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Who Will Pay for My Pension? The Trilemma of Pension Reforms in India

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Abstract: The implicit pension debt associated with un-funded or under-funded pension plans can create serious macroeconomic and political challenges in the future. Recognizing the need to address unfunded pension liabilities, the Indian Central Government shifted from the unfunded defined benefit-based pension to a contribution-based system for providing social security to its employees, joining from January 1, 2004. This shift aims to prevent further accumulation of unfunded pension liabilities. However, faced with the growing demand to revert back to the defined benefit pension system, the government has offered a middle path combining features of both defined benefit and defined contribution systems. The present paper compares the adequacy of retirement income under all three pension schemes. The results show that while the NPS was inadequate for the task of providing a pension comparable to OPS, increased contribution under the newly introduced UPS will enable the government to fund the retirement promises with the current contributions fully.

JEL Codes: H55, H63, H50

Keywords: Pension reforms, implicit pension debt, PAYG, defined contribution

1. Introduction

Pension liabilities toward retirees absorbs a significant proportion of government spending in developed and developing countries (Rusconi & Pick, 2020). Pension liabilities can be funded by either a Pay-As-You-Go (PAYG) or a contribution-based approach. The PAYG pensions operate on the principle that current workers' contributions fund the pensions of current retirees. However, the PAYG approach for funding pensions can become unsustainable with the aging population as a larger number of retirees must be provided for by a smaller workforce. Contribution-based pensions, conversely, are funded by contributions made by individuals throughout their working lives. These contributions are generally invested in various financial instruments. Effectively, the pension liabilities are paid using the accumulated invested contributions. Thus, future generations are not required to contribute towards the pension of earlier generations.

While almost all OECD countries have merged their public-sector pension funds with arrangements for private-sector workers, civil servants in developing countries tend to be covered by stand-alone schemes (Rusconi & Pick, 2020). These separate pension schemes for civil servants in developing countries are usually more generous and less financially viable

than those covering the private formal sector (Palacios & Whitehouse, 2006; OCED, 2016). On similar lines, India had defined a benefit pension system for government employees who joined before 2004. Total pension expenditure of the Central Government increased from 0.38 percent in 1990-91 to 0.59 percent in 2002-03. (Economic Survey, 2003). Nearly, double of this amount was also spent by the State Governments on their own employees (RBI, 2024)

Recognizing the threat that unfunded pension liabilities can create for future generations, the Central Government implemented a defined contribution (DC) system initially known as the New Pension System, later rebranded as the National Pension Scheme (NPS). Since January 1, 2004, all new recruitments for the Central Government, excluding defense forces, are made under this scheme. Defined benefit pension for employees who joined the earlier system, now labeled as Old Pension Scheme (OPS), have been protected. Under NPS, employees need to contribute 10 percent of their wages, which, along with employer contributions, is used to build a corpus for retirement in their individual retirement account (IRA). Subsequently, all State Governments (except Tamil Nadu and West Bengal) shifted towards NPS.

The employees recruited under NPS need to bear a higher burden for their pension through contributions. Further, the earlier PAYG system provided a defined fixed pension, while the quantum of pension under NPS depends upon the returns on contributions invested. The choice of pension system has become an electoral issue, and opposition parties often promise to return to the old PAYG pension system. To garner the support of employees, some state governments have reverted to the earlier PAYG model. In response to persistent demands for the reinstatement of the Old Pension Scheme, the Centre proposed a middle-ground solution by incorporating elements of both the NPS and OPS. In August 2024, the Central Government approved the Unified Pension Scheme (UPS), which maintains the contributory aspects of the NPS (with a higher contribution by government) while ensuring a defined pension.

The benefits of pension reforms should be analyzed from the long-term perspective rather than the impact on the current fiscal balance. For example, in the Indian context, a shift towards a defined contribution system from a defined benefit-based pension system may actually worsen the fiscal balance in the short term. The government would be required to meet the past accrued pension liabilities under a defined benefit plan while simultaneously paying contributions for future retirees. With declining birth rates and rising life expectancy, the share of the population above 60 years in India is projected to increase from 9.7 percent in 2021 to

15.9 percent by 2041 (Economic Survey, 2019). Hence, undertaking pension reforms before the aging of the population would help in ensuring long-term fiscal sustainability.

One of the biggest challenges while implementing pension reforms is to provide employees with a reasonable replacement rate[1] under the contributory system and ensure adequate retirement income. The present paper contributes to the literature by comparing the adequacy of retirement income under three pension schemes for employees recruited at various age levels. The results show that while the NPS was inadequate for the task of providing a pension comparable to OPS, increased contribution under the newly introduced UPS will enable the government to fund the retirement promises with the current contributions fully.

