E C O N O M I C S B U L L E T I N

Pension funds and capital accumulation

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Abstract

This note presents a model in which pension funds, by holding a significant share of capital assets, can exert a non competitive behavior on labor market. This leads to lower wages and higher capital returns, and can reduce capital accumulation and long−run welfare.

We are grateful to Cecilia Garcia−Penalosa, Pierre Pestieau and an associate editor for helpful comments.
Citation: Belan, Pascal, Philippe Michel, and Bertrand Wigniolle, (2002) "Pension funds and capital accumulation." *Economics Bulletin*, Vol. 4, No. 1 pp. 1−8
Submitted: August 27, 2001. **Accepted:** January 17, 2002.
URL: http://www.economicsbulletin.com/2002/volume4/EB−01D90001A.pdf

1 Introduction

Pension funds are among the most important institutions in certain national financial markets. For example, in 1997 in the US, pension funds assets were equivalent to 67 % of GDP, and in the United Kingdom they accounted for 75 % of GDP[1]. In a number of countries, there is an important political pressure for the development of pension funds (see the literature on the privatization of social security, e.g. World Bank (1994), Feldstein (1998), Belan and Pestieau (1999)). The increasing importance of pension funds in financial markets is accompanied by a concentration of assets. At least in some countries as the US and the UK, pension funds are in a position to have a decisive role in the evolution of corporate activity and hence on the economy as a whole. In this article, we intend to analyze the consequences of such a concentration from a macroeconomic viewpoint, focussing on the question of its impact on capital accumulation.

An important motivation underlying the development of pension funds is the notion that the accumulation of pension assets stimulates aggregate savings. But, direct international comparisons of saving ratios are not supportive of a simple relationship between pension funding and saving: countries with high levels of pension funding such as the US and the UK have comparatively low saving rates[2].

In this paper, we argue that the effect of pensions funds on savings are complex due to the combination of the concentration phenomenon and the existence of tax incentives.

The concentration of assets gives pension-fund managers a decisive role in management of firms. So doing, they hold an important market power on the labor market. In the literature, funded systems have usually been modeled as institutions with a perfectly competitive behavior (see for example Feldstein (1998)). We depart from this literature by assuming that pension funds use their market power in order to maximize their capital return. We study such a situation in the overlapping generations model of Diamond. In order to simplify the presentation, we assume that a unique firm represents the pension funds; its non-competitive behavior lowers wages and increases return on pension investment. This will result in lower savings with a Cobb-Douglas utility function.

But, it has often been suggested that tax privileges are a major reason underlying the rapid growth in pension funds in a number of countries. We

[1] Davis (1995), Gale (1994) or World Bank (1994) provide evidence about these evolutions.

[2] In general, empirical studies do not consider specifically the effect of pension funds (see, for example, Feldstein (1977), Munnell and Yohn (1992), Bailliu and Reisen (2000)).

consider the most common tax regime, where contributions are tax free and benefits are taxed. In our model, this tax regime takes the form of a subsidy to contributions to the pension funds, financed by taxes on workers and/or retirees.

We show that the effect of pension funds on capital accumulation is negative for low subsidy rates. Nevertheless, when these subsidies are not entirely financed by workers, there exists a threshold on the subsidy rate above which capital accumulation is higher after the inception of pension funds. We also present the consequences on long-run welfare.

The rest of the paper is organized as follows. The first section presents the model. In the second one, we study equilibrium dynamics and the consequences of the inception of pension funds on capital accumulation and welfare.

2 The model

2.1 Consumers

We introduce two types of savings in the standard OLG model. Savings invested in pension funds s_{1t} is subsidized in such a way that the cost is $(1-\theta_t)$ per unit saved. Their gross return is R_{1t+1}. Other savings s_{2t} is not subsidized and its gross return is R_{2t+1}. Subsidies are financed by taxes τ_{1t} on wages w_t and τ_{2t} on savings gross return.

$$N_t\theta_t s_{1t} = N_t\tau_{1t}w_t + N_{t-1}\tau_{2t}\left(R_{1t}s_{1t-1} + R_{2t}s_{2t-1}\right) \tag{1}$$

