The Value of Children and Immigrants in a Pay-as-you-go Pension System: A Proposal for a Transition to a Funded System

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A Proposal for a Partial Transition to a Funded System

By *Hans-Werner Sinn*

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I. Introduction

The crisis of the pension system is a demographic crisis. It results from a lack of new people who could pay for the pensions of the old. If there were more children or immigrants, there would be no crisis.

The pay-as-you-go (PAYGO) system socializes the earnings capacity of children and immigrants, and it imposes part of the burden of the crisis on families who have not caused it. It deprives parents of the fruits of their human capital investment, and it may have problematic incentive effects. The incentive effect can be seen in the lower birth rates of the western world and in a deterrence of immigration which conflicts with the basic liberties of the European union.

This paper describes a reform of the pension system which can help overcome the justice and incentive problems associated with the PAYGO system. The essence of this reform is a partial transition to a funded system which incorporates only those who do not have enough children. I will argue that this reform not only can bring about substantial equity and efficiency gains, but will also be a natural way of solving the transitional problems involved with the introduction of a funded system.

It is crucial for an assessment of the justice and incentive problems to clarify the value that a further participant of the PAYGO system has for the rest of the society. What is the fiscal externality of children and immigrants for the PAYGO system? In this address I will argue that this externality has often been underestimated and is, in fact, enormously large – so large that the justice and incentive problems involved require substantial policy changes.

I will begin my discussion with a short description of the pension crisis and a general critique of the current debate on the transition to a funded system, and I will then describe the reform proposal. The subsequent discussion about the magnitude of the external effect resulting from the birth of a child will help to determine the necessary amount of financial investment.

II. Aspects of the Crisis

When early voices warned about the imminent crisis of the pension system in the seventies and early eighties, the public did not pay much attention.[1] Today the empirical evidence is so alarming that it can no longer be overlooked. Figure 1 shows what is happening. In the European Community the "old-age dependency ratio", the ratio of people above 64 over those between 15 and 64 years of age has risen dramatically since the sixties and will continue to rise sharply in the years to come. The average will increase from 24% in the year 2000 to about 43% in the year 2040. The Japanese figures are similar to this, and even in the US the dependency ratio will climb to about 36%.

The situation is particularly alarming in Germany and Italy where the dependency ratio will double in the same period of time, from 24% to 47% or 48%, respectively. These two countries have the lowest reproduction rates in the world after Spain. Currently 10 Germans produce 6.2 children during their lives and 10 Italians only 6.1 children. 10 Spaniards have 5.8 children. In Germany the result is, as Börsch-Supan (1998) puts it, that the social security system is "on the verge of collapse".

For Germany the situation looks even more extreme if the dependency ratio is defined as the ratio of those 60 years and older over those between 20 and 59 years. Even with substantial immigration, this ratio will rise from the current value of 37% to 68%; i.e., while now three members of the working generation have to finance one retiree, in the year 2030 three members of the working generation will have to support two retirees.[2]

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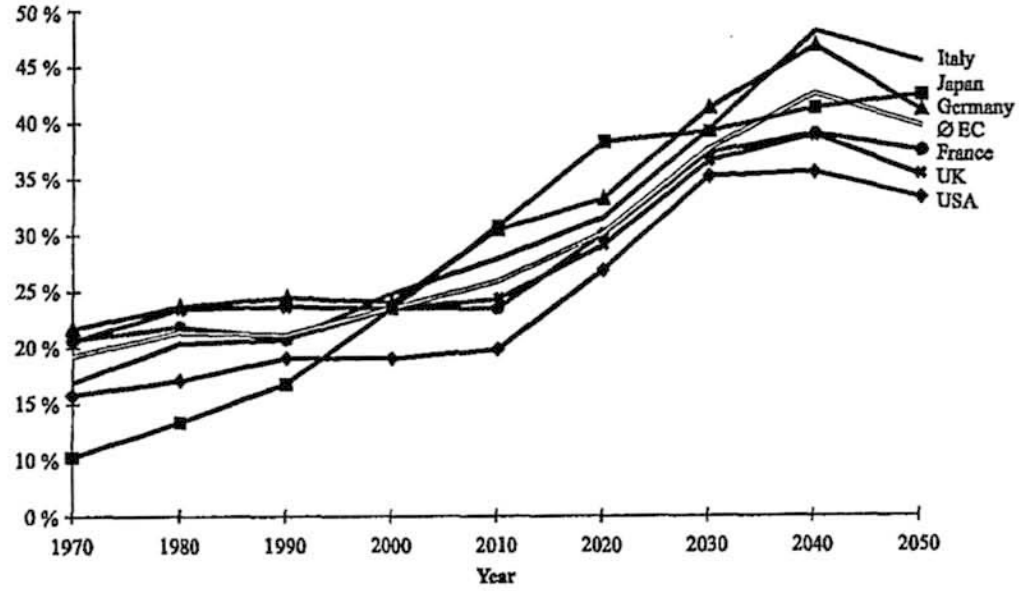
[1] See e.g. *Schmähl* (1974, 1984), Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft (1980), or *Miegel* and *Wahl* (1985).

