effects due to plan rules

The risk allocation rules of the fund specify which endogenous steering mechanisms are used to restore balance. This section illustrates this using three stylized pension contracts which specify linear risk

[4] And this only in the case that the current funding ratio is 100 percent.

[5] For instance it is not the same to increase the monthly annuity payment from 1000 euros to 1,100 euros for two years, which would be an example of a high-low option, than to get 2400 euros in one payment, which is an example of a PLS.

allocation rules.[6] Two assumptions are made to focus the analysis on the core argument without loss of generality:

- First, assume initially that the investment policy of the fund is risk-free and there are no other systematic risks. In this way any mismatch or shortfall will be created by the withdrawals from the fund and not through a more risky investment mix.[7]
- Second, there is no heterogeneity in plan participants. In particular all face the same survival prospects.[8]

DB with contribution adjustments (DB_{CA})

In this case, benefits are fixed at $b_t = b$ while contributions p_t are flexible. Hence, it is the working cohorts that bear any funding mismatch caused by SPWs or PLS. Consider the following linear risk-allocation rule:

$$p_t = p - \frac{R_t}{\Gamma} \tag{4.7}$$

Where contributions p_t are a function of the target contribution level p and the funding residual per cohort $\frac{R_t}{\Gamma}$. Recall that $R_t = A_t - L_t$ is the funding residual in period t and note that Γ is the number of active cohorts up to retirement age.[9] Under this pension contract, starting from a situation of balance, that is $R_t = 0$, reducing the size the assets by allowing PLS or a SPW will turn $R_t < 0$, introducing a mismatch. There is a direct negative external effect from allowing PLS or SPWs because, according to the risk-allocation rule in equation 4.7, current workers must increase their contribution p_t to the fund until balance is restored. In practice this is usually called *recovery contributions*.

DB with benefit adjustments (DB_{BA})

In this case, contributions are fixed at $p_t = p$. Benefits are the only steering mechanism. A simple linear risk-allocation rule may take the following form:

$$b_t = b + \frac{R_t}{M - \Gamma} \tag{4.8}$$

The benefit per retired cohort b_t is a function of the target benefit level b and the funding residual per cohort $\frac{R_t}{M-\Gamma}$, where M represents the number of cohorts at the maximal attainable age.[10] Going from $R_t = 0$ to $R_t < 0$ when PLS or SPWs are allowed engenders an external effect borne entirely by the retired cohorts. According to equation 4.8, retirees make it up by accepting a reduction in their benefits b_t until balance is restored. In practice this may happen through a reduction in the quality of indexation.

[6] The contract design is based on Cui et al. (2011). One difference with these author's setup is that the speed of adjustment is neglected to simplify the analysis. The speed at which steering mechanisms are adjusted in order to absorb a funding shortfall or surplus is decisive to how much funding risk is borne by current workers and current pensioners and how much funding risk is shifted forward to future participants, which is not the focus of the analysis in this section. See Ponds (2003) for more details.

[7] Given that pension contracts are linear, this assumption is innocuous.

[8] Differential survival probabilities were tackled in the previous section.

[9] For instance if by assumption retirement age is at age 65 and the working career starts at age 25, then $\Gamma = 40$.

[10] For instance if by assumption individuals die at age 85, then $M = 60$, comprised by 40 working cohorts ($\Gamma = 40$) and 20 retired cohorts ($M - \Gamma = 20$).

DB with contribution and benefit adjustments (DB_H)

In the hybrid is case, both contributions and benefits can be adjusted simultaneously to absorb any mismatch. A simple linear risk-allocation rule may be a combination of the previous two:

$$p_t = p - \delta \left[\frac{R_t}{\Gamma} \right] \tag{4.9}$$

$$b_t = b + (1-\delta) \left[\frac{R_t}{M-\Gamma} \right] \tag{4.10}$$

Where a fraction $0 < \delta < 1$ of the funding mismatch is absorbed by the workers while the rest, $(1-\delta)$, is shared by retirees. In this case $R_t < 0$ generates an external effect on all plan participants, the workers and the retirees. According to equations 4.9 and 4.10, contributions are increased and simultaneously benefits are decreased until balance is restored and the share of the burden is split according to the size of δ.

