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Abstract

This paper discusses two topics which are at the very center of the ongoing political debate on public pension reform. First, we deal with the puzzle that there is a public pension system at all from a purely neoclassical point of view. Second, we address the issue which is considered the hottest in the social security discussion: Is there a transition from a PAYGO system to a funded system which is welfare-improving? The paper provides answers to both problems by telling the standard social security story in a different order. Most importantly, we introduce a "good" which the initially old hold but cannot eat, the initially young, however, do not hold but could eat if they had it. The paper states that this assumption does the job to tell a social security story which makes sense in terms of standard welfare economics and motivate a welfare-improving pension reform with a transition from a PAYGO to a funded system at its center.

JEL classification: D6, H55, J26

Keywords: social security reform, public pension programs, funded pension systems

1. Introduction

More than 160 countries are said to maintain, in one way or another, government-run old age pension programs (*Mulligan – Sala-i-Martin, 1999*). These programs have much in common, above all they are, overwhelmingly, designed as pay-as-you-go – schemes (PAYGO). Many of these systems started fully funded and were unfunded by the political system soon after their introduction. Of course, there are plenty of "good reasons" why politicians prefer PAYGO to fully-funded programs, but to the best of my knowledge no explanation so far meet the standard consistency requirements of economic theory. Neither political nor efficiency theories of social security do a good job in providing a sound rationale for this change of policy. No wonder, one may argue, given the fact that social security is said to lack a sound theoretical foundation altogether. Too many key features elemental to social security are not explained by theory at all (for an excellent survey on the shortcomings of social security theory, see *Mulligan-Sala-i-Martin, 1999A, B*).

In this paper we deal with two issues which are considered to be at the very heart of the social security debate and, what's more, are anything but well theoretically motivated. First, we address the key question of old age pension systems by asking: Why is there a pension system at all? Oddly enough, social security theories are quite quiet when it comes to motivating the introduction of public pension schemes. Second, we take on the often-asked question once again: Is there a Pareto-improving transition from a PAYGO to a funded system and, if yes, how can it be managed?

The paper is organized as follows: Section 2 picks up the standard story of social security, but tells it in a slightly different order. In so doing, we make an attempt to propose a way for rationalizing the introduction of an old-age pension system. Section 3 presents a standard overlapping generation model which allows us to derive the implications of our story in detail. The model is to show that in the proposed setting a Pareto-improving transition from a PAYGO to a fully-funded system is possible. Section 4 discusses the major policy implications. Section 5 concludes.

2. A Tale Told Slightly Differently

The standard story of social security is, in short, as follows: The first generation of the old gets a lump sum pension $B > 0$ financed by the young. The first generation young is promised by the first old generation that each subsequent generation will receive a pension of the same size when old. As known, in this setting the first old generation takes it all and, as mentioned, receives a positive payment B , which is funded by the losses of all future generations. Assuming that the first young generation is rational and cares only about herself in the given set-up social security won't be started at all, but if it gets started anyway there is no way to Pareto-improve the welfare of the generations in the future periods.

This implication gave rise to the view that the initially young must have been led astray by some sort of irrationality to strike a deal that bad. A few critics of social security even go so far as to argue that social security as we know it has all the elements of a Ponzi-type chain letter game. Their point is that the initially old talked the initially young into the social security game by "promising" that the compensation for not investing the lump sum taxes - which are to finance the retirement of the initially old - in the real market will be getting larger somehow from generation to generation. This scheme, they argue, makes every generation better off and would finally offset the welfare losses caused by the initially old. Assuming that there is no growth this obviously can only work by continuously enlarging the tax burden of the future young. It is easy to see that such a scheme collapses for sure. There is a point with certainty some time in the future where the tax burden of the young will exceed their total income.

Growth doesn't change much as long as the growth rate of the economy is assumed not to exceed the rate of return to private capital investment. As known, this precondition ensures in the standard life-cycle set-up of an overlapping generation model (OLG), which is the workhorse of social security theory, that an economy is in the dynamically efficient region where accumulating capital is unambiguously welfare-improving.

As a result, in a rational world social security only makes sense when the state of the economy, at the time of the implementation of social security, is dynamically

inefficient. Dynamic inefficiency relates to an economy whose structure is conducive to the over-accumulation of capital which, of course, is a possible market result in standard OLG models. In this context, a PAYGO system is superior to a funded system and can even lead the economy to the golden rule steady state. In this sense the emergence of social security and rational bubbles, when watched through the lenses of a standard OLG model, has very strong parallels indeed and, what's more, is welfare-improving (Tirole, 1985).

However, empirical testing of dynamic inefficiency has been negative. The available evidence suggests that even highly developed economies have never ever been close to the state of dynamic inefficiency.