[2] See *Sommer* (1994), scenario II, medium immigration (200.000 per year, decreasing number of Germans from eastern Europe).

Figure 1

Ageing in the EC, the United States and Japan
The rise in the old-age dependency ratio

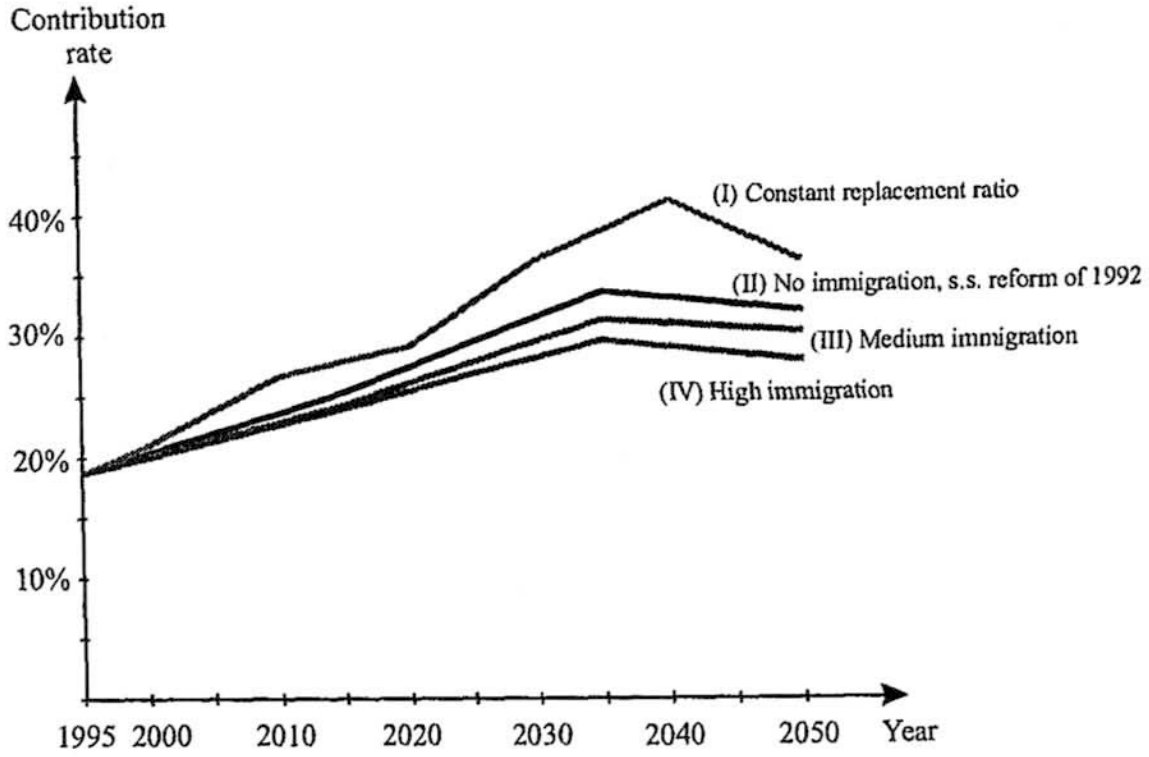


Source: Besseling and Zeeuw (1993).

Currently (1997) the German contribution rate is 20.3% of gross wages. If the replacement ratio, i.e. the ratio of pensions and average labour income, remains constant over time, the increase in the dependency ratio results in a proportional increase in the contribution rate. Figure 2 shows the projected development of the contribution rate under four alternative scenarios. The first scenario is one of a constant replacement rate and no immigration. The second one incorporates the measures to reduce the replacement ratio that were enacted in 1992. These measures introduced, among other things, the proportionality between pensions and net of tax wages which significantly reduced the pension growth rate. The third and fourth scenarios capture alternative immigration assumptions as described in the note to figure 2. Without immigration and with a constant replacement ratio, the contribution rate will exceed 40% in the year 2040. In the other scenarios, the rate will be lower. However, even under the extreme assumption (scenario IV) that the replacement ratio is gradually shrinking as defined in the reform of 1992 and that the annual rate of immigration will approach 1% of the existing population, which is roughly the rate which the US had in the last century, the contribution rate will climb to about 30%. This value will hardly be sustainable in the competitive environment which a single EC country will be facing.

Figure 2

The development of the pension contribution rate in Germany under alternative immigration scenarios



Source: Besseling and Zeeuw (1993, tab. 3.2), Bonin, Raffelhüschen, and Walliser (1997, tab.1), and own calculations.

