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## **Segmented labour market and private pension decisions**

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# Segmented labour market and private pension decisions\*

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## Abstract

This paper analyses the effects of social security in a two period OLG model when there is a segmented labor market with different unemployment risks for each segment. Considering two categories of agents, namely public sector and private sector employees, the model deals with the welfare implications of the private pension decisions for both labour segments. The effects of the privatisation of pension scheme are praised for a long time whereas it seems that the private pension option has not been that much attractive. We expect that part of this is due to the segmentation of the labour market.

## 1 Introduction

Many countries in Latin America, Central and Eastern Europe adopted either a mandatory funded private pension system or introduced the private pension on a voluntary basis along side with the public pay-as-you-go (PAYG) scheme<sup>1</sup>. Although theoretical discussions are in favor of private pension scheme and the individual accounts are long praised for increasing individual choice and attracting a higher return to pension accumulations and there is a strong lobbying for privatisation, the experience is that private pension scheme does not motivate

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<sup>1</sup>In Chile (1981), Bolivia and Mexico (1997), El Salvador (1998), and the Dominican Republic (2003–6) public system is closed and replaced by a private system; in Peru (1993) and Colombia (1994) the public system is not closed but reformed, a private system is created, and the two compete against each other; and in Argentina (1994), Uruguay (1996), Costa Rica (2001), Turkey (2001) the public system continues as a first public pension pillar, and a voluntary second private pillar is added. In Hungary (1998), Poland (1999) and Slovak Republic (2005), a new system is implemented where an earnings related public pension is supplemented with mandatory, funded, defined contribution schemes. In Bulgaria (1994) in accordance with World Bank multi-pillar pension model, a three pillar pension system is introduced. See also Barr (2006) for a review on pension debates.

individuals to participate<sup>2</sup> and when voluntary, individuals can choose not to participate at all. The current study aims to analyse individual decision making under uncertainty, provide insights about the choice between funded and unfunded scheme and question welfare differentials between these schemes when labour market is segmented. The results show that imperfect information, income risks and administrative costs in private management of pension plans are major concerns in this problem.

## 2 The model

This model accounts for a closed economy based on Diamond (1965). Time horizon is limited to two periods for an easy interpretation. We include government and pension system and suppose that any deficit option overcome the financial burden. The labour market is segmented as public and private employment. This segmentation is based on the income variability thereof. We take into account a public pension system (non-defined contribution, defined benefit, pay-as-you-go financial regime and public management) and a private system (defined contribution, non-defined benefit, fully funded financing and private management). We would like to analyse the impact of different pension schemes on the welfare of these segments and provide insights on the relative advantages of different schemes and the incentives to participate to private scheme when it is not compulsory.

### 2.1 Households

The private and public sector differ according to the variability of wages. Public sector offers a secure environment protected with solid contracts and a low variability wage. Private sector on the other hand is characterised with a higher unemployment risk during economic recessions but offers also a higher wage rate during economic expansions. We propose the following configuration to describe this situation. We note respectively by  $N_t^1$  and  $N_t^2$  the population working for private and public sector where the superscript denotes the agent type and we set  $k = 1$  for private sector workers and  $k = 2$  for public sector workers and the total population is denoted by  $N_t$ . We suppose that each labour segment has the same growth patterns. We denote by  $n$  the population growth rate. We can simply write the next period population as a function of the current period population by the following way:  $N_{t+1} = (1 + n)N_t$ . For the generation  $t$ ,  $\mu$  is the share of private sector workers and  $(1 - \mu)$  the share of public sector workers.

Both types of agents live two periods. The first period is the working period and the second period is the retirement period. Each agent is endowed with

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<sup>2</sup>The percentage of workers affiliated to the private systems (the rest are in the public system) in 2004 was 50 per cent in Colombia. In Turkey the participation to the voluntary private funded scheme was 6.8 per cent of active participants of compulsory public unfunded scheme in 2006.

