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The Simple Economics of Funded and Unfunded Pension Systems

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Most state pension schemes are financed on a pay-as-you-go (PAYG) basis which means that taxes on the young are used to pay for the pensions of the retired generation. With private pensions, however, a fund of assets is built up and invested. Some countries such as Chile and Australia have moved to a mandatory funded pension system and the Conservatives in the U.K. have proposed to do the same with their *Basic Pension Plus* proposal. Other countries such as the U.S. and Sweden have built up a funded reserve to help ease the payment of pensions when the 'baby boom' generation retires. This article reviews the economic theories of funded and unfunded pension systems and examines the advantages and disadvantages of each type of system; these theories help to explain the current interest in funded systems as well as the difficulties associated with the transition towards them.

A diagrammatic illustration of why individuals choose to join pension schemes when they have the appropriate tax incentives is shown in Fig. (1), which represents an individual's choice between consumption and savings over the life cycle expressed in two periods: 'young' (i.e., in work) and 'old' (i.e., in retirement). The horizontal axis shows consumption when young and the vertical axis represents consumption when old. The worker earns a wage W when young and nothing when old, but can reallocate consumption between youth and old age along his/her intertemporal budget constraint (WF) (whose slope is determined by the after-tax return on direct savings). With the availability of savings through a tax-favoured pension scheme, the worker earns a higher return by putting money into the pension scheme rather than into direct savings, so a higher intertemporal budget set is avail-

