Reform Options for Pay-As-You-Go Public Pension Systems

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1 Fiscal Affairs Department, International Monetary Fund. Opinions expressed are those of the authors and not necessarily of the International Monetary Fund. We thank Robert Holzmann for useful comments. This paper is part of the World Bank’s pension reform primer programme. For details see the website: http://www.worldbank.org/pensions.
The recent history of traditional public pension schemes is one of continuous readjustment of benefit formulas, retirement ages and other parameters. This paper reviews the basic relationships that determine the fiscal sustainability of public pension schemes, the challenges of maturation and aging populations when schemes are finance on a pay-as-you-go basis and the options available to policymakers short of systemic reform.
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1. Introduction

Public pension schemes in many countries are predominantly of a pay-as-you-go (PAYG) type, particularly in advanced and transition economies. This paper reviews the types of stresses that PAYG systems can experience and discusses a range of policy options to preserve the financial stability of public PAYG systems. Section 1 introduces the basic policy levers of a stylized PAYG system. Section 2 discusses the key short- and long-run financial challenges faced by PAYG systems. Section 3 covers parametric adjustments in the basic PAYG policy levers as well as administrative reforms. Section 4 describes broader reform strategies for maintaining financial equilibrium in a PAYG system including the option of partial funding.

2. Policy levers in PAYG systems

The main parameters affecting the financial condition of a stylized PAYG system can be brought out by considering the system’s basic budget constraint:

\[(1) \ N(\forall W) = M(\exists W),\]

where \(N\) denotes the number of contributors to the system, \(\forall\) is the effective pension contribution rate, \(W\) denotes average gross earnings subject to contributions, \(M\) is the number of pensioners, and \(\exists\) denotes the effective pension replacement rate.\(^2\) Equation (1) says that revenue and expenditure of a PAYG system have to match in each period.\(^3\) Accordingly, the equilibrium contribution rate of a PAYG system is defined as:

\[(2) \ \forall = \exists(M/N),\]

where \((M/N)\) is the pension system dependency ratio. Two extensions of the basic budget constraint (2) are useful for the following discussion of PAYG reform options. Firstly, to highlight the distinct implications of population aging and labor market developments on PAYG finances, assume that the number of contributors amounts to a proportion (of the

\(^2\) If pensions are indexed to consumer prices (CPI), the pension replacement rate of individual pensioners may, however, vary over the retirement period.

\(^3\) PAYG systems may, however, also maintain a fluctuation reserve.
number of persons of working age \((N^*)\) and, similarly, assume that the number of pensioners corresponds to a proportion \(*\) of the number of elderly persons \((M^*)\). Second, to allow for the financing of pensions through budget transfers, assume that a proportion \(\vartheta\) of expenditure on pensions is financed by budget transfers. Under these assumptions, the effective equilibrium contribution rate of a PAYG system can be written as:

\[
\forall = \exists(1-\vartheta)\left(\frac{*}{(M^*/N^*)}\right),
\]

where \((M^*/N^*)\) is the elderly dependency ratio.

The basic policy levers or parameters in the stylized PAYG pension system represented by (3) are the effective contribution rate \(\forall\), the budget transfer rate \(\vartheta\), and the pension replacement rate \(\exists\). In addition, policies that have an impact on the two pension system coverage ratios \(*\) and \(\()\), such as labor market policies, immigration policies, and retirement age regulations can also affect financial conditions. Finally, the finances of a PAYG pension system can be importantly influenced by demographic trends, as indicated by the presence of the elderly dependency ratio \((M^*/N^*)\) in equation (3).

The design and parameters of actual PAYG systems vary substantially across countries.\(^4\) It is nevertheless useful to group public PAYG systems under the three broad headings “large,” “medium,” and “small,” according to their role and size in the overall pension system’s multi-pillar structure. First, large-sized public PAYG pension pillars are mandatory schemes with broad coverage and relatively high pension replacement rates. Large-sized PAYG schemes usually dominate a country’s retirement income provision, leaving relatively minor roles to private pension arrangements. The PAYG schemes in many European countries as well as most transition economies would fall under this heading. PAYG schemes in developing countries, while mostly restricted to public sector employees, often mimic the other key features of large-sized PAYG systems. Second, medium-sized mandatory PAYG schemes with wide coverage but pension benefits that promise an average wage earner a pension of, say, only around 40 percent of average wages. Medium-sized

