
RESEARCH

Pension Design and the Failed Economics of Squirrels

Nicholas Barr

Public Economics, European Institute, London School of Economics, UK

N.Barr@lse.ac.uk

This paper explores the nature of reciprocity between workers and pensioners, starting from the observation that what pensioners consume has mostly to be produced by younger workers, and therefore reciprocity in some form is inherent.

The opening section argues that a worker can try to arrange consumption in retirement by (a) storing current production or (b) building claims on future production. However, storing current production (the squirrels model) does not work well, so that the main vehicle is building claims on future production. There are two approaches to doing so – through promises (which lie at the core of Pay-As-You-Go (PAYG) plans), or by accumulating financial assets which can be exchanged for goods and services (the basis of funded plans).

The second part of the paper establishes that a central element in assessing pension arrangements is the extent to which investment is in productive assets. The third part considers the durability of different pension regimes.

The paper's central conclusions are (a) that reciprocity is inherent in pension plans, (b) that the specifics of pension design are in many ways secondary, and (c) that what really matters are economic growth (increasing what is available to share between workers and pensioners) and good government (which will manage PAYG pensions responsibly and/or sustain the economic stability and regulatory capacity that underpin funded pensions).

Keywords: pensions; funding; pay-as-you-go; reciprocity; social security; saving; investment

JEL codes: D63, E21, E22, E24, J14, J18

1 The Backdrop

State pensions have a relatively long history in modern nation states. Early examples include Germany's social insurance programme, introduced by Chancellor Otto von Bismarck in 1889, and a tax-financed, non-contributory pension in New Zealand in 1898. For Bismarck the primary purpose was to counter the growing power of Marxists in German politics; in New Zealand, the aim was to encourage older workers to retire from the factory floor or farmyard where they were lowering the productivity of younger workers.

Since then, two things have happened. People are living longer, healthier lives, suggesting that they should retire later, but societies are also richer, and so can afford to give people a period of leisure at the end of their working lives. So the purpose of pensions is no longer primarily to clear out unproductive workers, but instead serve a social function, dividing adult life between working years and leisure years. As a combined result of social pressures and longer life spans, state and private pensions grew over the course of the 20th century, so that in advanced countries pensions now cover almost all workers.

Thus pensions are an important part of the social and economic fabric of a country, hence their durability matters. This paper explores the robustness of different economic mechanisms of reciprocity between workers and pensioners, using population ageing as a case study.

The economics of pensions can often be confusing because it tends to focus on financial aspects, such as portfolios of financial assets. For many purposes it simplifies analysis to focus on output. Thus a helpful starting point is to observe that the goods and services that pensioners consume have to be produced mainly by younger workers, so that interactions between generations are inevitable. Thus this paper is not about whether there is reciprocity, but its nature, extent and characteristics.

1.1 The zombie that won't die

What I call 'pub economics' refers to something that seems obviously right, which everyone firmly believes is right – but is wrong. Some examples eventually pass away – few today deny that smoking harms health – but others, zombie-like, refuse to die. An example particularly relevant to this paper is the argument that funded pensions

(i.e. plans that pay benefits out of funds built over a period of years) make pensioners independent, and continue to do so in the face of population ageing. In contrast, Pay-As-You-Go (PAYG) plans (in which the pensions of today's retirees are paid from the contributions of today's workers), are dismissed as Ponzi schemes. I first disputed this argument in an article published in 1979 [1], and in more detail in a widely-read IMF paper in 2000 [2], yet the zombie keeps on returning.

1.2 The failed economics of squirrels

For the most part, people are not interested in money – coloured bits of paper with portraits of national heroes on them – but in consumption. What pensioners are interested in are things like food, clothing, heating, bus rides, good medical care, and presents for their grandchildren.

For workers, the question is how they can ensure such goods and services for their later lives. There are two (and only two) ways of organising consumption for one's older self.

- By storing current production during working life; or
- By building a claim to future production.