The rest of the paper is organized as follows. Section 2 outlines the concept of implicit pension debt (IPD) and a broad framework to measure the IPD. Section 3 discusses the approaches that pension reforms have taken in a few developing countries. Section 4 provides a more detailed background on the pension system for public sector employees in India, along with various pension reforms undertaken. Section 5 provides details on methodology and data sources. Results are reported in section 6. The last section concludes the paper.

2. Concept of Implicit Pension Debt

Under the PAYG system, pension claims of current workers on the future governments are similar to those of government bondholders, who have lent their capital in the past. Pension claims can be considered as deferred wages, where the employees accrue their rights during the working phase, and the government makes payment of deferred wages during the retirement phase (Novy-Marx, 2013). In terms of Ricardian equivalence, deferred wages are equivalent to savings of employees lent to the government, which are to be repaid by contributions or taxes from future generations.[2] Unfunded pension obligations have similar implications on intertemporal budget constraints of government. As with a high level of public debt, servicing higher pension liabilities would force the government to choose between increasing tax

[1] The replacement rate is defined as the percentage of a worker's pre-retirement income that is replaced by their pension after retirement.

[2] Under Ricardian equivalence, consumers are forward-looking and internalize the government's budget constraint in terms of current fiscal deficits and future tax payments required to repay the government borrowings when making their consumption decisions (Barro, 1974). In the present context, if the workers do not appreciate the unfunded nature PAYG system, they would consider the future pension promises as their savings and may equivalently reduce their personal savings. On the other hand, if the employees are perfectly forward-looking, they may try to compensate future generations who will have to pay off these obligations.

revenue, partial default on its pension commitments, or lower public expenditure elsewhere. Similar to interest burden, pension-related expenditures are highly inelastic to economic cycles and can severely constrain fiscal space for governments to pursue macroeconomic stabilization during economic downturns.

While the unfunded pension liabilities have some features comparable to the government borrowings, the literature also highlights some limitations of this analogy. Firstly, unlike the buyers of government bonds, the creditors (employees) in PAYG are compulsorily required to participate in the agreement. Secondly, unlike the liquid market for government bonds, there is no market for trading pension rights (Beltrametti, 1995; Novy-Marx & Rauh, 2011). Thirdly, the yield on government bonds is usually known, while the value of promised pension heavily depends on demographic variables. Fourthly, unlike public debt, the stock of pension liabilities does not lead to direct financial market pressure (Franco, 1995). In the parlance of debt management, new contributions allow the rollover of pension burdens by redeeming previous liabilities and creating new liabilities.

The lifecycle of pension liabilities can be divided into two parts: the accumulation phase and the deaccumulation phase. The net Present value (NPV) of the future pension benefits can be defined as the gross pension benefits. At the same time, the pension system may also be designed to accumulate some funds to service pension liabilities. The gap between the NPV of pension liabilities and the NPV of contributions is termed net pension liabilities or Implicit Public Debt (IPD). In an entirely PAYG pension system, the gross and net pension liabilities are exactly the same because there is no accumulation of funds to service the pension liabilities. On the other hand, in a purely defined contribution-based pension system, as pensions are to be paid fully from the accumulated contributions, the net pension liabilities are zero, irrespective of the magnitude of gross pension liabilities (Deboeck & Eckefeldt, 2020). In a hybrid pension system, where contributions are accumulated during the working phase, while defined benefits are provided during the retirement period, the calculation of net pension liabilities needs to deduct the NPV of contributions from the NPV of future pension rights.

It is possible for the government to reduce pension liabilities by measures such as increasing the minimum retirement age or changing the benefit calculation formulas. However, during times of fiscal stress, governments can also default on explicit government debt – by the repudiation of the principal, reduction of interest rates, inflation tax, or changes in the taxation of the interest income (Holzmann et al., 2004). The incidences of complete default on

pension liabilities are as rare as default on domestic government borrowings, strengthening the claim that the impact of implicit pension debt on public finances can be comparable to conventional public debt.

Based on the coverage of employees and the employment period, the literature provides three approaches to evaluate pension liabilities: a) accrued-to-date liabilities, b) closed system liabilities, and c) open system liabilities (Holzmann et al., 2004; Novy-Marx & Rauh, 2011). The 'accrued-to-date liabilities' is the narrowest measure that calculates the NPV of pension benefits based on the existing employment and wage history. Since the calculated benefits are solely based on past employment history, this approach is also termed as the "termination liability" method. The second approach, namely closed system liabilities, calculates IPD as the sum of all liabilities towards current workers, including the pension rights that they will earn during their remaining employment period. Under this approach, the pension system is closed to new entrants and assumed to fulfill its obligations towards existing workers. The last approach, namely, open system liabilities, covers pension liabilities towards current workers and future entrants. While theoretically, an infinite time horizon will provide the most comprehensive estimate, the time period is generally limited in empirical works to a few decades due to uncertainties regarding long-term projections. Further, the present value of rights claimable in the distant future becomes relatively smaller, providing an empirical justification for limiting the time period.