The question now is how to re-write this story so that the introduction of social security makes sense, particularly, when the economy is in the more likely dynamically efficient status. As usual in economic theory, we do it by bringing in a new assumption (or a trick, if you like this term better). In so doing, we introduce a "little something" which the initially old hold but cannot eat, the initially young, however, do not hold but could eat if they had it. The job of the government now is to arrange a deal between the initially old and the initially young so that a member of the first old generation can be sure to get an eatable $B > 0$ in return for handing over her "something" D to the first young generation. Of course, the initially young will be indifferent to this scheme as long as D per capita equals B per capita. This makes sure that the old have to eat and the young do not suffer a welfare loss, because they don't care if they eat D or B . The government that cares equally about the old and the young will certainly determine that D per capita equal B per capita.

Surely, in this set-up the introduction of social security benefits the first old generation, but it does not hurt the subsequent generations either. In terms of the standard Pareto optimality criterion the welfare of the society has unambiguously been increased by this government scheme. However, the social security set-up has one more facet, namely whether the deal between the old and young has been organized as a funded or unfunded scheme. In our story the system is funded when the young are allowed to eat D when young, but are forced by the government to save an equivalent of D to provide for their own retirement age. On the other hand, the pension program is unfunded when the young generation is not allowed to eat

but rather store D for the second period of their life. The then old generation "sells" D to the then young generation and gets a return B which contributes to bring them through their retirement period.

Assuming b_t is B per capita and d_t is D per capita at the period t , it is easy to see that in a funded system the benefit is $b_{t+1} = (1+r)d_t$ and in an unfunded system, assuming that $d_t = d_{t+1}$, is $b_{t+1} = (1+n)d_t$ where n is the growth rate of the economy, and r the rate of return to private capital investment (or rental rate on capital). Since the economy is assumed to be in the dynamical efficient region, that is, r is greater than n , the rate of return on contributions of the young generation in a fully funded system is higher than that in a PAYGO system which is n . Thus, a transition from an unfunded to a funded system appears to be possible any point in time with welfare gains of $(r - n)$ for each subsequent generation.

3. A Model That Makes Sense

In the following, a standard OLG model is used to make our point more clearly. We state that the individuals live for two periods, that is, in any point in time the economy consists of two generations, the young and the old. In accordance with the respective literature, we state that the individuals work in the first period of their life and retire from work in the second period. Population grows at rate n so that $N_t = N_0(1+n)^t$. That is to say, the number of individuals born at time t and working in period t is N_t .

The structure of a standard two-period-OLG model is basically formed of technical assumptions such as a nonnegative and concave utility function (increasing with respect to per capita consumption, and additive separability), a constant returns technology, competitively acting firms, inelastically supplied labor, only by the young generated savings and capital stock, a single interest rate paid on savings, and an old generation that consume all their wealth. Most importantly, the individuals are assumed to behave opportunistically and care only about their own welfare. In other words, the individuals when optimizing their actions in the market-place don't consider the welfare of their parents or heirs.

This structure of the standard model is now broadened by assuming, as proposed in section 2, that at the period $t = z$ a public pension program is implemented by which the old per capita are entitled to receive a benefit b_z from the young. The old compensate the young by handing a something d_z over to the young per capita. How the young individual can use the compensation d_z at $t = z$ depends on the way the pension scheme is run.

If it is fully funded the following static identity applies for both the old and young individuals:

$$(*) \quad b_z \equiv d_z,$$

Clearly, this transaction does not change the maximization problem of the young generation at $t = z$ when the pension program is organized as a fully-funded system. The compensation d_z completely offsets the payment b_z leaving the budget constraints of the young unaffected. Since the system for generations to come is assumed to be funded the young then have to make a social security contribution at $t = z$ in order to provide for their own old age at $t = z + 1$. For the sake of simplicity, we assume that the social security contribution of the young individual d_z^* equal d_z , be invested and returned with interest at time $z + 1$ when the now young is supposed to retire. Thus, as long as d_z^* does not exceed the amount of saving the young considers as optimal at $t = z$ we get the following well-known first-order conditions which, not surprisingly, equal exactly those that ensure an optimal market allocation without social security (see, for example, Blanchard-Fischer, 1989)

$$(1) \quad u'(w_t - s_t) = (1 + \theta)^{-1} (1 + r_{t+1}) u'((1 + r_{t+1})s_t),$$

$$(2) \quad s_t = (1 + n)k_{t+1},$$

$$(3) \quad w_t = f(k_t) - k_t f'(k_t),$$

$$(4) \quad r_t = f'(k_t),$$

where $u(\bullet)$ stands for the utility function, $u'(\bullet)$ for the first derivative, θ for the strictly positive rate of time preference, w_t for real wage per capita, s_t for per capita saving, n for the growth rate of the economy (that is, in the given context the growth

rate of the population), k_t for the capital-labor ratio, $f(k)$ for the production function, and $f'(k)$ the first derivative.