A worker could try to ensure future consumption by setting aside part of his/her current production for future use, like a squirrel storing nuts for the winter. This human squirrel could theoretically have a storeroom and add to its contents each year, building up a supply of food, clothing, medication, etc. That approach, however, has obvious and major deficiencies:

- Cost: storing tins of baked beans forgoes the gains from holding savings in assets with a positive real return; and keeping perishables frozen throughout working life has direct costs;
- Uncertainty about life span, about what quantities to store, what old goods might be phased out (analogue televisions), how the worker's tastes might change (a preference for Chardonnay might morph into one for full-bodied red wine) or how constraints might change (past over-indulgence might have resulted in an alcohol ban); and
- Services: it is possible to store some services by storing the physical capital that generates them, for example housing services through owner occupation. But it is not possible to store services deriving from human capital – medical services being a particularly relevant example.

The bottom line is that heavy reliance on organising consumption for one's older years by storing current production in one's younger years is a non-starter.

The failure of the squirrels model means that a worker's main mechanism for ensuring their long-term security is to establish claims to future production. Such claims could be organised by accumulating a pile of *money* (or, more generally, financial assets) which could be exchanged for goods produced by younger workers, or by obtaining a *promise* – from the worker's children or from the government – that they would be given goods produced by younger workers after they retired, or through a mix. Fully-funded pensions are an example of the first approach, PAYG of the second. The bottom line is that what matters is the level of output after I have retired – money misses the point unless the goods and services are there to buy.

2 How Does Economic Reciprocity Work

2.1 A parable

To understand the nature of economic reciprocity between generations, consider an island with no outside contact. Three cases are illuminating.

Case 1: an economy with a single commodity, food. Food grows on top of tall trees which only the young can climb and is perishable, hence cannot be stored (in his seminal 1958 article, Samuelson [3] uses the example of chocolate bars). Thus older people can consume only what young people harvest and share. The young share, hoping that the next generation will do the same for them. Thus, the flow of economic benefit is in one direction, from younger to older.

Case 2: an economy with two commodities, food and cowrie shells. To try to avoid having to rely on the altruism of the next generation, young people harvest less food for themselves and use the resulting additional free time to collect cowrie shells to exchange for food after they have retired. The next generation of young people accept the cowrie shells (which have no other uses) as payment so that they can exchange them for food when they have retired. Again, retirees must rely on younger workers to harvest the food they eat.

Case 3: an economy with two commodities: food and ladders. Again, young people harvest less food for themselves but, crucially, use the resulting free time to build ladders, a productive asset. When old, they let younger workers use the ladders, which makes harvesting more efficient and hence allows a larger harvest. The young share the larger harvest in exchange for use of the ladders. In this case the flow of benefit is in both directions. The critical difference from Case 2 is that here the young accumulate productive assets, not simply a store of value.

Now consider what happens if life expectancy increases, with all else remaining unchanged, so that the number of workers remains the same, but the number of older people increases.

In Case 1, with a constant number of workers and constant production technology the chocolate harvest remains unchanged but has to be shared among more people. Average consumption must fall – workers, pensioners, or both have to consume less.

In Case 2, output also remains unchanged but again has to be shared among more people. If a larger older generation has collected more cowrie shells, in principle they can demand more chocolate, but a more likely result is that workers will demand more cowrie shells per bar of chocolate, i.e. pensioners' purchasing power will be eroded by inflation. Once more, pensioners or workers, or both, have to consume less.

In Case 3, in contrast, output is higher than in Cases 1 and 2 because ladders enable workers to bring in a larger harvest. If output rises enough, average consumption does not have to fall, thus neither workers nor pensioners have to consume less.

2.2 Back to economics: What matters is output

For *individuals*, the purpose of pensions is to transfer consumption over time. But, absent storing current production, that is not possible for society as a whole. From an *aggregate* viewpoint, the economic function of pensions is to divide total economic output between workers and pensioners.