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\(^4\) The annual publication *Social Security Programs Throughout the World* published by the U.S. Social Security Administration provides useful information on the parameters of the main public pension systems in most countries; it is also available on the internet under [http://www.ssa.gov](http://www.ssa.gov).
PAYG schemes provide significant scope for private pension arrangements. The PAYG schemes in most Anglo-Saxon countries, but also in continental European countries including the Netherlands and Switzerland fall under this heading. The third grouping is comprised by small-sized PAYG schemes, which are often financed exclusively through budget transfers, and designed to provide poverty relief to persons not adequately covered by private pension schemes. The public pension schemes in Australia and Chile would fall under this category.

3. Challenges to public PAYG systems

For a given setting of the basic PAYG policy parameters, pressures on the finances of a PAYG scheme can originate from adverse developments in the two pension coverage ratios or the elderly dependency ratio. At the same time, a given setting of the basic PAYG policy parameters may itself be the source of endogenous changes in the pension coverage ratios.

In the initial stage after the establishment of a medium- to large-sized PAYG system, the proportion of contributors in the working-age population (\( \ell \)) is typically large, while the proportion of pensioners in the elderly population (\( * \)) is typically low. This enables relatively high pension replacement rates (\( \Xi \)) to be paid without a concurrent need to levy high pension contribution rates (\( \forall \)). However, as the PAYG system matures, the dependency ratio \( *(\ell) \) will typically rise rapidly and, with unchanged replacement rates, contribution rates (and/or budget transfers) need to be adjusted upwards. Such adjustments have been typical for the medium- to large-sized PAYG systems in advanced economies since the 1950s. However, in the particular case of the transition economies, initial contribution rates and/or transfer rates were often set at high levels, as these countries rely almost exclusively (as a legacy of the planned economy) on large-sized PAYG systems for retirement income provision.\(^5\)

As PAYG schemes mature, several forces can put pressures on the financial position. First, by increasing the ratio \( *(\ell) \), high contribution/transfer rates required to finance

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large-sized PAYG systems may imply a high distorting tax burden on labor. This will tend to erode the formal economy’s employment opportunities and incentives, in particular for low-skilled/low-paid labor. Second, in response to adverse macroeconomic shocks and increased unemployment, there is often a (political) temptation to use the public pension system as a safety valve for reducing labor market pressures from elderly workers by encouraging their earlier retirement. And third, lax administrative controls/incentives can lead to increased rates of early retirement and/or disability schemes. Thus, increasing contribution/transfer rates in response to increases in the PAYG system’s coverage ratio can lead to a vicious circle of falling employment, and rising pension expenditure. If pensions are indexed to average wage developments, the “screening out” of low-skilled/low-paid workers reinforces this vicious circle by increasing average labor productivity and wage growth in the economy.

Much attention has recently focussed on the financial implications of population aging, reflected in projected rapid increases in elderly dependency ratios. Population aging is generally a slow, steady, and relatively predictable process, providing policy makers with ample time and forewarning to prepare and put policy responses into place.

Finally, PAYG pension systems may also need to be adjusted to changing economic and social environments. For example, the large-sized PAYG systems in Western Europe were established during the 1950s and 1960s based on the assumptions that jobs would usually be full-time and that labor market attachment of workers would be relatively steady. However, deindustrialization, skill-biased technological progress, and rising labor force participation rates of women increasingly undermine these assumptions, leaving an increasing share of the labor force without adequate benefit prospects.

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6 The World Bank publication *World Population Projections* provides data on long-run demographic projections. See also the comprehensive data appendix in the World Bank report *Averting the Old Age Crisis*, Oxford University Press (Oxford: 1994).