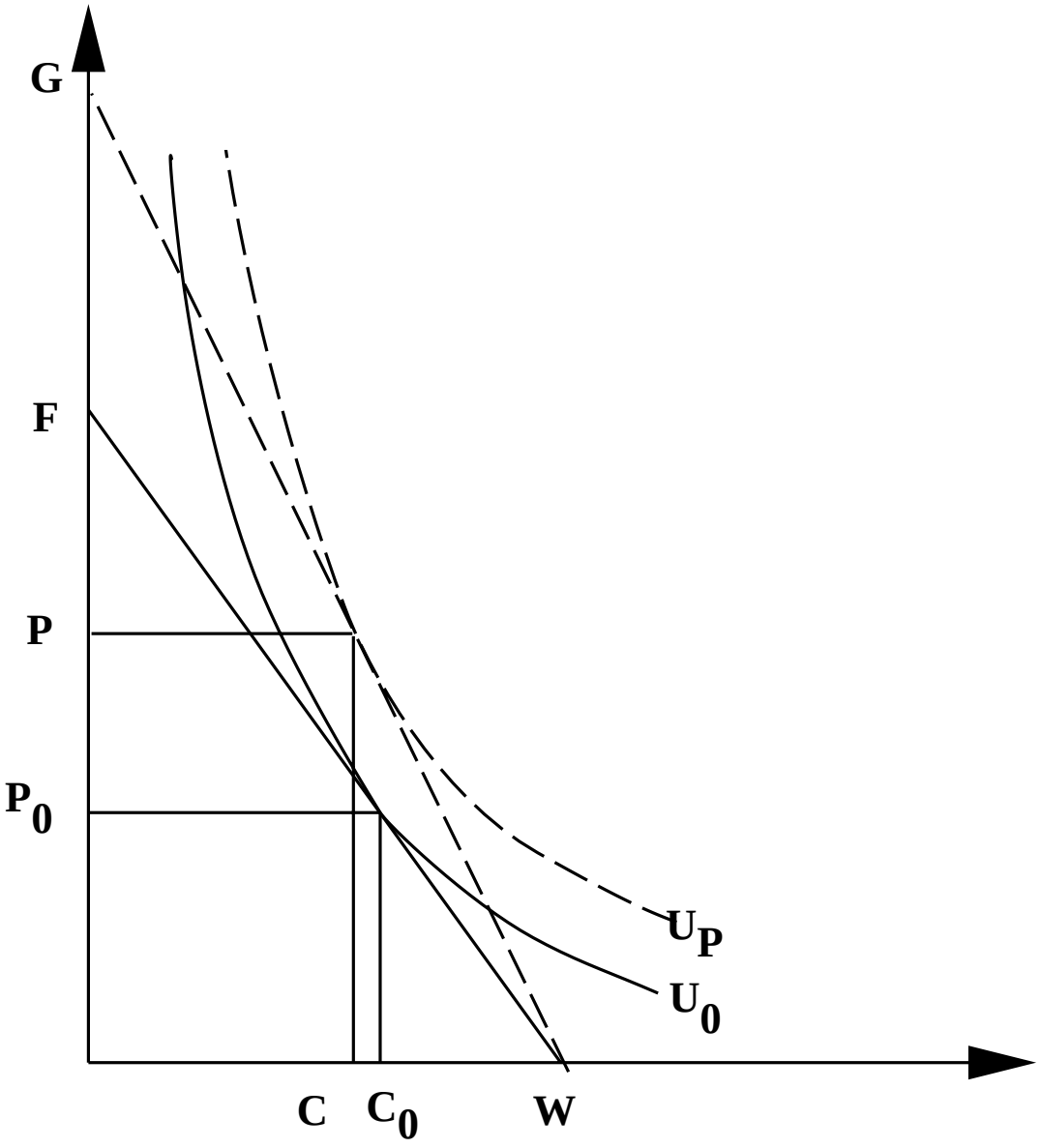


Figure 1: The effects of pensions on savings.

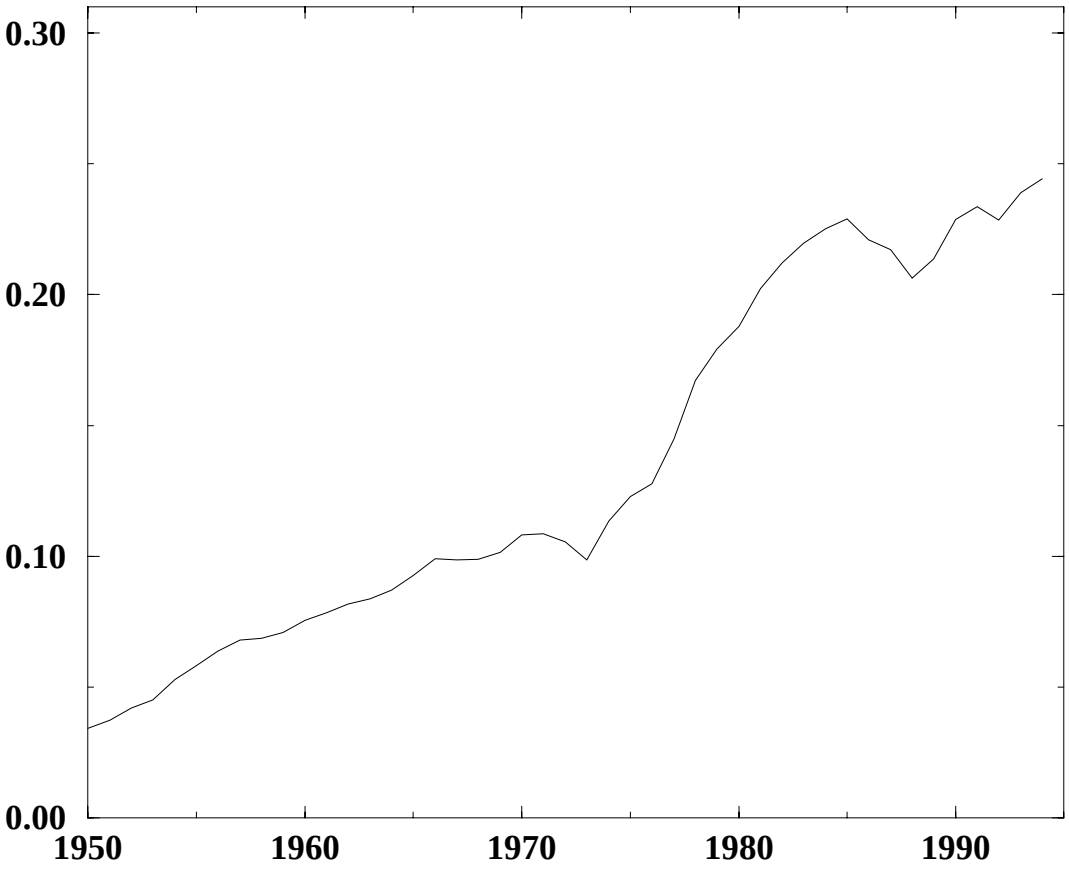
able: the broken line (WG). Preferences are captured by the indifference curves U_P and U_0 which express tradeoffs workers are willing to make and be equally well off. Prior to the introduction of the pension scheme, the welfare-maximising life-time consumption bundle is C_0 when young and P_0 when old. With the additional tax advantages, the worker chooses to save more (CW rather than C_0W) and enjoy higher retirement consumption than otherwise (P rather than P_0).