There are N_t young agents in period t who live two periods, supply one unit of labor in period t and are retired in period $t+1$. They consume c_t when young and d_{t+1} when old. Budget constraints are :

$$c_t = (1-\tau_{1t})w_t - (1-\theta_t)s_{1t} - s_{2t}$$

$$d_{t+1} = (1-\tau_{2t+1})\left(R_{1t+1}s_{1t} + R_{2t+1}s_{2t}\right)$$

Arbitrage between the two types of savings implies equality between both net returns

$$R_{1t+1}/(1-\theta_t) = R_{2t+1} \tag{2}$$

Assuming a Cobb-Douglas utility function $c^{1-a}d^a$, their optimal net savings $\sigma_t = (1-\theta_t)s_{1t} + s_{2t}$ is equal to a constant fraction a of their net wage income, $0 < a < 1$,

$$\sigma_t = (1-\theta_t)s_{1t} + s_{2t} = a(1-\tau_{1t})w_t \tag{3}$$

2.2 Firms

We assume two representative firms, $i = 1, 2$, with capital stock in t resulting from savings decision of preceding period : $K_{it} = N_{t-1} s_{it-1}$, and with the same Cobb-Douglas production function $AK_{it}^{\alpha} L_{it}^{1-\alpha}$.

The firm $i = 2$ is competitive and its labor demand L_{2t} equalizes marginal labor productivity and wage : $(1-\alpha) AK_{2t}^{\alpha} L_{2t}^{-\alpha} = w_t$. The firm $i = 1$ (managed by the pension funds) is non-competitive on the labor market; it takes into account the effect of its labor demand L_{1t} on the wage through the level of labor $L_{2t} = N_t - L_{1t}$ in the competitive sector. Firm $i = 1$ maximizes

$$\Pi_{1t} = AK_{1t}^{\alpha} L_{1t}^{1-\alpha} - (1-\alpha) AK_{2t}^{\alpha} \left(N_t - L_{1t}\right)^{-\alpha} L_{1t}$$

Π_{1t} is concave with respect to L_{1t} and its maximum is uniquely determined by $\partial \Pi_{1t} / \partial L_{1t} = 0$, i.e.

$$K_{1t}^{\alpha} L_{1t}^{-\alpha} - K_{2t}^{\alpha} \left(N_t - L_{1t}\right)^{-\alpha} - \alpha K_{2t}^{\alpha} \left(N_t - L_{1t}\right)^{-\alpha-1} L_{1t} = 0$$

In terms of the labor-capital ratios $l_{it} = L_{it} / K_{it}$, this condition is

$$l_{1t}^{-\alpha} - l_{2t}^{-\alpha} - \alpha \frac{K_{1t}}{K_{2t}} l_{2t}^{-\alpha-1} l_{1t} = 0 \tag{4}$$

With perfect foresight, the arbitrage equation of period $t-1$, $R_{1t} = (1 - \theta_{t-1}) R_{2t}$ implies (with $R_{1t} = \Pi_{1t} / K_{1t}$ and $R_{2t} = \alpha A l_{2t}^{1-\alpha}$)

$$A l_{1t}^{1-\alpha} - (1-\alpha) A l_{2t}^{-\alpha} l_{1t} = (1 - \theta_{t-1}) \alpha A l_{2t}^{1-\alpha}$$

And this condition determines a unique ratio $l_{1t} / l_{2t} = \lambda_t = \lambda(\theta_{t-1})$, $0 < \lambda < 1$, which solves

$$\lambda_t^{1-\alpha} - (1-\alpha) \lambda_t = \alpha (1 - \theta_{t-1}) \tag{5}$$

$\lambda(\theta)$ decreases from 1 to 0 when θ increases from 0 to 1, because $\lambda^{1-\alpha} - (1-\alpha)\lambda$ increases from 0 to α when λ increases from 0 to 1.

As a consequence, there is a unique ratio of pension funds capital stock to total capital stock, $p_t = K_{1t} / K_t$. This fraction verifies (4), with $K_{1t} / K_{2t} = p_t / (1 - p_t)$:

$$p_t = \frac{1 - \lambda_t^{\alpha}}{1 - \lambda_t^{\alpha} + \alpha \lambda_t^{\alpha+1}} \equiv p(\theta_{t-1}) \tag{6}$$

$p(\theta)$ increases from 0 to 1 when θ increases from 0 to 1.

3 Equilibrium dynamics

We assume constant population growth rate $N_{t+1}/N_t = 1+n$, and constant policies $\theta_t = \theta$, $\tau_{1t} = \tau_1$. We shall see that this implies the equilibrium tax τ_{2t} determined by (1) is also constant (see remark below).