4.3.3 External effects due to reduced welfare-improving opportunities

Residual loss due to diminished risk-bearing

Enter investments risks and assume SPWs and/or PLS are allowed. Cui et al. (2011) report that intergenerational risk sharing increases the risk-bearing capacity of the pension plan and hence participants are more able to exploit the positive equity premiums which is welfare improving, relative to an IDC system with no risk-sharing capabilities. Recall that starting from a balanced situation SPWs generate a funding deficit, that is $R_t < 0$. In the simulation of Cui et al. (2011), a funding deficit above 20 percent makes the collective fund to loose its welfare enhancing capabilities. That figure would need to be corrected in the current context to account for the positive individual utility that SPWs and/or PLS generate, but 20 percent is an initial benchmark. External effects caused by SPWs and/or PLS can be a countervailing force of the welfare benefits of risk sharing.

The intuition is that with diminished AUM to honor its target liabilities, the ability of the fund to optimally engage in a more risky investment policy–than in an otherwise situation where risk-sharing is not possible (i.e. an IDC scheme)–is impaired, and therefore either it takes more risk than is optimal, increasing mismatch risk and therefore transferring value between participants, or rely on adjusting its steering mechanisms–or a combination of the two–in a way that hurts the utility of risk-bearing parties above and beyond the marginal benefits of risk-sharing. This should be reflected in an increase in the absolute value of the put option on the funding deficit.

Forgone equity premium and mortality credits

The bond-like nature of a DB pension promise suggests that the "cost price" of newly accrued liabilities has to be equal to the present value of the associated increase in future benefit cash flows, where the present value is based on the nominal or real yield curve, depending on the nature of the liability. Therefore, the assumed discount rate determines the value of the liabilities and therefore plays a vital role in setting the cost effective premium (Ponds, 2003). In the expression for newly accrued liabilities,

$(1+r_t)^t$ represents the discount rate for rights payable in t years, which can be determined by the risk-free rate of return under the so-called *accounting approach*, or by the expected return on assets over t years under the *funding approach*.

Now assume SPWS and/or PLS are allowed. Other things being equal, the immediate effect is that the assumptions on returns will not be realized, because the original r_t considers the yields that the fund was expecting to obtain from investing the accrued pension rights during both, the accumulation and the decumuation phase. Returns fall short of expectations and there is a need either to adjust the discount rate to account for the lost risk premium.[11] In the case of PLS this is not relevant when using the risk-free rate as the discount rate but the argument is valid whether the discount rate used is the risk-free rate or the expected returns in the case of SPWs when the repayment conditions do not restore the economic value of the loan to the pension plan, or for the permanent withdrawal model.

Furthermore, in the case of PLS, it can be argued that it is theoretically possible that the individual that cashes out a portion at retirement gets the same risk premium by self-investment the proceeds.[12] Assume this is the case for the sake of argument. What the individual will most probably not be able to get is the enhanced return in the form of the mortality credit embedded in the full annuitization option. Indeed, cashing out part of pension savings generates an external effect on those that keep choosing full annuitization as micro-longevity risk pooling capabilities are diminished.[13] Note that this argument is more compelling for small funds than large funds. Also note that conditional on living beyond what is expected for its cohort, forgone mortality credits are also a cost for the individual, not only an external effect for the individuals that stayed in the pool.

4.3.4 Other relevant considerations

There are other potentially relevant considerations besides external effects. In particular, SPWs and/or PLS may have taxation,solvency, liquidity risk and behavioral consequences.

Taxation

Annuitizing pensions savings is usually the quid-pro-quo for tax relief of retirement savings over the working life. Consistent with this, countries following an EET approach tax PLS as any other pension benefit. A minority of countries even apply a surcharge but this is better understood as a policy instrument to discourage these payouts. To the contrary, not taxing PLS does not conform to tax neutrality and it may therefore be used by individual to access lifetime tax advantages. The same analysis apply to SPWs as individuals would be getting credit from a tax advantaged source.

Solvency

A very basic but important insight from previous sections is that SPWs and/or PLS impact the funding ratio and as such there are natural financial stability issues that may need to be monitored by regulators. In particular, some constraints should be imposed in severely underfunded pension plans and those undergoing a recovery plan to avoid insolvency. The Netherlands has experience on this through the

[11] It may also be possible to adjust the timing of the cash flows and retain the discount rate.

[12] This cannot be argued in the case of SPWs as the nature of these loans is assumed to be related to an emergency, and therefore holders will not use the proceeds to invest in the stock market.

[13] Recall this argument is stronger the older the individual. At high ages the mortality credit is almost impossible to beat by any accessible investment strategy.

special regulations for the *value transfer* mentioned before. This is particularly important in recessions as the demand for SPWs and/or PLS is presumably counter-cyclical as mentioned in the literature review.