Note: (I) Constant replacement ratio, no immigration. (II) No immigration and measures to reduce the replacement rate enacted in 1992. (III) Like (II), but medium immigration of 100.000 ethnic Germans per year which will decline to zero until 2011. Steady inflow of 200.000 other migrants per year. (IV) Like (II), but high immigration scenario: 300.000 immigrants every year from 1996 to 2012. From 2013, 620.000 immigrants per year.

III. Is the Funded System More Efficient?

With the PAYGO system, a rising contribution rate is a problem because it may exacerbate existing tax distortions. With a funded system, things are different, for in such a system the contributions would be considered as savings. Only the PAYGO system suffers from the problem that a substantial fraction of the contributions is, in fact, a wage tax which creates a labor leisure distortion.

The fraction of the contributions which is equivalent to a wage tax approaches 100% if there is only a loose individual connection between the contributions and the labor pensions. The Swedish and the US systems are of this type. However, even with a fairly perfect system of individual accounts such as the

German one, the tax-like fraction of the contributions is substantial. Even if the current pension formula and contribution rate could be kept constant over time the contributions of a new member of the German pension system would buy a pension which is only 40% of the pension these contributions would have bought if invested in the capital market. In other words, about 12 percentage points of the contribution rate of 20.3% is lost.[3]

The reason for the loss is the well-known result of Aaron (1966), according to which the rate of return for a contribution to a PAYGO system equals the growth rate of the sum of wages assuming that the contribution rate remains constant over time. Since this growth rate is approximately the GDP growth rate it cannot in the long run exceed the rate of interest. If it did, the economy would be dynamically inefficient and a capital market equilibrium would not exist. The prices of assets such as land or shares whose returns are likely to grow with the GDP growth rate would be infinite[4], and rather than imposing distortionary taxes the government should finance its budget exclusively by borrowing because the marginal social cost of borrowed funds would be zero. The land of Cockaigne where the growth rate permanently exceeds the rate of interest does not exist. In all mature industrialized countries the rate of interest exceeds the growth rate. Over the last 20 years the EC average for the difference between the rate of interest on government bonds and the growth rate of GDP was about 1.5%, and in some countries like Denmark or Belgium it even exceeded 4%.[5]

It is often argued that the comparatively low rate of return offered by a PAYGO system is a sign of inefficiency and that replacing the PAYGO system with a funded system would generate huge welfare gains. There would only be a problem in some initial period because the working generation faces the double burden of paying for the old and saving for their own pensions but this problem would be transitional and unimportant relative to the long run gains.

This view overlooks the trivial fact that, apart from administrative costs, any pension system, be it PAYGO or funded or a combination of both, is a zero-sum game for all the generations participating in the sense that the present value of all contributions (C) equals the present value of all pensions (P):

$$\sum_{t=0}^{\infty} C_t R_t = \sum_{t=0}^{\infty} P_t R_t \tag{1}$$

Here t is the time index and R_t the discount factor for a particular period. Any attempt to modify the pension system so as to make some generations better off will automatically make others worse off. As Breyer (1989) once stated clearly, there is no Pareto improving transition to a funded system.

The tax-like part of the contributions which has been the matter of concern for so many critics is the counterpart of the gains which the introductory generation

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[3] The following assumptions are used for the derivation of this result. Real rate of growth of gross and net-of-tax wage rate: 1.5%. Real rate of interest: 4%. 40 years of contribution payments and 18 years of pension claims at the current German pension formula and contribution rate. Income profile as depicted in fig. 3.

[4] See *Niehans* (1966) or *Homburg* (1991).

[5] See OECD, Main Economic Indicators, country pages in several volumes, 1960-1996.

and other earlier generations made at a time when the growth rate exceeded the interest rate. It is a burden which all future generations will have to bear under the PAYGO system. The transition to a funded system can change the time path of this burden, for example by imposing it on the present working generation alone, but it will not be able to affect its size in present value terms.

It has been argued by Homburg (1990) that a Pareto improving transition to a funded system is nevertheless possible because such a transition would reduce the labor-leisure distortion. The reduction in the labor-leisure distortion, he maintained, could be translated into a utility increase for each generation. This argument is correct with a flat pension system where indeed the full social security contribution can be considered as a wage tax. However, as shown by Fenge (1995), the argument does not apply when the PAYGO system is endowed with individual accounts as in Germany. When the pensions are proportional to the contributions of each individual, the labor-leisure distortion will result only from the implicit tax which is necessary to pay for the gains of earlier generations (the 12 percentage points mentioned above). This tax and the resulting distortion could have been avoided had the PAYGO system never been introduced. But given that this system is in place today, and given that today's pensioners have legitimate claims, the distortion cannot be avoided with the transition to a funded system.