With constant $\lambda = \lambda(\theta)$ and $p = p(\theta)$, the equalities $l_{1t}/l_{2t} = \lambda$ and $pl_{1t} + (1-p)l_{2t} = N_t/K_t = 1/k_t$ imply

$$w_t = (1-\alpha)Al_{2t}^{-\alpha} = (1-\alpha)A(p\lambda + 1 - p)^{\alpha}k_{2t}^{\alpha} \tag{7}$$

$$R_{2t} = \alpha Al_{2t}^{1-\alpha} = \alpha A(p\lambda + 1 - p)^{\alpha-1}k_{2t}^{\alpha-1} \tag{8}$$

$p\lambda + 1 - p$ is smaller than 1 and decreasing with respect to θ. There is a negative effect on wages resulting from the non competitive behavior of firm 1, and simultaneously a positive effect on the return of capital in the competitive firm 2 (which is equal to the net return of pension funds by the arbitrage equation).

The dynamics of $k_t = K_t/L_t$ is obtained by using $N_t s_{1t} = K_{1t+1} = pK_{t+1}$, $N_t s_{2t} = K_{2t+1} = (1-p)K_{t+1}$ and equations (3), (7) and (8). This leads to

$$(1+n)k_{t+1} = \chi a(1-\alpha)Ak_t^{\alpha}, \quad \text{where} \quad \chi = \frac{(1-\tau_1)(p\lambda + 1 - p)^{\alpha}}{1-\theta p} \tag{9}$$

With $\theta = 0$ and no tax ($\tau_1 = \tau_2 = 0$), we have $\chi = 1$ and the dynamics of the standard Diamond model is obtained. There are three effects on the parameter χ which modifies these dynamics. The positive effect $1/(1-\theta p)$ results from the subsidy of the pension funds. One negative effect $(1-\tau_1)$ results from the tax on wages. The other negative effect $(p\lambda + 1 - p)^{\alpha}$ results from the decrease in wages that results from the non-competitive behavior on the labor market of firm 1 (see relation (7)).

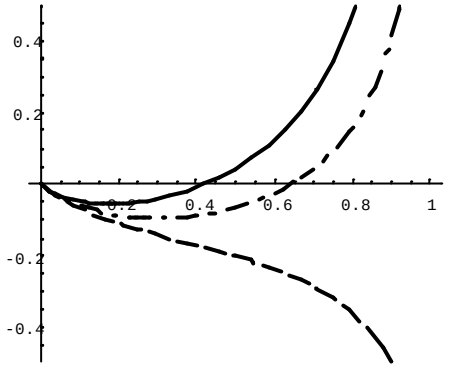
Remark. By substitution in relation (1), one obtains $\theta p\chi a(1-\alpha)Ak_t^{\alpha} = \tau_1 w_t + \tau_{2t}(1-\theta p)(p\lambda + 1 - p)^{\alpha-1}\alpha Ak_t^{\alpha}$ which implies a constant tax rate τ_2.

We represent the effects of θ on the capital accumulation factor $\chi(\theta)$ and on the long run life-cycle utility $u(\theta) = c^{1-a}d^a$ for standard values of the parameters: $\alpha = 1/3$, $a = 1/3$, $A = 1$, $n = 0$. We plot the values of $\chi(\theta) - \chi(0)$ and of $u(\theta) - u(0)$, in three particular cases: the case of no wages taxation ($\tau_1 = 0$), the case of a uniform tax ($\tau_1 = \tau_2$), and the case of no capital taxation ($\tau_2 = 0$). Capital accumulation is the largest when only capital is taxed, and the lowest when only wages are taxed. The case of equal tax rates is intermediary.

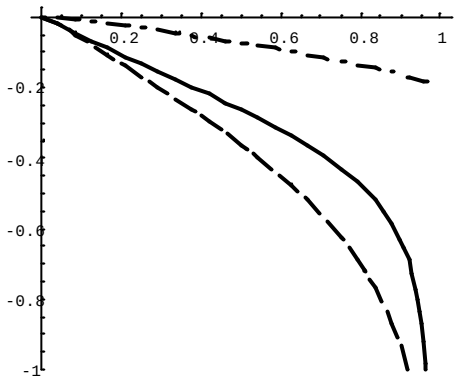
The following figures show that, for low values of θ, pension funds lead to less capital accumulation, even when wages are not taxed: the negative impact of pension funds on wages dominates the positive effect of savings subsidy. The corresponding fall of the utility results from the drop of capital accumulation. Indeed, in the case considered, the economy without pension funds is in under-accumulation, and the decrease of capital accumulation decreases utility. In addition, there is an increase in the long run capital stock only if taxes on wages are not excessive and the subsidy is large enough. For large values of θ, even when the stock of capital increases, there is a decrease in welfare: the distortion effects dominate the increase in available production.