This point is encapsulated by the 'Turner Test' (named after Adair Turner, chair of the UK Pensions Commission [4, 5]), which states that if there are problems paying for pensions, there are four – and only four – solutions in a closed economy (see **Box 1** for discussion of the open economy case):

- Lower average monthly pensions;
- An unchanged average monthly pension but starting at a higher age;
- Higher contributions by workers, or higher taxes; and/or
- Policies to increase national output.

As Turner pointed out to witnesses giving evidence to the Commission, any proposal to improve pension finance that does not involve one or more of these approaches is illusory.

These elements play out in different ways, depending on how pensions are organised.

1. *PAYG* is an example of Case 1 (though usually based on mandatory membership rather than the voluntary arrangement in the parable). Since output remains unchanged, workers have to consume less (higher contributions) and/or taxpayers have to consume less (higher taxes), and/or pensioners have to consume less (a lower monthly pension and/or higher pension age with no compensating increase in benefit).
2. *Funding with no increase in productive assets*; this is Case 2. In the simplest case, workers hold their pension savings in cash, whether hidden under a mattress or kept in a bank account. When they retire and start to draw down their savings, desired consumption by pensioners will exceed what the smaller generation of workers want to save, potentially leading to excess demand in the goods market, and hence to price inflation, thus reducing what pensioners can afford to consume.

The same is true also in more complex cases. Workers might hold their savings in government bonds to sell to the next generation to finance their post-retirement consumption. But because the next generation is smaller, their total saving and so their demand for bonds will be lower, leading to excess supply in the bond market, and hence to lower bond prices than if the generations were of equal size. (To see this, suppose that every couple has one child; thus each couple of the next generation will inherit two apartments and, other things equal, apartment values will fall).¹

Similarly, the outcome may be the same where workers hold equities rather than bonds in their pension plan, if they choose to offset the higher equity holdings in their pension plan by reducing equity holdings elsewhere in their portfolios. And the conclusion broadly holds in an open-economy, as **Box 1** explains.

Ultimately, what matters is whether - and to what extent - savings are translated into additional productive investment. Where that does not happen, workers do not get the pension they expect.

3. *Funding that involves an increase in productive assets*; this is Case 3. Suppose that workers hold their pension savings, wholly or in part, in equities *and* that those equities finance additional productive investment.² If, as a result, output grows sufficiently, equity purchases by the smaller but better-off generation of workers will match equity sales by pensioners (who sell financial assets to finance their consumption in retirement). Thus there is no 'asset market meltdown' and pensioners get the real pension for which they have planned.

¹ This example was suggested by András Simonovits.

² Or in corporate bonds issued in order to finance productive investment.

Box 1: How much difference does an open economy make?

Pensioners can consume goods made abroad if they can organise a claim on those goods. British workers, for example, could use some of their retirement savings to buy Australian firms. In retirement they could sell their share of the firms' output for Australian money to buy Australian goods which they then import to the UK. Though useful, this policy is not fool proof: its success depends on future production in Australia and fails if all workers in Australia retire.

Thus, the open-economy argument rests on a series of assumptions about the countries receiving foreign investment:

- They need to have a younger workforce than the transmitting countries;
- They need sufficient economic capacity (e.g. a workforce with adequate skills), economic stability (so that trade can continue reliably), and political stability (so that property rights are respected); and
- The scale of the recipient countries must – crucially – broadly match that of the transmitting countries.

These conditions are stringent. Given the extent of population ageing in Europe, North America and much of Asia, including China, the third point is highly relevant; and in many of the countries with young populations, economic capacity and economic and political stability cannot be taken for granted.

The conclusion is that opportunities for trade do not change the basic story significantly. Though international diversification is generally helpful, its impact, except for small economies, should not be exaggerated.

2.3 Strategic policies to increase output

What, then, are the policies to increase output? There are two strategic approaches. The first is to raise the productivity of each individual worker through investment, by:

1. Increasing the quantity and quality of physical capital and improving the allocation of capital; and
2. Increasing the quantity and quality of human capital, and improving the allocation of labour, for example by increasing labour mobility.