Fenge's result is important for the current discussion about the PAYGO system because it sheds new light on the welfare improvements from a transition to a funded system which authors like Feldstein (1995,1996), Kotlikoff, Smetters, and Walliser (1998), Feldstein and Samwick (1997) or Börsch-Supan (1998) have recently calculated in empirical general equilibrium models. In all of these papers the welfare improvements are merely by-products of a transition to a funded system which are not essential for this system and which could also have been attained without such a transition.

For example, Feldstein and Börsch-Supan assume that the funded system can invest tax-free at the pre-tax rate of return, while a normal capital investment is discriminated against by a capital income tax. The welfare gain they calculate in this way would also have been available by abolishing the capital income tax or reforming it along the lines suggested by the Meade Committee (1978). Similarly, Kotlikoff, Smetters, and Walliser assume that the funded system is combined with a value-added tax with a declining rate which is used to finance the existing pension claims resulting from the old PAYGO system. If the rate of decline of the value added tax rate is appropriately chosen, this tax would eliminate the capital income tax wedge and generate welfare gains by making the system intertemporally neutral.[6] This virtue, too, could have been achieved with an isolated reform of the existing tax system. A gigantic reform such as the transition to a funded system would by no means have been necessary. I conclude that the transition to a funded system will not be able to bring about any welfare improvements of the conventional type which would not have been available with an appropriate isolated reform of the tax system. At best, arguments of political feasibility or public saleability can be used to claim such improvements.

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[6] See *Howitt* and *Sinn* (1989).

IV. A Funded System for those who Caused the Crisis

Although welfare or efficiency gains of the conventional type are not available from a transition to a funded system, a solution to the crisis of the PAYGO system may nevertheless be sought in the funded system. As explained, the crisis is a demographic one. It results from an underinvestment in human capital. In principle, there are only two useful types of policy measures that promise a solution: measures that raise the stock of human capital and measures that raise the stock of real capital.

The major ways of raising the stock of human capital are fertility and immigration policies. As will be explained below there is indeed a need for such policies, however, neither of these policies will be able to change the demographic composition sufficiently fast to solve the crisis. Even with changed economic incentives, fertility choices change only gradually with the passage of time. It took a long time until people learned that the PAYGO system permits a decent life in old age even when they have no children and until they reacted by lowering their birth rates. Moreover, even a sudden change in fertility rates would only in the long run result in a larger working generation. First, there is a natural lag of about 20 years before the children can enter the work force and, second, an increased flow of entrants can only gradually grow to a sizeable stock. Immigration could work a little faster, but, as has become clear from figure 2, even strong immigration similar to that into the US in the last century would not change the picture significantly. Note also that immigration into a particular country would not help solve problems if the immigrants came from another country which also has a demographic problem. Useful immigrants would have to come from overpopulated regions of the world, but such immigration would involve new problems for the immigration countries which may not be smaller than those that are to be solved.

Thus measures to increase the stock of real capital remain as the most important alternative, and basically this is the case for the introduction of a funded system. The introduction of a funded system would make the scarcity around the year 2030-2040 palpable now and would help shift the necessary resources into the future, thus smoothing consumption over time.

A complete transition to a funded system is not desirable though. The logic of my argument implies that a funded system would only be needed as a complement of the PAYGO system not as a replacement. Only to the extent that human capital is lacking will additional real capital be needed. More than that is unnecessary.

The lack of human capital is not a general problem that affects all pensioners alike. Those of them who brought up a sufficient number of children could in principle continue to participate in the PAYGO system without any difficulties. Only those who did not invest enough in human capital by raising children need complementary funding by saving in terms of real capital.

A hybrid pension system that takes account of this asymmetry would be cutting the pensions from the PAYGO system in proportion to the number of children that are less than some target level and forcing people with an insufficient number of children to make compensatory contributions to a funded system. The contributions would be used to replace the resulting loss in pension claims

and they would have to be made in addition to the normal contributions to the PAYGO system which are required to pay for today's pensioners. Alternatively, the hybrid system can be described as one where everyone participates in the funded system and in the PAYGO system but where members with children get a rebate for every child they raise.

The hybrid system I described can be defended with several reasons.

The first is justice. In order for the pension system to function, every working generation has two duties, not just one. It has to make contributions to the current old and it has to raise children. Those who did not raise children caused the crisis and they could be asked to pay for the consequences by making contributions to a funded system in addition to paying for the old. This is basically what Albers (1990) called the causality principle.[7]

The second reason is the ability-to-pay principle. Those who did not raise enough children have saved the resources needed for that purpose, and they are able to make the contributions to a funded system. The ability-to-pay principle is very important in this context since it has often been argued that a transition to a funded system is not feasible, because the current working generation would have to bear a double burden. This argument is misleading, because every generation has to bear a double burden anyway with a functioning PAYGO system. My proposal just makes sure that everyone will indeed bear a double burden: paying for the old and paying for their own pension where the latter can be done by way of investing in human or in real capital. Currently, some people bear a single burden and others a double one, and if the funded system were introduced for everyone, some people would bear a triple burden while others would only bear a double one. With my proposal such asymmetries do not exist. There is no transition problem.