Now, consider a case in which the competitive economy is in over-accumulation (we only change a, taking $a = 2/3$). Capital accumulation is reduced by the introduction of pension funds. For fixed τ_1 ($\tau_1 = 0$), the accumulation factor χ is unchanged. In the other cases, $\chi(\theta) - \chi(0)$ is reduced. But this time, for small θ, the decrease in capital stock increases welfare. This is because the over-accumulation effect is partially neutralized. For high values, the distortions created by the non competitive behavior of pension funds and by taxes dominate the positive effect of the reduction of capital. The case of equal taxes creates less distortions, and leads to a higher welfare in this zone.

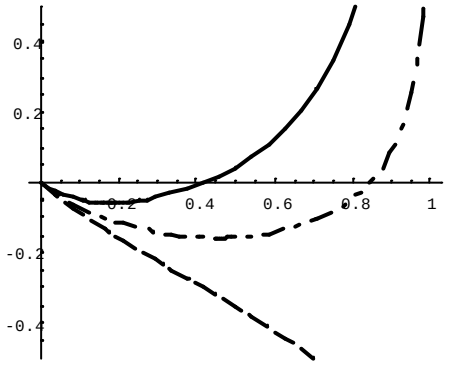
Except in the case of small subsidies and starting from a competitive economy with over-accumulation, pension funds lead to a fall in welfare.



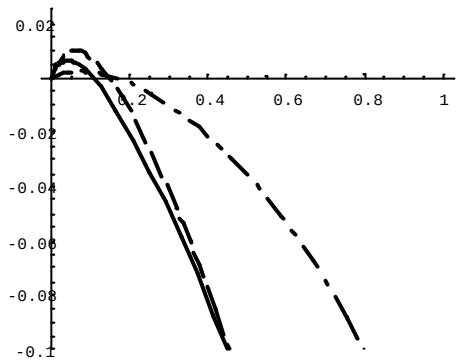
$\chi(\theta) - \chi(0)$ for $a = 1/3$



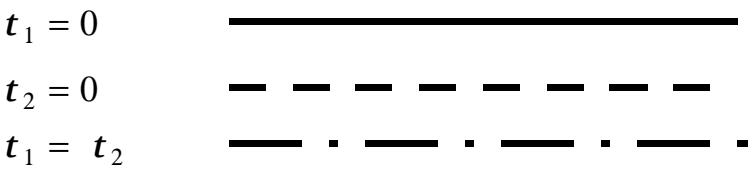
$u(\theta) - u(0)$ for $a = 1/3$



$\chi(\theta) - \chi(0)$ for $a = 2/3$



$u(\theta) - u(0)$ for $a = 2/3$



References

Bailliu J. and Reisen H. (2000) : Do Funded Pensions Contribute to Higher Aggregate Savings? A Cross Country Analysis, in H. Reisen, *Pensions, Savings and Capital Flows*, OECD.

Belan, P. and P. Pestieau (1999) : Privatizing Social Security : a Critical Assessment. *The Geneva Papers on Risk and Insurance, Issues and Practice*, 24, p 114-130.

Davis, E. P. (1995) : *Pension funds*, Oxford University Press.

Feldstein, M. (1977) : Social Security and Private Saving : International Evidence in an Extended Life Cycle Model, in M. Feldstein and R. Inman (eds), *The Economics of Public Services*, International Economic Association.

Feldstein, M. (1998) : *Privatizing Social Security.* University of Chicago Press.

Gale, W. G. (1994) : Public Policies and Private Pension Contributions. *Journal of Money, Credit and Banking*, vol 26, No 3, p 710-732.

Munnell, A. H. and Yohn, F. O. (1992) : What is the Impact of Pensions on Saving ?, in Z. Bodie and A. H. Munnell (eds), *Pensions and the Economy*, Pension Research Council and University of Pennsylvania Press, Philadelphia.

World Bank (1994): *Averting the Old Age Crisis, Policies to Protect the Old and Promote Growth*, Oxford University Press.