one unit of labor that they inelastically supply in the labor market. There are two states of nature: the economy may be in a boom with a probability  $p$  and in a recession with a probability  $1 - p$ . Without loss of generality we suppose that since public sector is a relatively more stable environment, wage rate in this segment is  $w_t^1 = w_t$ . Private sector workers face the risk of unemployment during recessions and earn a relatively higher wage during booms. During recessions, only a fraction  $1 - \varepsilon$  of total labor supply in private sector is employed. This means that there is an unemployment probability which is uniformly distributed within this labor category. We suppose that recession wage rate is  $w_t$  and there is an unemployment benefit  $\chi w_t$ . The income of a private sector worker during recession becomes  $w_t^r = (1 - \varepsilon)w_t + \varepsilon\chi w_t$ . During booms, private sector workers benefit from a relatively higher wage rate  $w_t^b = \nu w_t$  with  $\nu > 1$ <sup>3</sup>. The income of an agent working for private sector becomes then,

$$w_t^2 = \begin{cases} w_t^b & \text{with } P(s = r) \\ w_t^r & \text{with } P(s = b) \end{cases} .$$

**Remark 1** *We only consider additional unemployment due to recession to differentiate between these two segments and as such unemployment seems like a recession phenomena.*

The agent derives utility from his consumption of private and public goods. We distinguish between the working period consumption  $c_t^k$  and the retirement period consumption  $d_{t+1}^k$  which will determine the first and second period utilities respectively. If we denote the time preferences by  $\rho$ , the lifetime utility of agents born at time  $t$  is a discounted sum of the first and the second period utilities<sup>4</sup>:

$$\bar{U}(c_t^k, g_t, d_{t+1}^k, g_{t+1}) = U(c_t^k, g_t) + \frac{1}{1 + \rho} U(d_{t+1}^k, g_{t+1}) \quad (1)$$

The instantaneous utility is supposed to take the following form:  $U(c_t^k, g_t) = \ln c_t^k + \eta \ln g_t$ . The parameter  $\eta$  measures the impact of public services on the instantaneous utility of consumer where publicly-provided services affect the household's utility directly. However, we suppose that private consumption and public services are additively separable<sup>5</sup>. We suppose that both private consumption and public consumption generate a positive marginal utility, so that  $\eta > 0$  in line with the theoretical study by Agenor (2007) and suppose that publicly provided goods and services are substitutes for private goods and services.

<sup>3</sup>Notice that  $w^r < w$  and  $w^b > w$ .

<sup>4</sup>The utility function is supposed to have the following properties:  $U' \geq 0$  and  $U'' < 0$ . Note that  $\rho \geq 0$  and  $\frac{1}{1+\rho}$  is the subjective discount factor.

<sup>5</sup>We follow the theoretical formulation in Agenor (2007) which is in line with the empirical evidence provided by Karras (1994), McGrattan et al. (1997), Chiu (2001) and Okubo (2003). For this type of formulation the reader can also check Turnovsky (1996, 2000, 2004), Chang (1999), and Baier and Glomm (2001) as reference.

The first period income is allocated between consumption, pension contributions and tax payments. After the payment of pension contribution and wage income tax, at rates  $\theta^k$  and  $\tau^k$ , young agents consume  $c_t^k$ . In the second period, both type of agents are retired. Their only income is the pension benefit  $b_{t+1}^{k,m}$  where  $m$  indicates the prevailing pension scheme. We consider two pension scheme: an unfunded scheme ( $u$ ) and a private scheme ( $f$ ). We suppose that households do not pay any taxes on their pension benefits. At the retirement period, they consume their total incomes. The budget constraints for both periods and the resulting intertemporal budget constraint are given by the following equations:

$$\begin{aligned} c_t^k &= (1 - \tau)(1 - \theta^m)w_t^k \\ d_{t+1}^k &= b_{t+1}^{k,m} \end{aligned} \quad (2)$$

## 2.2 Government

We suppose that the government imposes a tax on wage income after contributions. Government intervenes in labour market to correct welfare fluctuations by unemployment benefits to private sector workers and transfers to private sector retirees (since a minimum pension guarantee is necessary when the private sector employees undercontribute in recessions)<sup>6</sup>. The total tax revenue finance government expenditures on public services, unemployment benefits and transfers<sup>7</sup>:

$$g_t = \begin{cases} ((1 - \mu) + \mu(1 - \varepsilon + \varepsilon\chi))\tau(1 - \theta^m)w_t - \mu\varepsilon\chi w_t - tr_t & \text{with } P(s = r) \\ ((1 - \mu) + \mu\nu)\tau(1 - \theta^m)w_t - tr_t & \text{with } P(s = b) \end{cases}$$

## 2.3 Pension system

We consider private and public pension schemes and compare their welfare implications when the economy is moving from booms to recessions or the economic environment involves risk for some agents. These welfare implications may reflect the low willingness to participate to private scheme when it is not compulsory. We suppose that private and public schemes do not coexist to make an analysis of welfare differences accompanied with each system.