The third reason in favor of the hybrid system is the improved incentive structure with regard to fertility decisions. The so-called "social security hypothesis", that the existence of the PAYGO system has significantly contributed to the secular decline in birth rates, is now a well-established empirical fact.[8] The hybrid system re-establishes the natural incentive to raise children as an assurance against poverty in old age that has been prevalent in human societies ever since they came into existence, and thus removes a serious economic distortion. As explained, this effect will come too late to resolve the current pension crisis. However, it is important insofar as it removes the only true economic distortion which the PAYGO system brings about. Because it removes the distortion in the fertility decision the hybrid system is ultimately able to bring about true welfare gains. I will come back to this issue in section VII.

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[7] Earlier authors who had made this argument include *Zeppernick* (1979) or *Dinkel* (1981).

[8] See *Cigno* and *Rosati* (1996) or *Nugent* (1985). For theoretical contributions to the social security hypothesis I see, e.g., *Cigno* (1991, 1993) or *Werding* (1997 and 1998).

V. The Value of a Child in the PAYGO System

In order to design a fair hybrid system where missing children are replaced by investment in real capital, it is essential to know what the value of a child in the PAYGO system really is. How much does someone who raises a child contribute to the rest of the society and how large would an equivalent contribution to a funded system have to be?[9]

To calculate the effect, consider a simple three-period overlapping generations model. Generation t is born in period $t-1$, it works in period t and receives a pension in period $t+1$. The average number of children per member of generation $t-1$ is n_t, and a child's lifetime wage income in period t is the multiple w_t of a parent's lifetime wage income. Let r_t be the rate of return for an investment in period $t-1$ which becomes available in period t.

The pension of a member of generation t is

$$P_{t+1} = n_t \cdot w_t \cdot C_t \tag{2}$$

where C_t is the lifetime contribution of this member. The direct net contribution X_t to the system of a member of generation t evaluated in prices of period t is

$$X_t = C_t - \frac{P_{t+1}}{1+r_{t+1}} \tag{3}$$

or, using (2),

$$X_t = C_t\left(1 - \frac{n_{t+1} \cdot w_{t+1}}{1+r_{t+1}}\right) \tag{4}$$

This is basically the value to the social insurance system of a member of generation t as calculated by Becker and Barro (1988, p.17). These authors argued that the value of a member is the discounted difference between the contributions and pension claims which is positive if the internal rate of return for pension contributions falls short of the rate of return offered by the capital market; i.e. if $n_t \cdot w_t < 1+r_t$ as was explained in section II.

However equation (4) does not reveal the value of a child for the social security system, because it neglects the fact that a new member of the system has children which themselves have children and so on. The birth of a child generates a cash flow for the PAYGO system not just in its own life, but for as long as that system exists provided this child and its descendants exhibit the normal reproduction behavior of the population. Adding a child to the system means adding a dynastic chain of generations that will never cease to exist.

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[9] This section develops a verbal argument first put forward by *Lüdeke* (1988, p. 177) and extended in *Sinn* (1989). It is based on an exchange of letters between the author and *Lüdeke* in 1989. See also *Lüdeke* (1995, p. 167 f.) and *Werding* (1998, ch. 5).

To find the true value of a child, let

$$N_t \equiv \prod_{i=1}^{t} n_i \tag{5}$$

be the number of descendants in generation t per member of generation 0 and

$$W_t \equiv \prod_{i=1}^{t} w_i \tag{6}$$

the lifetime wage income of one member of generation t relative to the lifetime wage income of generation 0. Moreover, let

$$R_t \equiv \prod_{i=1}^{t} \frac{1}{1+r_i} \tag{7}$$

be the discount factor for cash flows of period t in terms of values of period 0. Assume $N_0 = W_0 = R_0 = 1$.