The second approach is to increase the size of the labour force by:

3. Raising labour-force participation at all ages, including by reducing unemployment and through offering more – and more affordable – child-care;
4. Raising the average retirement age;
5. Importing labour directly, through immigration; and/or
6. Importing labour indirectly by exporting capital to countries with younger populations.

The conclusions are twofold:

- The key variable is output; and
- Policymakers should consider the entire menu of policies just listed – those that increase investment (discussed in more detail in section 3.1), and those that increase the size of the active labour force.

3 How Reliable is Reciprocity?

Having discussed how reciprocity – through gifts, exchange and/or through sharing the gains from productive investment – works with different pension designs, a separate issue is the durability and security of the arrangements – can workers trust that the deal under which they operate as contributors will carry through to their experience as pensioners?

3.1 Does accumulating assets always increase output?

The argument that accumulating assets in pension funds increases output growth has three links, each of which needs to be tested.

- Will there be an increase in saving? A line of research (see d'Addio *et al.* [6] for an overview) explores whether and to what extent an increase in mandatory pension saving is, or is not, offset by reduced voluntary saving. If pension saving is fully offset, there is no decrease in consumption, hence no additional saving, hence no additional ladders.

- Will there be a resulting increase in investment? Pension funds can and do invest in productive assets, but in the 1980s the UK General Union of Mineworkers famously used some of its assets to buy Old Masters. Similar issues can arise where pension funds invest in land or property, or, more recently, through financialization, which extracts value from firms (for example, through high dividend payments) rather than investing in productive assets. In these cases there is reduced consumption, but the time saved is used to collect cowrie shells rather than building ladders.
- Will increased investment lead to increased output? A counter-example is the inefficient allocation of capital in the latter days of communism in the former Soviet Union and much of Central and Eastern Europe. In this case, consumption falls but investment takes the form of too many ladders, each too short to be useful.

Thus, arranging reciprocity by accumulating financial assets to exchange for consumption in retirement can often work well, but not always.

3.2 Is funding safe?

It is sometimes argued that that funded plans, because they are based upon explicit property rights, are safer from government depredations than PAYG arrangements, which can be vulnerable to short-term political pressures.

Governments can, indeed, make profligate promises and fail to adjust in an orderly way, leading to sharp reductions in benefits. On the other hand, as outlined in **Box 2**, governments can act responsibly and with a long-term perspective.

Box 2: Is social security a Ponzi scheme?

Opponents of incompletely-funded public pension plans sometimes refer to them as Ponzi schemes. In assessing this characterisation, a distinction should be drawn between a price and a bribe.

According to the web site of the China Embassy in London, in 2021 the cost of a one-year multiple-entry visa for a UK passport holder was £151 via the regular service, or £178 for the express service. Most people would regard those as prices – a higher charge for faster service. In contrast, if the applicant made a covert individual payment to someone in the visa department to speed up their application, they would not be perceived as paying a higher price, but a bribe. The difference is twofold: a price is public and available to everyone on an equal basis; a bribe is non-transparent and generally specific to each individual.

A Ponzi scheme is closer to the latter. Its model is intentionally non-transparent. If its accounting were clear and public, nobody would join. Prospective savers would realise that using deposits to pay high interest rates works only if enough new savers continue to join, so that any such scheme will eventually collapse. It would also be clear that it is not the intention of a Ponzi scheme to provide savers with a safe high return but to defraud them.

Social security can act in the same way. If a government fails to adjust contributions and benefits over time in response to economic and demographic circumstances, a PAYG plan may fail to keep its promises. As examples, Italy in 2011 and Greece after 2016 were compelled by economic emergency to make drastic cuts in the level of pensions – both those already in payment and future benefits (on Italy, see [7]).