<sup>6</sup>In Chile reforms were required to cure problems with private pension system and improve the welfare of the population such as the expansion of social assistance pensions and improvement of the guaranteed minimum pension for those unable to meet its requirements (Arenas de Mesa and Mesa-Lago (2006)).

<sup>7</sup>We suppose that government make transfers to retirees only when there are individual accounts. Unfunded scheme may also need transfers because of deficits, though in an actuarial unfunded scheme, the level of transfers shall be predictable and manageable. On the other hand, funded scheme bears risks that are not fully predictable and that may be harmful for the economic stability. In order to take into account this uncertainty on the level of transfers compared with the predictability of transfers of unfunded scheme, we have made such an assumption.

### 2.3.1 Fully unfunded pension - Public Pension Institution

We suppose that the public system is a defined benefit PAYG. The principle of PAYG is to finance the pension benefits of retirees by the contributions of current workers. We suppose that the same contribution rate applies to all workers. The budget constraint of PAYG scheme is then as follows:

$$\frac{(1 - \mu)b_t^{1,u} + \mu b_t^{2,u}}{1 + n} = \begin{cases} ((1 - \mu) + \mu(1 - \varepsilon + \varepsilon\chi))\theta^u w_t & \text{with } P(s = r) \\ ((1 - \mu) + \mu\nu)\theta^u w_t & \text{with } P(s = b) \end{cases}$$

The pension benefit of an agent  $k$  is a function of his average wage and the accrual rate  $\phi$ . This implies following benefit rules for the agents:

$$\begin{aligned} b_t^{1,u} &= \phi w_t \\ b_t^{2,u} &= \begin{cases} \phi(1 - \varepsilon + \varepsilon\chi)w_t & \text{with } P(s = r) \\ \phi\nu w_t & \text{with } P(s = b) \end{cases} \end{aligned}$$

For a balanced PAYG scheme budget  $\phi = \theta^u(1 + n)$ . The accrual rate is as a function of contribution rate and population growth rate.

### 2.3.2 Fully funded pension - Private Pension Institution

The retirement period is financed by benefits received from private scheme denoted by  $b_t^{k,f}$ . The contribution rate is  $\theta^k$  for an agent of type  $k$  in public and private sector. We suppose that public sector wage provides just a subsistence consumption in each period of life, thus when a public sector employee is deciding for his contribution rate to funded scheme, he will certainly choose a contribution rate which is not greater than PAYG contribution rate  $\theta^{1,f} \leq \theta^u$  since this PAYG level provides with subsistence consumption at the working period. So the contribution rate of public sector employees is determined as a solution of optimal allocation of consumption between working and retirement periods subject to the subsistence level constraint.

**Assumption** We suppose that government chooses PAYG contribution rate to maximise the intertemporal utility employees. This will coincide with the private scheme contribution rate  $\theta^{1,f} = \theta^u$ .

For a private sector employee the decision becomes even more complicated by the unemployment risk in private sector. In either status, the pension benefit equals to the real return of total contributions minus administrative costs:

$$b_{t+1}^{k,f} = (1 + r_{t+1})(1 - c)\theta^{k,f}w_t^k \quad (3)$$

where the administrative cost  $c$  incurs to pensioners. For private sector  $\theta^{2,f}$  is the contribution rate. For recession period private sector employee definitely earns less than public sector employee but as public sector employee lives at subsistence level, private sector employee is also constrained by this level in his

choice of contribution. He could only contribute wage after consumption so this contribution rate is calculated as follows:

$$\begin{aligned} (1 - \tau)\theta^{2,f}w_t^r &= (1 - \tau)w_t^r - c_t^1 & (4) \\ \theta^{2,f}(1 - \varepsilon + \varepsilon\chi)w_t &= (1 - \varepsilon + \varepsilon\chi)w_t - (1 - \theta^u)w_t \\ \theta^{2,f} &= \frac{\theta^u - \varepsilon(1 - \chi)}{1 - \varepsilon(1 - \chi)} \end{aligned}$$