7 The projection of immigration flows, particularly for small countries, can, however, introduce considerable uncertainty in population projections.
4. **Parametric reform options**

Several options are available for alleviating the financial strains that a PAYG system may be experiencing. Different countries have resorted to different combinations of these options at various stages in the evolution of their PAYG systems.\(^8\) If possible, the source of the financial pressure should be directly addressed, but less direct alternatives may be necessary in the face of persistent, structural, tendencies or strong political resistance. Moreover, efficiency considerations often have to be balanced against equity concerns.\(^9\)

**Adjusting the contribution rate:** This adjustment is most often considered first, especially in the initial stages of the maturing of a PAYG scheme. However, there are well known limits to this option set by considerations of equity and efficiency. The payroll tax is regressive, especially when it is levied at flat rates and there are upper ceilings on taxable earnings. More generally, resistance is likely to be encountered in raising social security contribution rates that fall disproportionately on the low- and moderate-income families. Resistance is also likely to be met from higher-income groups, who may view any attempt at raising their contribution rates as not commensurate with the benefits that they anticipate. As regards efficiency, increasing already high contribution rates has been widely associated with reducing employment, especially of workers with relatively elastic labor supply elasticities, typically in low paying jobs. Nonetheless, at times raising the contribution rate may be a reasonable compromise as part of a package of parametric reform measures.

**Adjusting the budget transfer rate:** Increasing transfers from the budget has merit if the financial strain on the system is regarded as temporary and there are serious political costs to adjusting the other system parameters. An additional argument for relying on increased budget transfers is that they could be used to pay for the cost of redistribution of benefits between participants from different income classes, thereby facilitating a closer linkage between an individual’s contributions and future pension benefits. The strengthening

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\(^8\) A collection of papers on pension reform options and efforts in the countries of the European Union is provided in *European Economy*, 1997, No. 4, The Welfare State in Europe: Challenges and Reforms. For a global review of recent changes to public schemes, see Schwarz and Demirgüç-Kunt (1999).

\(^9\) The impact of several parametric reform options on the long-run financial conditions of PAYG systems in industrial countries is illustrated in the Annex.
of such a link could help to reduce labor market distortions that are associated with high social security taxes, although this benefit must be weighed against the potential distortions arising from the financing of additional budget transfers.

**Adjusting the replacement rate:** Faced with difficulties in raising contribution rates on workers or increasing budget transfers, a basic option on the spending side of a PAYG system would be to reduce the average replacement rate. This can be effected through reductions of accrual factors; lengthening of assessment periods; elimination of special pension privileges that assure high replacement rates for selected pensioners; introducing actuarially fair adjustments due to early/late retirement; the incorporation of demographic factors in the benefit formula such as negative effect of rising dependency ratios, and changes in indexation. To overcome likely resistance to the downward restructuring of the replacement rate, emphasis is often placed on those of the preceding measures that work their way over time, for example, shifting indexation from wages, which may be growing more rapidly than the CPI, to the CPI. Since it preserves the real value of benefits, this may prove more acceptable than directly reducing accrual factors, even though the effect over time is similar. Frequently, a political compromise is struck by applying the measures to reduce the average, effective, replacement rate of “new” pensioners, and grandfathering existing pensioners, or those shortly to join their ranks.

**Adjusting the pension coverage ratio:** Perhaps, the most frequently considered option is to reduce the stock of pensioners by both delaying the age at which a worker becomes eligible for a pension and by lengthening the assessment period for pension eligibility.\(^{10}\) This has been undertaken by several countries, most notably the United States, which will gradually extend the normal retirement age at which a full pension is received for both men and women to 67 years. There may also be scope for equalizing the retirement ages of women, which are often set lower despite greater longevity, with those of men. A gradual phasing-in of reforms would clearly be necessary, in order to limit the perceived unfairness to workers close to retirement, who would have only limited opportunity to make the requisite financial adjustment in their consumption and savings behavior. The higher

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\(^{10}\) To be effective, such a policy would need to be combined with additional disincentives to limit early retirement, e.g. through a reduction in accrual factors in the case of early retirement (reflecting the actuarially higher costs of a longer time span for receiving pensions).
proportional cost of such reforms to women should also be noted if there is need for equalization of retirement ages.

Another option would be to increase labor force participation, in particular of women. This, however, may be less amenable to direct influence. In addition, it may take considerable time before incentive measures such as lowering the burden of social security taxes on workers and their employers or the public provision of child care increase labor force participation.