That is not true if there are transparent rules and mandatory independent auditing, especially if combined with legally-enshrined rules for addressing projected shortfalls in pension finance. For example, the Canada Pension Plan is required by law to be assessed every three years by an independent body, with the laws that govern any adjustment of the plan subject to protections broadly similar to that of the Canadian Constitution, thus offering protection against short-term political pressures.

The argument that social security is capable of abuse is incomplete. There is no campaign to ban cars or pharmaceutical drugs because they can be used badly. Rather, it is necessary to consider the balance of risk and advantage. How well a system works will depend both on its design and on the capacity of government. Well-governed countries reliably adjust or reform pensions to keep them sustainable, assisting balance in the contributions and benefits across generations.

None of the arguments about problems with PAYG plans mean that funded plans are immune from irresponsibility or incompetence. Governments can reduce the real return to pension funds in several ways: they can require fund managers to hold government financial assets with a lower yield than they could earn on the stock market; or they can reduce or withdraw tax privileges. Or they may appropriate pension fund assets with no or inadequate compensation, as in Hungary [8] and Argentina [9].

A more subtle problem caused by bad government is strategic incoherence between the different parts of a pension system. The UK is a sad example. Until a worker is 55, policy assumes that many people will make bad choices, and hence in 2012 the government introduced NEST pensions (www.nestpensions.org.uk) which incorporated a nudge in the form of auto-enrolment. However, once a worker reaches 55, they are given 'pension freedom'. This arrangement,

introduced without consultation in 2014, allows workers to draw down their pension saving as fast as they like. It makes the implicit assumption that people aged 55 and above, who previously could not be counted on to act reasonably, can be relied on to make good choices for their financial future.

'Unless the government beefs up guidance, new pensions freedoms could undermine auto-enrolment and leave us with a pensions crisis. *If the government was worried about obesity but simultaneously handing out free sweets, you'd have to question either their motives or their competence.*

'But that's exactly what the government has done with pensions. Autoenrollment largely exists because we believe that people are either incapable or unwilling to save for their future. At the same time, 'freedom and choice' makes the assumption that people are capable of making good decisions about retirement.

'It doesn't take a behavioural economist to tell you something's not right here. The two policies aren't just contradictory; they are underpinned by diametrically opposed assumptions about the way people think.' [10, p. 8, emphasis added].

There are good reasons why someone aged 55 and over might have a clearer view of the way ahead than a younger person and hence a case for more freedom. The problem with UK policy is not that it allows older people more freedom, but that it allows them almost complete freedom. The extent of choice should be optimised, not maximised. In discussing choice architecture, Barr and Diamond [11] argue that good pension design should assist choice by those who want to make choices, but should work well also for people who make no choice. Thus, for example, NEST pensions offer workers a limited range of simple choices, but also have a default fund and default retirement age for workers who make no choice.

In political economy terms, the issue of the relative safety of PAYG and funded plans turns on whether pensioners are better able to fight for their share of national output as recipients of current tax revenues or as owners of capital. Political pressure on government to repair a state scheme might be stronger than those to address adverse outcomes in private plans. On the other hand, the larger the share of the population with private pensions, and the greater the fraction of pension income deriving from private sources, the greater the pressure on government in the face of disaster, such as the Port Talbot scandal in the UK [12]).

The PAYG mechanism makes clear both the quarrel over output shares and the dependence of pensioners on younger workers. Funding hides both issues, but does not remove them.

The bottom line is that neither funding nor PAYG is inherently safe or inherently unsafe – each has potential advantages and risks. Trying to ensure durability of exchange between generations can work well, and often does but, again, not always and not necessarily. What matters for any plan is good government, discussed in the conclusion.

3.3 Is more saving the right policy?

We have seen that reciprocity can be arranged in terms of promises, or by accumulating assets during working life, or by a mix. The previous discussion outlined two cases where accumulation may not be fully effective. A third question is whether accumulation, even where it works well, is necessarily the right policy. There are three sets of issues: dynamic efficiency (i.e. economic growth); intergenerational distribution; and whether, if more saving is needed, funded pensions are the best way to arrange those savings.