In the last decades, there has been a growing emphasis in OECD countries on transparent reporting of unfunded pension liabilities in the national accounts. For example, the European System of Accounts of 1995 (ESA 95) required reporting of only funded pension schemes where explicit liabilities were recognized for the employer and social security system (Deboeck & Eckefeldt, 2020). However, the European System of Accounts of 2010 under ‘Table 29’ required more detailed information on unfunded pension liabilities (ESA, 2013). Member States are required to provide details on the general government's pay-as-you-go schemes (social security schemes and unfunded schemes for general government employees) following an accrued-to-date pension liability approach (Deboeck & Eckefeldt, 2020). Although a narrower definition, this enhanced reporting requirement provides comparable data on underfunded general government pensions in member states. As per the data compiled by Eurostat for 2021, the ratio of accrued-to-date social insurance gross pension entitlements to

GDP of most EU countries was between 200% and 400%.[3] Unfunded pension schemes dominated pension entitlements for most EU countries. Thus, gross and net IPD figures are comparable for most member states.[4]

As pension commitments involve a constant stream of payout from the government to employees after retirement, one way to analyze the implicit pension liabilities is by calculating the amount required to annuitize the pension payout. The government can buy an annuity from a life insurance company for a person at retirement age. The insurance company would pay an annuity till the death of the retiree and then pay an annuity to the spouse (if dependent benefits are covered under pension). Measurement of NPV of pension liabilities can be done at three stages: a) forecast pension at retirement based on employee entry age, current age, wage growth rate, and replacement rate, and b) calculate the lump-sum payment required to purchase the pension equivalent annuity from the insurance companies, and c) discount the annuity purchase price at retirement age to the current year. The first component is relatively easy to capture, while the second component involves much more uncertainties due to the mortality assumptions involved. Life insurance companies specialize in this field, and their lump-sum pricing can be expected to capture the NPV of annuities to be paid out along with their managerial expenses.

Using this approach, Bhardwaj and Dave (2005) estimated India's IPD towards central (civil) and state government employees at 64.51 percent of the GDP for 2004. However, the authors recognized that their results were likely to be an underestimate because they used nominal annuity as the benchmark while pensions are inflation-adjusted. On the other hand, annuity charged by insurance companies includes an actuarially fair component along with a loading fee. The actuarially fair component is a lump-sum amount that is exactly equal to the expected payout of an annuity, based on risk probabilities. The loading fee component is the markup charged by insurance companies to meet their expenses and earn profit. It is only the actuarially fair component that should be considered while calculating the PV of pension liabilities.

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Pensions_in_national_accounts_-_statistics
[4] Only Denmark and Iceland had more than half of their pension entitlements funded.

3. Approaches to Pension Reforms in Developing Countries

Pension reforms aimed at reducing fiscal stress can be categorized into two categories: a) parametric reforms and b) structural reforms. Parametric reforms include an increase in pensionable age, reducing replacement rate, and changes in indexation or benefit formula. Parametric reforms reduce pension liabilities by tweaking the duration and quantum of pension outgo. On the other hand, structural reforms are aimed at not only recognizing but also contributing towards the pension liabilities as they accrue (Rusconi & Pick, 2020). Thus, a shift from a defined benefit to a fully contribution-based approach eliminates the unfunded liabilities. One of the components of pension reforms is also to converge the public sector pension system with the pension system for employees in the private formal sector.

By the late 1970s, Chile's pension system was in crisis, and the annual benefits paid exceeded the contributions by nearly 3% of GDP (Soto, 2005). In 1980, Chile introduced a system of individual accounts where civil servants, excluding military and police, were required to contribute at a mandated percentage of earnings. New recruits were brought into the contributory system on the same terms as private sector employees. However, vested rights accrued by civil servants in the pre-reform era were respected (Rusconi & Pick, 2020). By 2003, pension assets were equivalent to 40% of GDP; by 2017, they stood at 70% of GDP (OECD, 2018). The size of pension assets in the funded system also highlights the magnitude of pension liabilities when they were not funded.

Between 1950 and 2015, government employees in China were covered under a defined benefit pension scheme. There was no requirement for contributions by employees, and pensions were paid from general government revenues. In 2015, China moved from the DB pension system to the contributory pension system for its civil servants and employees in public institutions. The earlier DB system provided a replacement rate of 80-100 percent of the final salary. In contrast, the new DC system required contribution rates of 20 percent by employer plus 8 percent by employees and is expected to provide a replacement rate of 59.2 percent. Interestingly, at the inception of the scheme, salaries in the public sector were augmented to ensure the same level of take-home pay as before (Wong & Yuan, 2020). The contribution rates and expected replacement rates for new entrants under the Public Employees Scheme are the same as applicable for formal workers in the private sector covered under the Urban Employees Scheme, thus converging the two schemes (Fang & Feng, 2018; Wong & Yuan, 2020).