This implies following benefit rules for private sector employees:

$$b_t^{2,f} = \begin{cases} \theta^{2,f}(1 - \varepsilon + \varepsilon\chi)w_t & \text{with } P(s = r) \\ \theta^u w_t & \text{with } P(s = b) \end{cases}$$

**Result** For recession period, if the private sector employee determined the contribution by maximising the intertemporal utility the contribution rate would be  $\theta^u$ . Notice that individual accounts necessitate individual calculation of contribution rates and intertemporal maximisation is replaced with short-sided calculations. The myopic behaviour implies a lower contribution rate in the first period i.e.  $\theta^{2,f} < \theta^u$ . The choice of the threshold consumption is a myopic behavior. This behaviour will favour only the present utility and private sector employee will suffer welfare losses in the retirement period when we compare with the unfunded scheme.

### 3 Welfare implications

#### 3.1 When government does not intervene in retirement

The welfare difference between these pension schemes is mainly a function of their returns ( $R$ ), the differences in the provision of public services in each scheme ( $G$ ) and for the private sector employees additional differences arising from wage fluctuations:  $\bar{U}^{1,u} - \bar{U}^{1,f} = \frac{1}{1+\rho} \ln R + \eta \frac{2+\rho}{1+\rho} \ln G$ ,  $\bar{U}^{2,u} - \bar{U}^{2,f} = \frac{1}{1+\rho} (\ln R + (1-p) \ln \frac{\theta^u}{\theta^{2,f}}) + (1-p) \ln(1 - \varepsilon(1 - \chi)) + \eta \frac{2+\rho}{1+\rho} \ln G$  where  $G = 1 - \frac{\mu\varepsilon(1-\chi)(1-\theta^u)\tau}{\tau(1-\theta^u) - \mu\varepsilon\chi}$ ,  $R = \frac{(1+n)(1+\gamma)}{(1+r)(1-c)}$  and  $\gamma = \frac{w_{t+1}}{w_t}$ . Note that  $G < 1$  then there will definitely be welfare gains for public and private employees due to the increase in tax revenue and public services in funded scheme as the myopic behaviour in the private sector during recessions implies less contribution and more taxable income.  $R \geq 1$ , the relative return indicates that funded scheme is more attractive as long as organisational and institutional costs are minimised<sup>8</sup> and return of funds is maximised<sup>9</sup>.

<sup>8</sup>Arenas de Mesa and Mesa-Lago (2006) states that during the reform Latin America as a whole, administrative costs of private schemes were considerably higher than those of public schemes and points out a 5% real increase of administrative costs paid by an insured in Chile. Diamond (2004) calculates accumulated administrative costs occurring to a pension account in UK and finds out that for a 1% administrative charge per account, which is annual unweighted average rate, total pension accumulation of an individual decreases as much as 20%. Sundén (2006) says that 'plan implementation has been more costly and complicated than anticipated.

<sup>9</sup>The experience reveals that this objective is not easily achieved. In theory diversification is necessary to reduce risk but in fact pension funds are fairly diversified and their returns

**Remark 2** *Private sector employees will suffer in their retirement period from their myopic decision of pension contribution when young in funded scheme. The uncertainty in retirement earnings related to return levels and organisational costs, is doubled with the individual myopic calculation of contributions in private sector. The welfare comparison reflects this doubled uncertainty and gives an insight on the attractiveness of public scheme.*

### 3.2 When government intervenes in retirement

In the model, we suppose that the government intervenes in the labour market through unemployment benefits and transfers during recessions when the income of private retirees fails short compared with the public sector retired officials to provide with the subsistence consumption level. Here we inquire if government intervention is welfare improving for both segments in the labour market and through different pension schemes. The welfare difference between these pension schemes is mainly a function of their returns ( $R$ ), the differences in the provision of public services in each scheme ( $G_I$ ) and the wage fluctuations:  $\bar{U}_I^{1,u} - \bar{U}_I^{1,f} = \frac{1}{1+\rho} \ln R + G_I$ ,  $\bar{U}^{2,u} - \bar{U}^{2,f} = \frac{1}{1+\rho} \ln R + (1-p) \ln(1 - \varepsilon(1 - \chi)) + G_I$  where  $G_I = \frac{\eta(2+\rho)p(1-p)}{1+\rho} \ln G - \frac{\eta(2+\rho)(1-p)p}{1+\rho} \ln G_I^1 + \frac{\eta(2+\rho)(1-p)^2}{1+\rho} \ln G_I^2$ ,  $G_I^1 = 1 - \frac{\mu\varepsilon(1-\chi)}{R(1-\mu+\mu\nu)\tau}$  and  $G_I^2 = \frac{GR\tau}{R\tau-1+G}$ .