Companies in Britain also have tax incentives to make contributions to occupational pension schemes and these date from shortly after World War I, but the incentives started to become particularly strong as a result of the high taxation of corporate profits after World War II and subsequent changes in tax rules such as those in the Finance Acts of 1956 and 1970.[1]. The result has been a steady increase in the ratio of private pension wealth to total wealth in the UK (which, in addition to private pension wealth, comprises housing assets, net financial assets and the value of Basic State and SERPS (State Earnings Related Pension Scheme) pension wealth) as shown in Fig. (2).[2]. Currently, the assets of private pension funds amount to three-quarters of the size of the gross domestic product of the UK.

While Fig. (1) illustrates the effects of tax incentives for funded pension savings, it does not describe why governments might prefer unfunded pension systems to funded systems. However, a slightly different diagram can illustrate this point. In Fig. (3), we show the difference between fully funded and unfunded pension systems. The consumption possibilities when young and old under the funded system are illustrated by the line (WG), as in Fig. (1). With an unfunded system, however, the tradeoffs between consumption and savings are different. Assuming a constant tax rate, the payoff to the old depends on the growth rates in population and in wages. If the payroll (social security) tax is τ, the total pension received by the old is τwN, where N is the number of the young and w is the wage of the young. If the population grows at the rate n, the number of young N will equal $(1+n)N_0$, where N_0 is the number of the old (who were young when they paid their taxes). Similarly, if real wages and labour productivity grow at the rate g, the wage w of the young will be $(1+g)w_0$, where w_0 was the wage of the old when they were working. The return from an unfunded (social security) pension then is determined by the ratio of the pension received by the old from the young to the taxes paid when the old themselves were young. This ratio is $(1+n)(1+g)$ and is equal to one *plus* the real growth rate in national income. An unfunded scheme is sustainable in the long run if the real growth rate in national income is at least as great as the real growth in the

[1] Blake (1995)

[2] Blake and Orszag (1996)



Source: (Blake and Orszag, 1996)

Figure 2: Ratio of private pension wealth to total wealth.