Using these definitions and equation (4) the value in period 0 of the direct net-contribution of a member of generation t to the social security system, X_t^0, can be written as

$$X_t^0 = C_t\left(R_t - \frac{N_{t+1}W_{t+1}R_{t+1}}{N_t \cdot W_t}\right) \tag{8}$$

or assuming that individual contributions grow in proportion to wages,

$$X_t^0 = C_0\left(W_t R_t - \frac{N_{t+1}W_{t+1}R_{t+1}}{N_t}\right) \tag{9}$$

The present value of all net contributions, V_0, which the new dynasty founded with an additional child will generate is

$$V_0 = \sum_{t=0}^{\infty} X_t^0 N_t \tag{10}$$

provided the dynasty reproduces at the normal rate; i.e. has N_t descendants in period t. Using (9), we get

$$\begin{aligned} V_0 = C_0[&N_0W_0R_0 - N_1W_1R_1 \\ &+ N_1W_1R_1 - N_2W_2R_2 \\ &+ N_2W_2R_2 - N_3W_3R_3 \\ &\ldots\ldots] \\ &= C_0 \end{aligned} \tag{11}$$

Thus the net present value of all payments generated by the dynasty put in place when a child is born equals the gross contribution of this child to the social

security system. It turns out not to be correct to subtract the present value of this child's own pensions, because the children of the child will make the contributions necessary to pay its pensions, and their children will pay for their pensions and so on.

If the additional child could set up a PAYGO system with its own descendants it would be able to enjoy the full introductory gain by receiving a pension without making a contribution other than raising his or her own children. However the child is not allowed to do so. The child will be forced to make contributions to the existing system that will not be transferred to its own parents but will either be transferred to the community of all parents in the form of additional pensions or be used to lower the contributions of other parents' children. One hundred percent of the gross contributions of the additional child are a positive fiscal externality that benefits the rest of the society.

There are two noteworthy implications of this result. The first concerns the size of the necessary contributions to a funded system by those who do not have enough children. And the other concerns the distortion in individual fertility decisions. The next two sections address these problems.

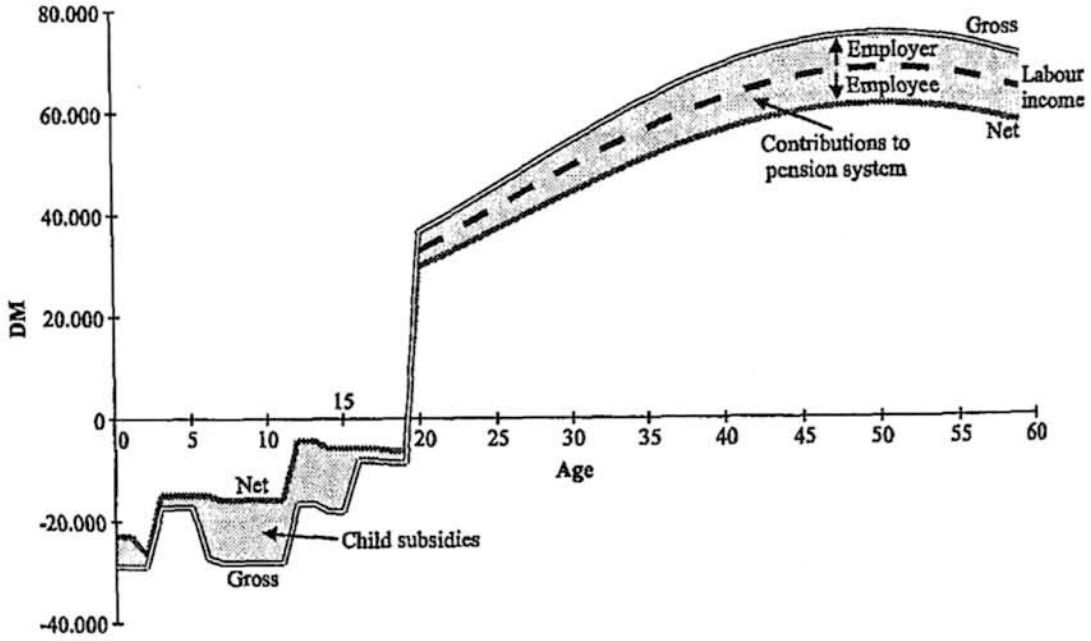
VI. The Value of a Child in the German Pension System: An Example

If equation (4) were applicable, the value to the PAYGO system of a child would not be very large because only the discounted difference between one individual's pensions and contributions would count. In fact, however, given the result stated in (11), the total gross contribution to the PAYGO system is a net external effect, and this could be a large sum of money.

Figure 3 shows the typical cash flow profile of a typical German worker where it is assumed that he begins to earn an income subject to social insurance contributions at the age of 20 and finishes working at the age of 60. The profile reflects cross-section data of the year 1997. Assuming a real rate of growth in labor income of 1.5%, a real rate of return for a capital market investment of 4% and a social security contribution rate of 20%, the present value at age 20 of a new member's lifetime contributions to the PAYGO system is DM 285.000. Accordingly, the present value of lifetime contributions of a child born today is DM 175.000. This is the fiscal externality resulting from the birth of a child and this is an amount that could be used as a guideline for the present value of the rebate per child in the contribution to a funded system.