Investment policy and risk management

Provided solvency is taken care of by proper regulation (see previous point), from the standpoint of pension managers PLS and/or SPWs represent a "liquidity risk" problem. Dealing with liquidity risk may entail a change in the investment and risk management strategies that may not be easy to achieve immediately, depending on how illiquid are the underlying investments of the fund. In practice the illiquidity of the portfolio is usually related to the size of the fund and the demographic characteristics of its client base. In any case, should SPWs and/or PLS options are allowed then a reasonable transition period for the fund to adjust their policies may be advisable to avoid fire sales and the ensuing value losses.

Behavioral issues

According to previous chapters, a behavioral design such as the default, frame, timing of the decision and nudges surrounding a potential introduction of SPWs and/or PLS may matter for the final outcome. For instance:

- If SPWs and/or PLS are a part of the default then participants may understand the frame as an outright endorsement and this may increase the take up rate. It is probably wiser to do it the other way around, that is, to set up the no SPWs and/or no PLS option as the default.
- Early decision may also be included in the design as the cases of Denmark and Switzerland in the previous chapter showed. This may also be supplementary to the previous point as an early decision should help pension funds in dealing with liquidity risks.
- Finally, such a dramatic change from the historical status quo in the Netherlands may create confusion at the beginning and according to behavioral economics it may be then important to provide framed information and frequent nudges that may induce participants to select a preferred option.

4.4 Quantitative illustrations

4.4.1 Model set-up

The setting is a two period Black-Scholes economy following the value based asset-liability management (ALM) framework developed in Ponds (2003) and Kortleve et al. (2006). The main variables and assumptions are sketched in Table 4.2 and explained below.

State	Probabilities	Risk free	Equities	Deflators	Risk neutral probabilities
Up	$p = 0.5$	5%	+30%	0.714	$q = 0.375$
Down	$1-p = 0.5$	5%	−10%	1.190	$1-q = 0.625$
		$R_f = 5\%$	$E[R_A] = +10\%$	$E[D] = 0.952$	

Table 4.2: Returns, probabilities and deflators

- Assume a collective funded plan that has promised to pay next period, $t = 1$, a pension liability L_1 of 105 monetary units. The risk-free return, r_f, is 5%, so the present value of this liability, $PV[L_1]$, is 100.
- The pension fund receives a contribution A_0 at the beginning of $t = 0$ to fund the liability. The sum of contributions and investment proceeds in $t = 0$ must deliver the necessary means to meet the liability next period. This contribution is equal to the present value of the liability, i.e. $A_0 = PV[L_1] = 100$.
- The plan can choose between three different investment strategies: 100 percent risk-free bonds, 50 percent bonds and 50 percent equities, and a 100 percent equity strategy.
- It is assumed that the uncertainty in the economy can be described with two states: Up and Down. Both states have a probability of 0.5 to be realized. The expected return of stocks is 10%, being the weighted outcome of the return in the good state, +30%, and in the bad state, −10%.
- There is no other source of risk in the economy, so the risk neutral probabilities and the deflator set are determined by the shocks in the equities solely. Deflators are computed following the approximations in Jong (2004). Plan participants face average survival probabilities.
- It is assumed that when PLS or SPWs are allowed, withdrawals are such that 10 percent of AUM–i.e. the value of contributions– is draw-down.

The tables in the following sections share some characteristics worth mentioning as guidance. On the rows dimension, each table is comprised by 3 panels, presenting the next period *expected outcomes* and *present values* for the balance sheet variables A, L and R, correspondingly. Keep in mind that:

- *Expected outcomes* are computed under two methodologies. The *accounting approach* sets the risk-free rate as the discount rate (DR), while the *funding approach* uses expected returns instead of the risk-free rate. The *present values* of payoffs at $t = 0$ use the stochastic deflators as DR.[14]
- The expected results are shown for the good state and the bad state. The result for the Residual is split up in option payoffs: a call payoff equal to the funding surplus in the good state and a put payoff as the funding shortfall in the bad state.

In the columns dimension three sections dubbed A, B and C, respectively can be discerned from left to right. Each section shows results for different equity mix allocations. Within each section the status quo–the original equilibrium situation before the shock–; and the PLS or a SPW shock at t=0 are shown.

4.4.2 Partial lump-sums

Accounting approach

The accounting approach sets contributions as the present value of future liabilities discounting at the risk-free rate. A withdrawal of 10 euros in period zero would translate into a commensurate decrease in the liabilities for the next period to 94.5 euros in expected value terms and to 90 in present value terms. No funding deficit is created. This is very transparent in Section A-Panel III of Table 4.3.