**Administrative reform options:** How a PAYG scheme is managed can play a significant role in its successful financial operation. An important feature of a PAYG scheme is its usually low administrative cost in comparison to private pension systems, which is generally realized by industrial economies. However, the transition countries in particular have been experiencing difficulties in effectively administering their pension systems. To a considerable extent this is attributable to the restructuring process involving the replacement of a relatively few collection and disbursement points with a larger array as a consequence of decentralization. The resulting greater independence of employers from the state and the abandonment of traditional ways of collecting contributions in favor of self-assessments and declarations has, in a context of frequent liquidity shortages, led to shortfalls in collections. Further sustained reforms of the administrative setup are needed to ensure adequate compliance. This source of stress on the financial performance of the PAYG scheme is frequently compounded by excessive payments of benefits. Reforms of an administrative nature are needed to promote more effective control on benefit payouts involving, among others, the weeding out of “ghost” pensioners.

A problem frequently encountered, especially with mature systems, is the easier access to eligibility which contributes to a build up in financial pressure. An example would be the relative ease with which disability pensions may be obtained. To preserve the financial integrity of the PAYG scheme, procedures need to be instituted and incentives provided for the exercise of greater restraint on the granting of eligibility.

Aside from improving the administration of individual contributions and benefit payments, it is also important to ensure that the overall management of the system is adequate. This is best achieved if the system is given a high degree of independence, under suitable safeguards, from political interference. In this context, there is considerable value in
instituting a procedure of publishing periodic long-term actuarial reports prepared by independent institutions as this could temper political propensities to abuse the public pension system.\textsuperscript{11}

5. Broader PAYG reform strategies

Besides parametric adjustments and administrative reforms, there may be a need to reconsider a broader strategy that would allow PAYG schemes to adjust and respond to a changing environment. Exclusive reliance on discretionary year-on-year adjustments of parameters would be indicative of a “muddling through” approach, with decisions on adjustments made only when the source and size of financial pressures become clear. While a year-by-year discretionary approach may be justifiable in situations of significant uncertainty, it can itself be a source of uncertainty if the adjustments are politically contentious and specific adjustment measures are difficult to predict.

A politically more assured approach would be to set long-term rules for the adjustment of PAYG parameters, which lead to automatic adjustments as financial pressures arise. A case in point would be the practice in Germany of automatically indexing benefits to the growth rate of net wages, determined as gross wages less payroll and income taxes. This has the advantage of taking some account of demographic and coverage changes by automatically lowering the replacement rate and the need for budget transfers when the contribution rate rises. Such an approach can also be justified on equity grounds: if workers have to suffer a higher contribution rate to pay for current pension benefits, the latter should be adjusted downward so that pensioners share in the burden.

A third approach, which attempts to tackle the issue of intergenerational equity head-on, is to put in place a “sustainable” contribution rate. Here, a contribution rate is selected that is a constant proportion of pensionable income for all generations so that there is no perception of unfairness. Determining the appropriate level at which to set the sustainable contribution rate can be a difficult exercise and requires considerable judgement and foresight regarding the likely contingencies that will generate financial pressures. This

\textsuperscript{11} See, for example, the regular actuary reports published by the Government Actuary’s Department in the United Kingdom and the Board of Trustees in the United States.
approach was attempted, with a measure of success, by the United States in 1983. However, subsequent experience showed that the rate should have been set higher so as to better cope with long-term funding requirements. Owing to uncertainties about the timing and extent of future demographic changes and other contingencies likely to adversely affect the PAYG system, a conservative policy would be to err, if err one must, on the high side in setting payroll tax rates. The essence of the sustainable-rate approach is to build up a reserve fund during the initial years, when the flow of contributions exceeds benefits paid out. This fund can then be drawn down as the population ages, without the need for unsustainable increases in payroll tax or contribution rates.

However, and leaving aside the issue of intergenerational equity, the reserve fund approach is not without controversy. Issues arise regarding the economic and financial returns to pre-funding and implications with regard to the general tax burden over time. Of particular interest is how the fund is organized and administered which can affect the success with which financial pressures in the PAYG system are contained. Suppose that, as in many countries, the fund is required to invest in government securities. Often such financing induces a bigger nonpension-related fiscal deficit, indicating that the general level of taxes is low but offset by the higher PAYG contribution rates. It could then be argued that keeping contribution rates at the lower equilibrium levels would have been preferable as this would have forced an increase in general taxes. Notice further that in a later period, when as a consequence of aging, benefits paid out exceed contributions, and the pension fund is being depleted, an increase in general taxes or cutbacks in expenditure will be needed to meet the maturing obligations. Rather than rely on higher taxes, the higher pension payments could equally well have been achieved by relying on a higher equilibrium contribution rate. Thus, what difference has accumulating reserves under the pension fund made, if the future contributing generation is subject to a higher fiscal burden, whether in the form of taxes or a higher equilibrium contribution rate? Clearly, the case for a sustainable contribution rate is strengthened if the government does not engage in offsetting fiscal behavior.