Figure 3

The lifetime cash flow of a child in Germany until pension age



Notes: The figure shows the gross and net cash flows. The gross cash flow is defined including taxes, contributions to the pension system and public in-kind transfers. The expenses for a child consist of consumption, schooling and the mother's opportunity cost of time. The consumption of a child is assumed to equal the normal consumption subsidized by social aid (Sozialhilfe) and the cost of schooling is the average public schooling expenditure per child. It is assumed that the mother does not work from birth to the third year of a child and has a part time job from the child's fourth to twelfth year of life. Her annual full-time gross income is DM 35.000. The child begins to earn an income at the age of 20 years and receives a pension after the age of 60 years (German average). His initial annual gross income (net of the employer's contribution to social security) is DM 33.000 and it reaches the average income of all members of the German social security system (DM 54.000 p.a.) at the age of 33 years. German data not being available, the lifetime profile of this income is assumed to equal the pattern which Blanchflower and Oswald (1994) found for Austria and Switzerland, two similar countries. The net cash flow is defined as the gross cash flow net of contributions to the pension system and net of the in-kind subsidy of free schooling and child benefits where the latter are equal to DM 4.200 p.a. for the first two years and DM 600 thereafter. All data refer to cross section comparisons for prices and wages of 1997.

Source: Blanchflower and Oswald (1994, pp. 429, 438); Bundessozialhilfegesetz: § 22; Bundeskindergeldgesetz: § 6; Bundeserziehungsgeldgesetz: § 5; Deutsches Institut für Wirtschaftsforschung: Alternde Gesellschaft. Zur Bedeutung von Zuwanderungen für die Altersstruktur der Bevölkerung in Deutschland, DIW Wochenbericht 33/1995, pp. 579-589, here: p. 580; Schmidt (1992); Statistisches Bundesamt: Statistisches Jahrbuch für 1996, Metzler und Poeschel: Wiesbaden, 1997, p. 504, table 20.4 and p. 379, table 16.2.

It could be argued that this amount is an overstatement of the fair rebate insofar as the government contributes to the human capital investment by providing free education, child benefits and child allowances in the tax system. Given that the government subsidizes the investment in human capital and hence the creation of new contributors to the system, those who do not have enough children should not be asked to compensate for the full value of a child to the PAYGO system. Figure 3 reveals the information necessary to make an adjustment for this argument. The present value of public schooling and child benefits in Germany is DM 107.000. Subtracting this from the value of a child as calculated above still leaves the substantial amount of DM 68.000.[10]

However, such a calculation may be misleading because child benefits and public schooling are not motivated by the attempt to compensate for the fiscal externality via the PAYGO system. In Germany, a substantial fraction of the population do not participate in the PAYGO system because their income is too high or because they are covered by other pension schemes. Nevertheless they receive free schooling and public child benefits. Be it as it may, it remains an indisputable fact that the German public pension system in itself involves a marginal net entrance fee of about DM 175.000 and that this sum is the investment in a funded system necessary to compensate for each missing child.

VII. Removing the True Distortions

As explained above, the current debate about the distortions created by the PAYGO system concentrates on the labor leisure distortion, but this distortion cannot be avoided by a transition to a funded system. A distortion that can be avoided is the family's fertility choice.

The decision to give birth to a child creates a large positive external effect for the rest of the society via the PAYGO system. In the German example this was DM 175.000. If this external effect is internalized in the family's fertility choice it is likely that many more children will be born, and this would be a welfare improvement if judged from the point of view of the parent generation. The distortion in the fertility choice is the only major efficiency problem of the PAYGO system that can be avoided.

One possibility for achieving this end would be a general transition to a funded system. However this possibility would affect the parent's fertility choice only indirectly to the extent they have an altruistic concern for their children's consumption. A more direct way would be the introduction of the hybrid pension system described above. If everyone had to pay for the old and into a funded system, but those with children received a rebate in the contributions equal to the external effect, a very strong impact on fertility behavior would be likely. The sum mentioned above would certainly induce many families to decide for more children.

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[10] Note that, for an argument similar to the one given in the previous section, it would not be necessary to subtract the subsidies paid out to future generations of children. These subsidies would always be covered by the excess of ordinary taxes over public expenditures as borne by the respective generation of tax payers. The marginal decision to give birth to a child today is also a marginal decision for an additional tax payer.

I mentioned the empirical literature which has provided an overwhelming evidence for the prevalence of the social security hypothesis. Additional evidence for a strong reaction of fertility choices to fiscal stimuli are given by two German experiences. The one refers to the integration of the Saarland in 1957, which had been ruled by France since the second world war. The integration meant that the high level of French child benefits was replaced with the meager incentive structure of the German system, and the result was a rapid decline in birth rates. While the Saarland had a much higher fertility rate than the rest of Germany before the integration, its fertility rate dropped below the German average after the integration.[11]

The second example is the family policies enacted in the German Democratic Republic in 1976. These policies led to a sudden and dramatic increase in birth rates. Before the policies were enacted east and west German birth rates were more or less equal. Thereafter the east German rates climbed to a level of 43% above those in the west. Part of this was a timing effect because some children were conceived earlier than originally planned, but the total number of births also reacted significantly.[12]

As said before, the positive effect on birth rates of the hybrid system I propose will not be able to solve the current pension crisis because it comes too late. Nevertheless it will induce a permanent welfare improvement which is another plus in addition to the equity and ability-to-pay arguments which are the basis of this paper.