[14] Results were double-checked using risk-neutral valuation.

Equity allocation	A. Zero percent		B. Fifty percent		C. Hundred percent	
	Status quo A_0=100	**PLS** A_0=90	**Status quo** A_0=100	**PLS** A_0=87.9	**Status quo** A_0=100	**PLS** A_0=85.9
Panel I: Assets in t=1						
Present values	**100.00**	**90.00**	**100.00**	**90.00**	**100.00**	**90.00**
Expected values	**105.00**	**94.50**	**107.50**	**96.75**	**110.00**	**99.00**
Up	105.00	94.50	117.50	105.75	130.00	117.00
Down	105.00	94.50	97.50	87.75	90.00	81.00
Panel II: Liabilities in t=1						
Present values	**100.00**	**90.00**	**100.00**	**90.00**	**100.00**	**90.00**
Expected values	**105.00**	**94.50**	**105.00**	**94.50**	**105.00**	**94.50**
Up	105.00	94.50	105.00	94.50	105.00	94.50
Down	105.00	94.50	105.00	94.50	105.00	94.50
Panel III: Residual in t=1						
Present values	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Up=PV(Call)	0.00	0.00	4.46	4.02	8.93	8.04
Down=PV(Put)	0.00	0.00	-4.46	-4.02	-8.93	-8.04
Expected values	**0.00**	**0.00**	**2.50**	**2.25**	**5.00**	**4.50**
Up=Payoff Call	0.00	0.00	12.50	11.25	25.00	22.50
Down=Payoff Put	0.00	0.00	-7.50	-6.75	-15.00	-13.50

Table 4.3: Effects of a PLS under the accounting method

This simple result conveys a very important message, namely, that if contributions are set discounting liabilities at the right discount rate, then individuals get an amount fully consistent with its *economic value* and therefore there are no external effects involved. The analysis carries over for the two investment strategies with equities in sections B and C. Again, the PLS does not create a funding deficit in present value because contributions are set using the right discount rate for future liabilities.

For completeness, note that the table shows the classic result that adding risk does not add economic value. Panel III reports an expected surplus relative to the zero equity allocation, which is higher the higher is the equity premium. This also shows off in the form of a higher expected value of the call option than the put option. This is corrected fully by deflators, which make the present value of the residual is always zero, showing that higher returns are fully compensated by more risk associated to equities.

Funding approach

By construction, the funding method sets contributions as a function of the expected rate of return, while liabilities are discounted at the risk-free rate. An implication of this is that contributions are lower the higher is the equity allocation as shown in the headings of Table 4.4. This operation is such that a zero expected value for the residual obtains, even in the case of a PLS withdrawal. It is therefore not surprising that the only case where there is no mismatch is precisely the risk-free investment strategy.

A negative residual indeed shows up in present value terms for the risky strategies. Take for example investment strategy C. When withdrawing 10 percent of 95.45 the remaining assets go down to 85.91. Using the risk-free rate, the liabilities in period 1 would be 90, creating a funding deficit of value $[85.91 - 90] = -4.09$. Note that the put and the call payoffs no longer hold the same values and the absolute value of the put is higher than the value of the call, confirming the analysis in previous sections.

The intuition is that with diminished assets, the assumed expected returns are not enough to cover the target liabilities and therefore the price of getting insurance for a residual value of zero increases.

The table also allows to get a number for the external effect created by the PLS under the funding approach. Indeed, withdrawing 10 percent of a fund of size 94.45 results in assets of size 85.91, but withdrawing 10 percent of the expected value of that amount results in 85.050 = [(0.9)(94.5)] which in turn generates a mismatch of 0.86 = [85.91 − 85.050], which can be attributed to the external effect. The rest, 3.23 (4.09 − 0.86) is explained by risk taking. The external effect represents 0.91 percent of liabilities. Performing the same computation for the balanced investment strategy results in 2.86, but that figure should be adjusted to account for a higher contribution of value 2.00 (87.91 − 85.91) and then the 0.86 figure appears again.

This confirms previous intuition that the equity premium is forfeit. Recall that in setting contributions under the funding approach in the status quo incorporates the equity premium over the entire life cycle, but when PLS are allowed this assumption will only be partially realized. The main takeaway is that under this methodology, which is not uncommon in the real world, the individual that takes a PLS at retirement takes more than the economic value and therefore creates external costs to fellow participants.