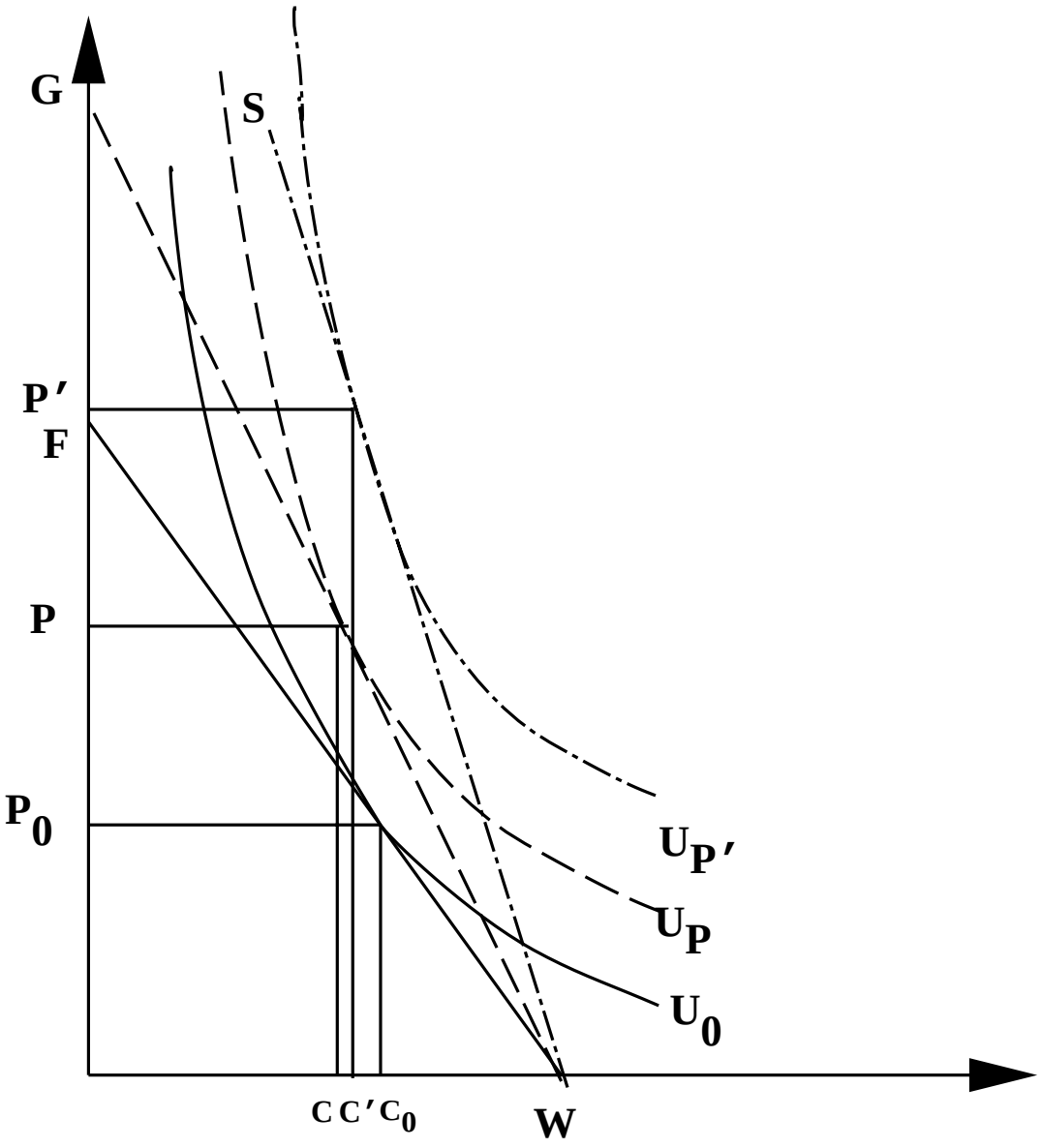


Figure 3: Funded vs. unfunded pension systems.

pensions bill (which in turn is equal to the growth rate in per capita real pensions plus the growth rate in the pensioner population).