VIII. The Value of an Immigrant

The roles for the social security system of a new child and an immigrant are similar. Both are net contributors to the system and create a positive fiscal externality. Nevertheless there are important differences.

If the immigrant families return to their home country the value of the fiscal externality would be governed by the Becker-Barro formula (4) and would hence not be very large. On the other hand, if the immigrant family and their descendants stay, the value of an adult immigrant may even be higher than the value of a new child.

First, he starts paying social security contributions immediately so that the contributions have to be discounted over a shorter period. Second, the immigrant may have more children than the average domestic inhabitant. In Germany, this is an important effect. During the last 15 years, the average immigrant woman had 35% more children than the average German woman. In the next generation, however, there is no longer a significant difference in the fertility behavior.

In principle, there is also a negative effect. Immigrants tend to earn less than the average German and hence pay less in social security contributions (and receive lower pensions). However, this effect is negligeable. Initially, in the first

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[11] See *Schwarz* (1989).

[12] See *Büttner* and *Lutz* (1989).

year after immigration, the wage gap is very small, but this gap closes continually over a period of 17 years.[13]

Using (4), the value of an immigrant, whose income is the multiple α of an average domestic member of the social security system and whose number of children is the multiple β of the average number of children, can be written as

$$V_0 = C_0 + C_0(\alpha - 1)\left(1 - \frac{n_1 w_1}{1 + r_1}\right) + (\beta - 1)\frac{C_1}{1 + r} \tag{12}$$

where C_0 and C_1 are the typical contributions of social security members in the first and second generation after immigration. Based on this formula, I arrive at a present value of about DM 340.000. This is nearly twice as much as the gross value of a German child to the system.

Obviously, the PAYGO system involves a substantial entrance fee for immigrant families which is a major gain for the incumbent population. Waiving this fee would certainly increase immigration flows, but such a policy measure would meet with strong objections. Among the justified reasons for charging an entrance fee are the potential erosion of the redistributive tax system and the rivalry for impure public goods which are offered at prices below their marginal congestion cost. Perhaps the PAYGO system could even be interpreted as a congestion charge. It goes beyond the scope of this paper to try to come to a conclusion on this issue.

If the hybrid system, presented above, is introduced, there are two possibilities for treating immigrants. One possibility is to treat the immigrants like domestic workers, i.e. ask them to pay for the old and give them the normal rebate for their children. In this case a fiscal externality roughly equal to the gross contribution of one immigrant remains. In Germany this is a sum of about DM 280.000. The other possibility is to free the immigrants from paying for the old. Realizing this possibility would establish full fiscal neutrality with regard to the immigration decision, but of course it would not bring about any fiscal relief for the existing population.

IX. Conclusions

If a new pension system had to be introduced from scratch today, the choice would be likely to be the funded system. However, the PAYGO system is in place, and the transition towards a funded system would be far from simple. Under these circumstances a hybrid system seems better suited for solving the current pension crisis.

In the PAYGO system each member of the working generation has to bear a double burden: supporting the old via their contributions to the system and investing in human capital by raising children. Those who chose to bear only one of these burdens and who have thus caused the pension crisis could be asked to bear a double burden, too. Since they did not invest in human capital it might

[13] See *Schmidt* (1992). For Germany we calculate a value $\alpha = 0.97$.

be fair to make them invest in financial capital instead. This idea is the essence of the hybrid system proposed in this paper.

The necessary investment is equal to the fiscal externality created by a child via the pension system. In Germany this is an amount of about DM 175.000 if account is taken of the fact that the birth of an additional child is the birth of a new dynasty of descendants.

Immigration is an alternative to raising children or investing in the capital market. The immigrant's contributions are readily available without a human capital investment, and he or she raises more children than the average domestic inhabitant. A skilled immigrant dynasty may contribute twice as much as a new child in present value terms to the PAYGO system, a sum of over DM 300.000 being easily attainable. However immigration may not be strong enough to solve the crisis and may involve other types of problems which are no smaller than the one it is expected to solve.

Summary

It is shown that the net fiscal externality created by an additional member of a Pay-as-you-go-pension system that is endowed with individual accounts equals the gross contributions of this member. In Germany, this is an amount of about DM 175,000. The paper uses this information to design a hybrid funded system that avoids this externality and improves the public pension system under equity and efficiency considerations.

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