Equity allocation	**A. Zero percent**		**B. Fifty percent**		**C. Hundred percent**	
	Status quo A_0=100	**PLS** A_0=90	**Status quo** A_0=97.67	**PLS** A_0=87.9	**Status quo** A_0=95.45	**PLS** A_0=85.91
Panel I: Assets in t=1						
Present values	**100.00**	**90.00**	**97.67**	**87.91**	**95.45**	**85.91**
Expected values	**105.00**	**94.50**	**105.00**	**94.50**	**105.00**	**94.50**
Up	105.00	94.50	114.77	103.29	124.09	111.68
Down	105.00	94.50	95.23	85.71	85.91	77.32
Panel II: Liabilities in t=1						
Present values	**100.00**	**90.00**	**100.00**	**90.00**	**100.00**	**90.00**
Expected values	**105.00**	**94.50**	**105.00**	**94.50**	**105.00**	**94.50**
Up	105.00	94.50	105.00	94.50	105.00	94.50
Down	105.00	94.50	105.00	94.50	105.00	94.50
Panel III: Residual in t=1						
Present values	**0.00**	**0.00**	**-2.33**	**-2.09**	**-4.55**	**-4.09**
Up=PV(Call)	0.00	0.00	3.49	3.14	6.82	6.14
Down=PV(Put)	0.00	0.00	-5.81	-5.23	-11.36	-10.23
Expected values	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Up=Payoff Call	0.00	0.00	9.77	8.79	19.09	17.18
Down=Payoff Put	0.00	0.00	-9.77	-8.79	-19.09	-17.18

Table 4.4: Effects of a PLS under the funding method

4.4.3 Special-purpose withdrawals

Recall that there are three operative models identified in previous chapters for SPWs. The *permanent withdrawal* model is akin to a PLS, the difference only being that it happens during the accumulation stage while PLS happens at retirement and therefore the extent of the external effect maybe larger under

the funding method for this type of SPW.[15] The *feeder-fund* model implies a set up of an "individual account" whereby withdrawals are canceled against. Hence it does not lend itself to be analyzed under the framework of this chapter.[16] Therefore this section focuses on the loan and repay model.[17]

The *loan & repay* model works in such a way that there is a withdrawal that is assumed to be paid at retirement (period 1). Therefore provided that what is paid back to the fund reflects the "economic value" of the loan (i.e. that the interest rate charged on the loan plus the principal fully recovers what is lost because of diminished assets in period zero, including external effects), then SPWs should not represent a problem, abstracting from operative costs. Needless to say, other risks arise in this case that were not present in the case of a PLS. In particular there is the possibility that the individual dies in debt before repaying or defaults on the loan.

Table 4.5 assumes that an individual gets 10 euros in the first period as a loan with the promise to pay by period 1, but the individual passes away and therefore does not repay. Note that in this setting this exercise is the same case as a SPW under the permanent withdrawal model.[18]

Zero equity	**Panel 1. Accounting approach**			**Panel 2. Funding approach**		
Allocation rule:	DB_{CA} (A_0=100)	DB_{BA} (A_0=90)	DB_H (A_0=95)	DB_{CA} (A_0=100)	DB_{BA} (A_0=90)	DB_H (A_0=95)
Section I: Assets in t=1						
Present values	**100.00**	**100.00**	**100.00**	**100.00**	**90.00**	**95.00**
Expected values	**105.00**	**94.50**	**99.75**	**105.00**	**105.00**	**99.75**
Up	105.00	94.50	99.75	105.00	94.50	99.75
Down	105.00	94.50	99.75	105.00	94.50	99.75
Section II: Liabilities in t=1						
Present values	**100.00**	**100.00**	**100.00**	**100.00**	**90.00**	**95.00**
Expected values	**105.00**	**94.50**	**99.75**	**105.00**	**94.50**	**99.75**
Up	105.00	94.50	99.75	105.00	94.50	99.75
Down	105.00	94.50	99.75	105.00	94.50	99.75
Section III: Residual in t=1						
Present values	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Up=PV(Call)	0.00	0.00	0.00	0.00	0.00	0.00
Down=PV(Put)	0.00	0.00	0.00	0.00	0.00	0.00
Expected values	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Up=Payoff Call	0.00	0.00	0.00	0.00	0.00	0.00
Down=Payoff Put	0.00	0.00	0.00	0.00	0.00	0.00

Table 4.5: Distributional effects of an unpaid SPW

The withdrawal creates a funding deficit of -10 which is allocated among participants using the three benchmark pension contracts described before. The table only shows results for investment mix A.[19] The results confirm that under a DB plan with contribution adjustments, current workers bear all the

[15] For instance, the equity premium attached to the drawdown is lost for a larger period than in the case of PLS at retirement. Note that the model is not rich enough to account for this but a multi-period model would do the job.