We can illustrate this by means of a simple analogy. Imagine there are five 'workers' on top of a hill with a well of water and with a stream running down the hill and at the bottom of the hill are five 'pensioners'. The five workers at the top have five buckets and the five pensioners at the bottom also have five buckets. Now as long as the workers at the top keep drawing water from the well and keep pouring it down the hill, there will be enough water (i.e., 'pensions') to fill the buckets of the pensioners at the bottom. But what happens if you double the number or pensioners at the bottom of the hill? Will the scheme still work? Well, the scheme will still work if the pensioners are now prepared to accept half a bucket of water each. The scheme will also still work if the workers at the top either work twice as hard in drawing water as before or if they are given buckets twice as big as their existing buckets and then they only need to put in the same amount of effort as before. In terms of our analogy, the growth rate in real pensions is about the amount of water in the buckets of the pensioners at the bottom of the hill. The growth rate in labour productivity is about how hard the workers have to work at the top of the hill and how willing they are to pay (through additional social security payments) for the growing pension bill of the elderly. And labour productivity also depends on capital per worker (i.e., the size of the buckets that each worker has), and this, in turn, depends on investment per worker. With an unfunded scheme, pensioners, collectively, can never have larger pensions than the next generation of workers is prepared to give them. But if pensioners are prepared to accept a reduction in their pensions (i.e., less water in their buckets), then an unfunded system could still survive the demographic timebomb.

An unfunded scheme will be superior to a funded scheme if $(1+n)(1+g)$ is higher than one *plus* the tax-subsidised real rate of return on financial assets invested in a pension fund. This comparison between real income growth and real returns is known as the *Aaron test*.[3] Fig. (3) illustrates the case when the payoff is higher for an unfunded system. Individuals' budget sets are given by the line (WS) (which has slope $-(1+n)(1+g)$) and they choose to consume C' when young and P' when old. In this case, individuals in the unfunded system are able to consume more when both young and old than under the funded system. However, if the real return on pension fund assets exceeds $n+g$ then the funded system will be preferred.

Again, it is possible but somewhat more difficult to illustrate this using the abstract analogy of the stream running down the hill. In this context, we can think

[3] Aaron (1966)

of a pension fund as a dam built half way down the hill. The workers still pour water down the hill, but it is no longer immediately available for the pensioners at the bottom to fill their buckets. Instead, the water accumulates in a reservoir behind the dam. Over time, the amount of water in the reservoir rises as rain falls (this corresponds to the investment return on the assets).

Table (1) summarises the application of the Aaron test to some major countries. The table shows that unfunded pension schemes are not viable in any major country if real pensions grow in line with the real growth rate in labour productivity. However, they are viable in the long run if the real growth rate in pensions is zero (as it is in the U.K. state pension system); but this implies that, as a proportion of national average earnings, the state pension will fall continuously over time. In addition, because the table shows that (except for Japan) the real return on pension assets exceeds the sum of the forecast growth rates in the labour force and in labour productivity, funded schemes are generally expected to yield higher returns than unfunded schemes. One important reason for the superiority of funded schemes is that pension funds are able to generate high returns by investing in faster-growing emerging markets.[4]

An additional layer of complexity, identified first by the Nobel laureate economist Paul Samuelson,[5] arises when we take into account the effort of individuals. For example, if the young know they will face high taxes in the future, they may choose not to work hard or build up valuable skills. Consider, for example, the situation where one generation accumulates a fund of assets for its retirement. Its consumption during retirement depends on the 'value' of the fund at retirement. The fund can only be used to purchase goods and services that are produced by the next generation. No generation can store for its own retirement the commodities that it has produced itself. Each generation is wholly dependent on the next generation, not only for the types of goods and services that it consumes in retirement, but also for the quantities of goods and services that it is able to consume. This is because the next generation also chooses the prices of those goods and services; and it is possible for the next generation to reduce the 'value' of the pension funds of the previous generation through inflation, for example.

The point that is being made (and this is the crux of Samuelson's argument) is

[4]A related problem here is the 'transition deficit' which needs to be financed when moving from an unfunded to a funded system. In Chile, the government issued 'transition bonds' in the early 1980s to finance its transition to a funded system. In terms of the analogy presented above, water accumulates behind the dam and is no longer immediately available to fill existing pensioners' buckets. They need to get their water from elsewhere.