**Public service differential** Notice that public service differential is composed of three factors associated with a transition of economy between different states (boom to crisis, crisis to boom and in crisis for more than one period). If economic crisis lasts for more than one period, unfunded scheme seems to be definitely a better alternative in terms of welfare for both type of agents. In an economy moving from crisis to boom, welfare differential associated with government services depends on the relative return  $R$ . For an economy moving from boom to crisis, welfare differential is the same as without government intervention. Government intervention is essential in the decision making in economies where crisis lasts for longer terms, such as the lack of incentives for funded scheme when voluntary.

**Comparison of two cases** The comparative welfare difference for public (private) employee reveals that government intervention to correct income losses in retirement, increases (decreases) the welfare gap between schemes. This implies that public employee will suffer from a switch from unfunded to funded even more with government intervention, since the welfare loss induced by myopic decisions of the private segment is distributed over the

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are not as much as the long promoted theoretical levels. In Latin American private systems, investment is mostly made in public debt, with little or nothing on stocks and foreign instruments with the striking Argentinian example where a high risk was illustrated by the problems endured during the crisis in Argentina. Capital returns on investment in Chile exhibit a declining trend, and have been lower than returns from the Santiago stock exchange (Arenas de Mesa and Mesa-Lago (2006)). Similarly, in Turkey 73% of pension assets are held in government bonds.



whole population of tax payers. Consequently, in an economy with no government intervention, individuals with high income fluctuations can prefer unfunded scheme over the funded one.

## 4 Concluding Remarks

The main purpose of this article was to investigate the welfare implications and incentives to participate to a funded scheme when voluntary given the fact that the participation rate to private funded plans were actually low contrary to theoretical predictions. We show that when we consider segmentation of labour market according to income and unemployment risks and the role of government, we can capture essential features in decision making. First, we have shown that income risks and individual myopic calculations of contribution rates induces welfare losses in retirement. We have seen that the uncertainty of retirement earnings related to return of individual accounts and administrative costs, is doubled with income risks and errors in the determination of contributions. Public unfunded scheme which necessitates a defined level of contribution offers definitely a simpler picture far from this complicated view of individual accounts. This result is confirmed with evidence from Chile where structural reform has expanded existing income differences in labour market (the ratio between the maximum taxable income and the minimum salary was 8.6 times, but this ratio increased to 9.3 times among pensioners in the two income groups, and to 13 times when incorporating contribution densities differentiated by sex (Arenas de Mesa and Mesa-Lago (2006)). At this point, we think that *it is essential to reconsider the results of previous theoretical studies, disregarding the fact that individual decision making may not be optimal, rational but short-sighted, to elaborate the impact of individual accounts on welfare.*

Second, government intervention is shown to be central to the decision making when the individual is faced with a voluntary participation to funded scheme. Stiglitz (2005) underlines the role of the inevitable government intervention in case where a financial crisis crashes returns of individual accounts and even without any special circumstance, such as a financial crash, government may interfere to provide some form of minimum guaranteed benefit (2005 Report of US Government Accountability Office). In principle, as individuals assume risks with the investment of funds in their individual accounts, minimum benefit is essential to ensure retirees with at least a minimally adequate level of income. Transfers or additional benefits may in turn encourage individuals to make risky consumption decisions and minimise their voluntary contributions by relying on the guarantee i.e. in Australia, individuals have spent down their retirement assets quickly to qualify for the means-tested benefit. In this context, government intervention distorts decision-making in the sense that there may be more incentives for short-sighted behaviour i.e. the low level of contributions or the lack of participation to a voluntary funded scheme and the welfare implications is not straight-forward given the trade-off between the transfer of the financial risk to government together with distributional consequences and the protection

of individuals against poverty under individual accounts.

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