Essays in pension economics and intergenerational risk sharing

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Chapter 1

Introduction and Overview

This thesis is inspired by the developments over the last decades in pension schemes worldwide and specifically in the Dutch pension system. In this introduction, I describe these developments as they have unfolded in the Netherlands, although the general trends in terms of demography and financial markets that will be discussed hold on a worldwide scale.

In the Netherlands, the pension system is organized in three different parts, or 'pillars' as they are usually referred to. The first pillar, the AOW, is state sponsored and is intended to prevent old-age poverty. The level of the first pillar pension income depends only on years of residence and on marital status and is such that an individual without any additional pension income will be above the subsistence level. The second pillar of pension income provision is the occupational pension. Ninety percent of the Dutch employees are covered by some sort of second pillar pension scheme, while participation in occupational pension schemes is obligatory for about 70% of the employees. Finally, the third pillar consists of private additional savings for retirement.

The first pillar is financed on a pay-as-you-go (PAYG) basis, in such a way that the currently active part of the population pays the contributions that are used to finance the retirement benefits of the retirees. The second and third pillars are organised on a funded basis. In the second pillar, employees and employers pay contributions to a pension fund or insurance company that executes the occupational pension arrangement offered by the employer to the employee. These contributions are part of the

employment contract and can be considered to be deferred wage income. Third pillar pensions consist of pension savings to provide additional retirement income - such as a pension savings account, life insurance, etcetera - that individuals privately decide on.

Currently there is substantial debate around the design of the Dutch pension system. The first driving force behind this debate is the changing demographic composition of the population. Following the baby-boom just after the second World War, birth rates have been declining steadily. At the same time, life expectancy has increased substantially. Although the increasing longevity brings us much happiness, it can be problematic for a pension system that is not designed to deal with it (see King (2004) for some accessible illustrations of changes in life expectancy). The combination of these two trends implies that, for a given retirement age, the fraction of the population that is retired has been increasing relative to the fraction that is working. This increase in the so-called dependency ratio is foreseen to continue over the next twenty to thirty years. This has caused a debate on how to deal with these demographic changes: if the retirement age remains fixed at its current level of 65 years, in the first pillar those of working age will have to contribute an increasing share out of their labour income to pay for the retirement benefits, while in the second pillar the same generations have to increase their savings for retirement, or accept lower pension benefits. At the same time questions arise on how to deal with the rapidly increasing life expectancy of current retirees. During the period when they were saving for retirement, their contribution levels were based on an expected length of life that is substantially lower than actual length of life has turned out to be. Should benefits to these retirees be reduced or should contributions by current workers be increased to cover the funding gap that this unexpected longevity causes?

The second important issue is the impact of financial markets on the pension system. After World War II, the amount of the second-pillar occupational pension savings has been growing steadily. The occupational system has gradually transformed away from a system in which most participants are in the working phase of their lives and annual contributions paid into the system are relatively large compared to the total amount of

assets. Slowly the system has evolved to a mature one, in which an increasing fraction of the participants are close to or in the retirement phase of their lives and the total amount of accumulated assets in the system is very large. Hence, annual contributions into the system have become small compared to total assets. This implies that shocks in the financial markets have increasingly large consequences for occupational pensions. This increased sensitivity of the funded pension pillar to financial market shocks has become very clear over the last 20 years, with periods of both fast growth in pension assets and periods of rapid declines. These took place in particular during the dot-com crisis of 2000-2002 and the financial crisis that started in 2008.

As a consequence of these developments, for some years a debate has been going on about whether the Dutch pension system needs to be redesigned. Two reports were commissioned by the Dutch government to analyse the situation and the sustainability of the second pension pillar. The Frijns committee (2010) brought out a report on the asset and risk management by pension funds, while the Goudswaard committee (2010) analysed the sustainability of the system of occupational pensions. Both reports convincingly show the need for structural reforms of the system. Subsequently, the social partners and the Dutch government started negotiating the restructuring of both the first and second pillar pensions. This resulted in an agreement on principles in the summer of 2010. However, working out the details of the agreement has proved an arduous process, and no definitive results have been reached yet.

Overview

In this thesis, I analyse the design of pension arrangements, paying particular attention to the intergenerational risk sharing aspects of pension design. Chapters 2 and 3 deal with the optimal design of multipillar pension arrangement when taking into account multiple sorts of shocks and distortions. In these chapters, participation in the pension system is taken for granted. Chapter 4 investigates the decision to participate in a pension system, and the impact this has on pension arrangement design when participation is not mandatory. Chapter 5 performs a detailed analysis of some of the options that have been considered in the redesign of the Dutch occupation pension contracts.

Chapter 2 deals with optimal pension system design when taking into account the labour supply decisions that individuals make. The central question of chapter 2 is: 'How should a two-pillar pension system - with a PAYG first pillar and a funded second pillar - be designed when taking into account endogenous labour supply decisions'? In this chapter, the sources of uncertainty are productivity and financial market risks. In principle, the pension system designer would like to create the pension system in such a way that these risks are shared optimally by the different generations. However, the pension system may have distortionary effects. Here, the distortion concerns the labour supply decision. Specifically, if the contribution to the pension system is linked to the wage an employee earns, this lowers his net wage. This may induce the employee to supply more or less labour than in the absence of the pension contribution. If all employees face this same incentive, the resulting suboptimal aggregate labour supply distorts wages, capital returns and national production and decreases welfare for all individuals in the economy. This chapter shows that if such a distorting link from individual pension contributions exists, the optimal response of the pension system designer is to find an alternative way for the market economy to attain the socially optimal allocation. The solution is to link the contributions to the second pillar to the aggregate wage sum rather than the individual wage rate. This in fact imposes a lump-sum contribution on the working generation, thereby evading the distortion, while the risks inherent in wages can still be shared with the retired generation.