1. Dynamic efficiency raises the question of whether increased saving always increases economic welfare. For countries that save too little – which is the majority – the answer is yes. But it is not always the case. If a country saves and invests too little, growth will be lower than it could be. But a country that saves and invests too much has to devote excessive resources to addressing depreciation of an over-large capital stock. The 'golden rule' of growth seeks to balance these effects.

Though it seems to be a somewhat nerdy theoretical point, the issue can have huge ramifications. In early 2000s, the aggregate saving rate in China was around 50%. People were saving too much and consuming too little, resulting in lower well-being for the Chinese population than necessary. It is beyond the scope of this paper to explore the wider ill-effects, other than to note that the mountain of Chinese saving was a significant element in the global imbalances that contributed to the 2008 financial and economic crisis.

2. Intergenerational distribution: as discussed, in order to increase output growth, funding has to increase investment. But increased investment now means that today's workers have to consume less (i.e. take time away from harvesting to build ladders) so that tomorrow's workers and pensioners can consume more. That may or may not be good policy. In Asher *et al.* [13] written for the government of China, Peter Diamond and I argue that with high growth rates, increased saving by poorer workers to make future richer generations even richer is not good policy.
3. Where higher saving is good policy, there are many different ways of doing so within a pension plan [14], including individual accounts (Australia, Chile); simple, cheaper accounts (the US Thrift Savings Plan or UK NEST pensions); funded occupational plans (industry plans in the Netherlands and USS in the UK); and partially funded national plans (Canada). Often overlooked, however, is that higher saving can also be organised outside the pension system. An example is the Norway Government Pension Fund Global, a sovereign wealth fund whose purpose is to invest

in productive assets globally, hence financing investment both in Norway (pro-growth policy 1 in section 2.3) and other countries (pro-growth policy 6). The purpose of the fund is to adjust consumption across workers and pensioners, i.e. to improve the balance of reciprocity between generations.

The relevance of this discussion is that in considering reciprocity it is important to take a holistic view – even when considering only economic aspects, the canvas is wider than pension design in isolation.

4 Conclusion: Where Does This Get Us on Reciprocity?

For an individual, a central purpose of pensions is to enable a person to plan over their life course by transferring consumption from their younger to their older self. At an aggregate level, pensions are about sharing output between workers and pensioners and are thus inherently about reciprocity.

- Pensioners consume goods mostly produced by younger workers;
- Younger workers use capital accumulated by older workers; that capital makes younger workers more productive, hence with higher wages.

The extent to which such arrangements benefit both generations depends on two sets of factors:

1. Saving and investment, i.e. (a) how much today's pensioners saved during their working lives, and (b) the extent and effectiveness with which those savings were channelled into productive investment; and
2. Behavioural offsets: pension savings are only part of workers' wealth. For instance, if my pension fund invests more in equities I might balance my portfolio by moving my non-pension saving more towards bonds [15].

Though good pension design is important, two other factors are even more important.

1. Output growth, or the importance of ladders, as in Case 3; and
2. Good government, to assist efficient investment and protect pension rules, including the capacity to take a long-run view. Good government will manage PAYG pensions responsibly and will sustain the economic stability and regulatory capacity that underpin funded pensions. Work by Tim Besley on wider aspects of state capacity is directly relevant (see 16, 17 for non-technical discussion, and 18 for more formal analysis).

Why, in conclusion, is it important to kill the zombie – that funding insulates pensions from demographic developments? It matters because a belief that funded individual pension accounts are a complete response to population ageing is a misleading guide to policy for two sets of reasons. First, there are many other ways to organise saving. Second, it is not saving *per se* that matters, but investment in productive assets (ladders, not cowrie shells). This line of argument brings us back to the real policies for addressing population ageing – policies to increase investment in physical and human capital, and policies to increase the number of people in the labour force.

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