There are, of course, no welfare losses in this set-up, neither for the young nor the old. At time $t = z$ the old get b_z per capita from the young and the young receive d_z per capita which is as good as b_z . In the following, the social security payment d_t^* of the young per capita is simply considered as a part of the total saving s_t per capita, all what matters is that the young individuals gain r_{t+1} as a rate of return on her social security contribution. In this case the retirement benefit for the young per capita at $t = z + 1$ then is $b_{z+1} = (1 + r_{z+1})d_z^*$. This also applies to the subsequent generations as well.

What happens to the first-order conditions (1)-(4) when, at time $t = z$, the government introduces an unfunded pension system. Most notably, while the identity (*) still applies the young, in addition, have to face the following dynamic identity:

$$(**) \quad \frac{b_{z+1}}{(1+n)} \equiv d_z,$$

The individuals' maximization problem now is subject to

$$(\bullet) \quad c_{1z} + s_z + b_z = w_z,$$

$$(\bullet\bullet) \quad c_{2z+1} = (1 + r_{z+1})s_z + (1 + n)d_z,$$

which is equivalent to the assumption made in section 2 that the young are not allowed to consume the compensation d_z at $t = z$ but are rather forced to put d_z aside for use as a compensation for retirement benefits they are entitled to receive at $t = z + 1$.

Under these constraints, the first-order condition (1) which governs the consumption (or saving) decisions of the individuals born at time t is affected and becomes

$$(1') \quad u'(w_t - s_t - d_t) = (1 + \theta)^{-1} (1 + r_{t+1}) u'((1 + r_{t+1})s_t + (1 + n)d_t),$$

Again, there are no welfare losses for the old and young at $t = z$ due to social security contributions. However, when compared with the decentralized competitive

equilibrium of a market economy without social security (or with a fully-funded pension program where $d_t^* < (1+n)k_{t+1}$) introducing a PAYGO system affects, most likely, the saving of the young negatively and, thus, could slow the rate of capital accumulation and lower the steady state capital stock. More notably, the social security benefits on a PAYGO basis will, for sure, increase at a lower rate than on a fully-funded basis since r is greater than n by construction.

To sum up, our story which is based on purely neoclassical assumptions does provide an answer to our two questions raised at the beginning: First, according to the model presented there is a social security program in order to ensure the old that they can trade their ‘something’ D , that they cannot consume, for B , they can consume. Second, given the set-up of our story it is hardly imaginable that a caring government will ever run a social security program which deprives the old of the retirement benefits they would receive in a fully-funded system. However, if a government has erroneously introduced a PAYGO system there is, according to our story, no excuse not to fix this blunder right away, because a transition from a PAYGO system to a fully-funded system is always welfare-improving.

4. Policy Implications – Are there Any?

The question arises if our model has an economic meaning or is just a gimmick. Of course, what we did was to turn the standard security story up-side down and, in so doing, let vanish all the problems associated with the old story. Yet, we think our story is worth being told that way, because it stresses what social security is all about: It is an intergenerational contract which is supposed to be fair and just for all generations, particularly for the future generations, and is certainly not restricted to benefits as a function of labor-income only. Admittedly, our way to tell the social security story comes close to the view of the old when their social security benefits are questioned by the young. Basically, the old hold that they contributed to strengthen both the economy and the society when young. This contribution is seen by the old as something which they can no longer enjoy, but the young can. Thus, the social benefits they receive when old are just the fair price for their contribution to the public good. Most notably, neither side seldom raise bequest or altruism motives to bolster their line of argumentation. As a result, social security benefits are

hardly ever considered by the beneficiaries as a transfer payment, they are rather viewed as fair intergenerational barter transactions. The political problem is that the most young pretend that they don't see it that way, in particular, they don't agree with the price they have to pay for the 'something' the old generation leaves them. This leads us straight to generational accounting as the most suitable framework to discuss the political aspects of a public pension scheme. A 'good' the old hold, but cannot enjoy, the young, however, can is a natural candidate for the centerpiece of a public pension program which is based on generational accounting. That is to say in more down-to-earth terms, a public pension system should be based not only on labor-income and labor-income distribution, but also on wealth, wealth-income and intergenerational wealth relations. In true perspective, a reform with a fully-funded pension program at its center does indeed not look stranger than paradise.

5. Final Remarks

The paper shows that the standard security story can be told in a way which makes sense in terms of standard welfare economics. Beyond that, the story which is neoclassical in spirit allows a reasonable, welfare-improving reform of social security any time with a transition from a PAYGO to a funded system at its heart. This is made possible by enriching the structure of the standard social security story such as to linking social security benefits to some sort of wealth initially held by the old but now controlled by the young. The political message is that pension schemes and their reform should rather be viewed as a matter of intergenerational accounting covering all areas of intergenerational relations, particularly intergenerational wealth relations. If this message will ever be heard and, if yes, will then be taken seriously by the political system remains to be seen. No question, doubts are in order.

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