[5]Samuelson (1958)

Country	Growth Rate in:			Real Return	Unfunded Pension Viable if:		Funded Pension Viable if:	
	Labour Force	Labour Prod'vity	Retired Population	on Pension Assets	Pensions Grow with Prod'vity?	Real Pension Growth Zero?	Pensions Grow with Prod'vity?	Real Pension Growth Zero?
UK	0.0	2.1	0.7	6.3	No	Yes	Yes	Yes
Germany	-0.7	2.5	0.8	5.5	No	Yes	Yes	Yes
Netherlands	-0.3	2.1	1.2	4.3	No	Yes	Yes	Yes
Sweden	0.1	1.8	0.6	2.8	No	Yes	Yes	Yes
Denmark	-0.3	1.9	0.5	5.8	No	Yes	Yes	Yes
Switzerland	-0.2	1.5	1.1	2.2	No	Yes	Yes	Yes
USA	0.4	1.6	1.4	3.9	No	Yes	Yes	Yes
Canada	0.4	2.6	1.7	4.1	No	Yes	Yes	Yes
Japan	-0.6	4.1	1.4	2.9	No	Yes	No	Yes
Australia	0.5	1.8	1.9	4.2	No	Yes	Yes	Yes

Notes:

1. Projected annual average growth rate in labour force aged 15 to 64 between 1990 and 2050.
2. Annual average growth rate in real GDP per capita between 1967 and 1990, assumed to hold over the period 1990-2050.
3. Annual average real return on pension assets between 1967 and 1990, assumed to hold over the period 1990-2050.
4. Projected annual average growth rate in retired population over the age of 65 between 1990 and 2050.
5. Unfunded pension schemes are viable if the sum of the growth rates in the labour force and in labour productivity exceeds the sum of the growth rates in the retired population and in real pensions.
6. Funded pension schemes are viable if the real return on pension assets exceeds the growth rate in real pensions.
7. Funded schemes are superior to unfunded schemes if the real return on pension assets exceeds the sum of the growth rates in the labour force and in labour productivity.

Sources:Penn World Tables, Davis (1995) (Table 6.15), United Nations (1995)

Table 1: Testing the Viability of the Pension Systems in Different Countries in the Next Century

that, despite having extracted 'guarantees' about indexed pensions, it is impossible for the generation in retirement to assure the real value of its pension in retirement because it is impossible for that generation to pre-commit the next generation to deliver a particular flow of goods and services. Since pensioners are interested in the flow of goods and services in retirement, they will be interested in the flow of real purchasing power required to pay for these goods and services. This is the case whether the pension scheme is 'funded' or 'unfunded'. In this sense, all pensions are PAYG and a pension fund is in reality only a deferred PAYG scheme. Instead of using current contributions to pay for pensions, a funded scheme pays for pensions using contributions collected forty years before. This means that even funded schemes are not immune from the consequences of the demographic timebomb. Nevertheless, the claims of pensioners over future flows of goods and services are undeniably stronger in the case of funded schemes compared with unfunded schemes, especially if the Aaron test is passed.

A related issue concerns whether it matters where the contributions into funded schemes are invested. To illustrate, if investment returns are higher abroad, then investing pension contributions in foreign economies will increase the gross income available to pensioners compared with investing in the domestic economy. But will it increase their net (i.e. post-tax) income in retirement? The answer to this question depends on how flexible the domestic labour market is. If there is a net outflow of investment funds from the domestic economy, this will eventually reduce capital per worker and hence labour productivity. If workers respond by accepting lower real wages, then they will still be able to retain their jobs and compete in the world market. If they refuse to accept real wage cuts, many are likely to lose their jobs and this will increase unemployment benefits. Pensioners' gross incomes may well increase as a result of overseas investment, but their net income will only be higher if the taxes needed to pay for these additional unemployment benefits rise by less.

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