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12 Estimates of sustainable contribution rates for the major industrial countries and Sweden are presented in Chand and Jaeger (1996). See also the Annex to this paper.

13 See for example, Iglesias and Palacios (2000).
Suppose, however, the fiscal operations of government are not influenced by movements in the pension fund, for example, if the government is pursuing a firm fiscal target (excluding social security). It may now be contended that in a period when the pension fund is being drawn down, the situation has become potentially inflationary and that this is also taxing. However, the inflationary effects need not occur as long as monetary policy is not accommodative. The sale of pension fund assets would be absorbed in private portfolios, involving an exchange of liquidity for the assets. Depending on the state of asset demands, asset prices will be depressed (interest rates raised) to the point where the private sector lowers its consumption to accommodate the higher demands of the pensioners. No doubt higher interest rates will add to the debt service charges of government and, assuming it maintains its fiscal target, force it to undertake some fiscal adjustment. The outcome would then be a combination of fiscal measures and additional private saving that would ensure a noninflationary outcome. The argument has so far implicitly assumed a closed economy, but assuming an open economy could reduce the burden of adjustment on residents. Even if the pension fund had only invested in domestic government assets, as long as financial markets are integrated across borders, a drawdown of such assets, by putting upward pressure on interest rates, would lead to an influx of foreign financing. As a consequence, domestic demands need not decline to accommodate the growing demands of pensioners, which would, of course, result in a bigger deficit on the current account of the balance of payments.

It might also be noted that during the period when the reserve fund is being built up and the proceeds not being siphoned away by a bigger fiscal deficit, there is scope for an increase in overall saving. This will, of course, depend on the private sector not now engaging in countervailing behavior, which could occur if they view the pension fund reserves as a substitute for their own saving. Clearly, if the capital stock and output is higher than it would otherwise have been, it becomes easier for succeeding generations to meet the growing consumption demands of an aging population. However, if the sustainable contribution rate results in an offsetting decline in savings of current generations, there would appear to be no difference between this approach and that of lowering contribution rates to their equilibrium levels under the standard PAYG and raising them subsequently when the need arises. Nonetheless, even if this concern and the preceding ones about the effectiveness of the sustainable rate approach are valid, the latter approach may still be
preferable. This is because it obviates the need for politically difficult adjustments in contribution rates, while assuring a more equitable distributing of the pension burden over time.

Issues may also be raised concerning the placement and administration of the social security funds. On the face of it, replacing the customary investment in government securities with private equities, on which higher returns are generally obtained, should help reduce the burden on the contributing generation. However, it may be contended that the latter reduction is spurious. The argument is that a shift in pension fund portfolios in favor of private equities will affect market prices, reducing yields on equity but raising bond interest rates. The latter implies higher debt service charges which would necessitate tax increases to keep the fiscal deficit unchanged, assuming that government maintains a firm fiscal target. Indeed, the outcome could be one where the private sector suffers relative to the public sector: the increased flow of debt service receipts is offset by higher taxes, while equity incomes would be lower. As a result the overall rate of return to private saving declines, with obvious adverse effects. However, it could also be argued that such a portfolio shift, by lowering the cost of capital, stimulates capital accumulation and higher future output levels. This should make the pension-related burden easier to bear. The accumulation of a publicly-managed pension fund, in particular in the case of a large-sized PAYG system, may also raise difficult issues regarding the role of pension fund managers in corporate governance.