Chapter 3 also explores optimal pension system design, but from a very different perspective. In that chapter, instead of looking at behavioural distortions, uncertainty about demographic developments is taken into account. Specifically, in addition to the shocks of chapter 2 we include uncertainty about fertility and life expectancy (the mortality rate). Hence, four fundamental sources of risk are present in the model. Demographic uncertainty affects all macroeconomic relations. They are determinants of the amount of labour supply, wages, capital returns, national income, private and pension savings, the size of bequests and the relative size of transfers through the PAYG first pillar. Even though the model is highly stylized, the presence of demo-

graphic uncertainty renders it impossible to find constant pension system parameters that produce the optimal degree risk sharing arrangement implemented by a social planner. Therefore, a detailed numerical analysis is performed to determine how much risk sharing can be achieved in a two-pillar pension system and how closely the market economy combined with the pension arrangement can approximate the social planner's solution. It turns out that although the social planner solution can not be replicated, an appropriately designed pension system with a defined-benefit second pillar results in a very small welfare loss compared to the social planner's solution. Obviously, an open question is whether this finding is generalisable to a less stylised setting.

Chapter 4 deals explicitly with a very important aspect of collective pension arrangements that was assumed to exist in chapters 2 and 3: obligatory participation in collective arrangements. The question that chapter 4 poses is whether or under what circumstances collective funded pension arrangements are sustainable when participation by new employees is not mandatory. It is well known that from an ex-ante perspective collective pension arrangements can result in large welfare gains to participants because of the risk-sharing they provide. However, new employees that are required to enter into a collective arrangement may find that at the time of their entry, the financial position of the arrangement is not very good. Thus, additional contributions may be asked of them without corresponding additional entitlements being awarded. This raises the question whether this particular generation would be better off not entering into the collective arrangement and, if this is the case, whether it is possible to design a pension arrangement such that it becomes attractive to this generation to enter, while preserving some of the risk-sharing benefits among participating generations. The set-up is an infinite horizon model with two overlapping generations, where the young generation can choose to join the existing pension arrangement or to break the existing arrangement by saving for retirement privately. Once a young generation decides not to participate, the pension arrangement breaks down forever. The challenge for the designer of the pension arrangement to design it in such a way that the expected utility of joining is always at least equal to the expected utility of staying out. Whether it is possible to design an arrangement that is attractive for new young

generations depends both on the volatility of the shocks against which the collective arrangement offers some protection (financial market risk in this case) and on the risk aversion of the young generation. We demonstrate that the collective arrangement breaks down when the volatility of the financial market shocks and risk aversion are relatively low, while for intermediate values of these parameters the arrangement can only be maintained if it provides less risk sharing than is socially optimal. In these circumstances, optimal risk sharing can only be achieved by making participation in the pension arrangement mandatory.

Finally, Chapter 5 is of direct importance for the current public debate about the redesign of collective pension contracts in the Netherlands. As indicated before, several options for redesigning the pension contract have been contemplated. The proposal that initially garnered most support was the proposal of a 'combined contract'. Under such a contract, pension entitlements would be split into a 'hard' and a 'soft' part, where soft entitlements would form the flexible shell around hard entitlements that would - in theory at least - be almost surely guaranteed. Chapter 5 performs a detailed analysis of three different ways in which such a combined contract could be implemented and it compares these three variants with pension results under the current contract. In particular, the analysis provides insight into how shocks are distributed across the current and future generations participating in the pension fund.

Under the first variant, accumulated entitlements are initially soft, but are converted into hard entitlements after a fixed number of years. Under the second variant, a fixed share of newly accrued entitlements are hard, while the remainder are soft. Under the third variant, newly accumulated entitlements are soft. If the funding ratio of the pension fund is sufficiently high, soft entitlements are transformed into hard entitlements. Using an asset-liability management (ALM) model of the pension fund, we simulate funding ratios, the degree of indexation awarded to both soft and hard entitlements as well as reductions in hard and soft entitlements when funding ratios become too low. The results show that under these new contracts, indexation is higher and more readily awarded than under the current contract. Hence, under these pro-

posals the pension fund's assets tend to shrink more rapidly and the currently-retired generations benefit at the expense of the current young and future generations. Of the three new proposals, only the variant in which hard and soft entitlements are accrued in a fixed proportion (the second variant) is able to effectively guarantee that 'hard' entitlements indeed need to be reduced only in very rare circumstances. Moreover, under the other two variants young generations hold almost all of the soft entitlements, so that they bear almost all of the risk associated with the pension fund. This may produce large intergenerational transfers. The results suggest that effective risk sharing among all participants in the pension arrangement requires either all entitlements to be of the same type, as is the case under the current contract, or all participants to have an equal share of both types of entitlements, as is the case under the second variant of the combined contract.