[16] But see the op. cit. Adriaansen (2014).

[17] Also note that SPWs may also be allowed during retirement but the analysis in this chapter refers mainly to SPWs during the accumulation phase.

[18] But this is only circumstantial to the limitations of this model (see footnote 15 above).

[19] Similar tables were constructed for the other two variants but the insights would be the same and therefore these tables are not shown. Note that for the hybrid case we assume that $\delta = 0.5$.

burden of the shock; under a DB plan with benefit adjustments plans it is retirees that face a cut in their pension promise; while under a hybrid plans both groups of participants face the burden of the initial decrease in assets.

Turning to the second case, assume in line with the 401(k) experience that 10 percent of the SPWs default in period 1. Loosely speaking, this means that out of 10 euros that are withdrawn as a loan in period 0, only 9 euros are effectively repaid in period 1. The result from this exercise, not shown in the table, is that the discount rate must be increased from 1.0500 to 1.0590 percent in order to restore balance. Assuming the loan has a life equal to the average duration of the working career of the plan participant, the figure translates into an increase of 2 basis points for the whole period.[20]

4.5 Final remarks

The analysis and the value-based ALM illustrations in this chapter provided binocular lenses into a topic that is high on the pensions agenda in the Netherlands, namely, adding some flexibility to a design that looks rigid both in theory and relative to the international practice. In particular, this chapter offered an analysis of the potential effects of enabling some specific forms of liquidity to retirement savings and retirement options.

Striking a good design of SPWs and/or PLS is not straightforward even in an IDC scheme where property rights are clearly defined, as the previous chapters showcased, but in collective funds there are some extra design complexity layers stemming from potential external effects due to differential survival probabilities, forgone welfare enhancing opportunities and the rules governing the distribution of funding deficits among plan members. The zero-sum property of pension funds in terms of value plays a paramount role in explaining the external effects. There are also important taxation, solvency, liquidity risks and behavioral considerations that should be taken into account when introducing SPWs and/or PLS into collective plans.

The importance of external effects is at the end an empirical question, so much work remains to be done. Some ideas on how to move forward are provided below.

4.5.1 Research agenda

Besides studying the two trade-offs mentioned at the begging of this chapter but not covered later– related to optimal annuitization level for the Netherlands and adequacy considerations–, the analysis of the external effects could be refined and extended in the following directions:

1. Build a multi-period OLG model of optimal design of SPWs and/or PLS in the context of the Dutch collective second pillar plans. This model should be rich enough to model different types of SPWs under different scenarios. The model also should:
    - Consider all sources of external effects simultaneously in order to sort out its relative importance.
    - Disentangle distributional effects among groups with different survival probabilities.

[20] Assuming the loan is taken at 25 years old are not paid back until 65 years old then the increase is about 5 basis points. Needless to say, these figures were obtained from a very general and stylized model and should therefore be refined. At this stage the message should not be about the size, but about the fact that a default rate indeed would require a change in the discount rate in order to restore balance.

- Value the impact on the welfare of participants.

2. Explore potential internalization mechanisms, that is, find a design for SPWs and/or PLS that avoids the external effects and ensuing value transfers.[21] This can be achieved in different ways:
   - By adjusting rules on how much a plan participant gets at fund entry or exit to economic value such as to avoid external effects and value transfers in case of new accrued rights.
   - By applying a straight downward adjustment to the withdrawal in the case of PLS or more stringent payment conditions (i.e. higher interest rate on the loan or a higher penalty in case of no payment) in the SPW case. The exact details on *the size of the cut* in the former case and the details on the *loan conditions* in latter case need to be carefully studied.
3. Extend the analysis to SPWs in the retirement phase and provide an assessment of PLS and SPWs in comparison to already existing high-low constructs. A more in-depth study of the similarities and differences with value transfers is also warranted.
4. Explore in more detail one or more of the additional topics that were just mentioned *en passe* in this chapter: taxation, financial stability, liquidity risk management and behavioral design.

All in all these points suggest a very challenging, enticing and relevant research agenda that will be tackled in a follow up project.

[21] In this sense internalization is different than discouraging SPWs or PLS which can also be a legitimate policy objective that lies probably more in the realm of the taxation and behavioral design considerations than in the internalization referred to in this point.

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