6. Conclusions

This paper has addressed issues concerning the financial pressures that a PAYG scheme may be subjected to and the measures that could be taken to alleviate them. A distinction was drawn between adjustments involving key parameters of the PAYG scheme and more fundamental strategic reform involving the replacement of fluctuating, equilibrium, contribution rates with a constant sustainable rate. The Annex reports the results of simulations that show the potential scope of reforms for preserving PAYG systems among the leading industrial countries. Although in principle recourse to such reforms should be adequate for the rehabilitation of a PAYG system, in practice this has not been widely borne out. It would be interesting to review how different countries have coped
with the financial pressures that their PAYG systems may have been experiencing or that they are anticipated to experience. However, while such an assessment is beyond the scope of this paper some broad generalizations may be noted.

Countries that have large-sized PAYG systems that are poorly organized and administered have the greatest difficulty in rehabilitating such systems. This would appear to be the case with most countries in Latin America and now with the transition economies. The response among the Latin American countries, stimulated no doubt by the successful experience of Chile, was to shift to defined-contribution schemes that to varying degrees are private-based. In most cases the large-sized PAYG schemes are downgraded to small-sized schemes that provide essential poverty relief. However, this need not be the outcome with the much better administered PAYG schemes of Western Europe for whom the kind of adjustments indicated in the Annex may be adequate, although painful. At the same time, medium-sized PAYG systems of the type to be found in most Anglo-Saxon countries and also in the Netherlands and Switzerland are more readily reformed than large-sized PAYG systems.
Annex

This annex illustrates various parametric reforms to make a PAYG system more sustainable drawing on data for the major industrial countries.\textsuperscript{14} A simple way to gauge the scale of long-run adjustment needed to assure the financial viability of a pension plan is to calculate the contribution gap. This gap is the difference between a constant sustainable contribution rate consistent with no build up of pension debt and the average contribution rate likely to prevail under unchanged PAYG parameters (Table 1). For example, for Germany’s pension system, the average unchanged contribution rate would amount to 10.3 percent of GDP while a sustainable contribution rate of 13.7 percent of GDP would be required during the period 1995-2050, indicating a contribution gap of 3.4 percent of GDP.\textsuperscript{15} All the major industrial countries face contribution gaps over the period 1995-2050, although some countries are relatively well off, while other countries appear to face more difficult situations.

The need for prompt attention to the long-run financing problems of a PAYG system is illustrated by calculations indicating the effect on the contribution gap of postponing reforms. For the average major industrial country, a delay of ten years in addressing the pension fund imbalance would permanently increase the contribution that will be needed by 0.7 percent of GDP; a delay by 30 years would increase the gap by 4.5 percent of GDP. Thus, the earlier the adjustment measures are taken, the smaller the adjustments that are needed in the long run.

The table also illustrates the fiscal impact of various parametric changes in pension plan parameters: a 5 percentage point reduction in the replacement rate for all pensioners; a cutback of the present indexation arrangements of pension benefits to 80 percent of the CPI inflation rate; and a uniform and immediate increase in the retirement age to 67. For many of the countries, increasing the retirement age has a marked effect on the size of the

\textsuperscript{14} Additional evidence on the impact of parametric pension reforms for 20 OECD countries is provided by Roseveare (1996).

\textsuperscript{15} These calculations were based on public pension plan parameters as of end-1994. In the meantime, several countries included in Table 1 have undertaken parametric reforms of their pension systems, and projections based on more recent information may indicate more favorable long-term financial outlooks for these pension systems.
contribution gap. In countries like France, and especially Italy, raising the retirement age to 67 would practically close the large contribution gaps.
Annex Table. Selected Industrial Countries: Sustainable Contribution Rates and Contribution Gaps, 1995-2050

(In percent of GDP)

<table>
<thead>
<tr>
<th></th>
<th>Projected Average Contribution Rate 1995-2050</th>
<th>Sustainable Contribution Rate 1995-2050 1/</th>
<th>Contribution Gap 2/</th>
<th>Reforms postponed by 10 years</th>
<th>Reforms postponed by 30 years</th>
<th>Reduction in Replacement rate by 5 percentage points</th>
<th>80 percent indexation</th>
<th>Retirement at age 67</th>
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<td>1.8</td>
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<td>-0.</td>
</tr>
</tbody>
</table>

Source: This table is based on Chand and Jaeger (1996).

1/ The sustainable contribution rate is defined as the constant contribution rate over 1995-2050 that equalizes the net asset position in 2050 with the initial net asset position in 1995.

2/ Defined as the difference between the sustainable contribution rate and projected overall contribution rate.
References