In 2000, expenditure on pension benefits for civil servants in Brazil consumed 18 percent of the revenues of the federal government, while state governments spent 13% of their revenues on pension benefits (Rusconi & Pick, 2020). On the parametric side, Brazilian pension reforms initiated in 2003 focused on increasing the retirement age (53 to 60 for men and from 48 to 55 for women) and reducing indexation benefits (shifted from wage to price indexation). On the structural side, contributions of 11% of salary were required from all participants, including, somewhat unusually, current pension recipients. The government also contributed 11 percent of the wages towards retirement funds. However, a link between the salary drawn prior to retirement was retained, which was broken only with the 2013 reforms when the pension was fully linked with the contributions accumulated for new entrants (Rodrigues & Afonso, 2015). In 2019, another parametric reform was implemented that raised the retirement age to 65 for men and 62 for women. This will, in particular, reduce the burden towards employees joining prior to 2013 who have access to some form of defined benefits.

In India, government employees who joined prior to 2003 received defined benefit-based pensions at 50 percent of the last drawn salary, without any requirement for contribution. Given the rising fiscal stress, the government introduced a defined contribution (DC) based system called the National Pension System, where both employers and employees contributed 10 percent each to the individual account. Like other countries, defense force personnel have been exempted from the defined contribution scheme due to concerns regarding their shorter employment period, which will be insufficient for accumulating adequate funds through contributions for a relatively longer retirement phase. With growing concerns regarding the adequacy and uncertainty of the projected pension from the accumulated corpus under NPS, the government first raised its own contribution in 2019 and later also brought in a defined benefit component in 2025. The next section provides a more detailed overview of pension system for government employees in India.

4. Indian Pension System for Public Sector

India had a defined pension system till 2004, when concerns over fiscal sustainability led to the introduction of a defined contribution-based pension system for new recruits from January 1, 2004. The newly introduced pension system was termed the National Pension Scheme (NPS), while the earlier pension system applicable to employees joining till December 31, 2003, was labeled as the Old Pension Scheme (OPS). Over the years, public sector

employees raised concerns about market-linked uncertainty regarding the actual value of future pensions, the decline in effective salaries due to the deduction of contributions, and the absence of family pensions in case of early mortality. Finally, the Central Government came out with the Unified Pension System (UPS), which retains the contributory features of NPS yet also provides a minimum floor for the pension.

While the pension burden for defense forces has also become a challenge, the contributory pension system was not extended to them. To address the pension burden and reduce the average age of armed forces, the government has introduced a program called 'Agnipath,' in 2022 which is a tour of duty style scheme. New recruits under this scheme are employed only for a four-year period, after which 25 percent of the retiring batch will be selected for the permanent cadre. The remaining personnel will be retired with a lump sum payment at the end of a four-year tenure. As the present paper focuses on the pension reforms carried out in terms of a shift from a defined benefit to a contributory regime, an analysis of the pension system for defense forces is not attempted in this paper.

4a. Old Pension Scheme (OPS)

The old pension system (OPS) provides for a defined benefit pension to government employees who joined service prior to January 1, 2004. While the method of calculating pension has seen some variation over time, the pension amount is broadly determined based on the last salary drawn and the number of years served. A minimum employment period of 10 years is required to be eligible for the pension. For the employment period of 20 years or more, the pension amount is calculated at 50% of the average emoluments received during the last 10 months or the pay last drawn, whichever is higher. If the duration of the employment period is less than 20 years, then the pension amount is reduced proportionately. The pension amount is protected against inflation as it is adjusted according to the Consumer Price Index. In case of the death of a pension recipient, the spouse of the pensioner is entitled to receive 60 percent of the pension as a family pensioner.

Features of the minimum eligibility period, linking pension to the pay drawn during a specified period, proportional reduction, and adjustment for inflation are usually followed in most countries for their defined benefit pension system. However, the DB pension system in India has two additional pillars of support for employees: a) indexation to wages of existing employees and b) age-based increments. The idea behind wage indexation is that an identical

pension amount should be provided to every retiree from the same rank, irrespective of the date of retirement. Age-based increments above 80 years of age were implemented in 2006. This provision aims to provide additional support with advancing age considering the increasing needs, especially those relating to health expenditure.

4b. National Pension Scheme (NPS)

The total number of Central Government (civilian) employees was 1.83 million in 1961, which increased to 2.7 million in 1971 and 3.4 million in 1981. After peaking at 3.9 million in 1995, this number started declining and stood at 3.1 million by 2023. The timeframe of the 1960s and 1970s can be seen as the period of expansion of the Indian State. The recruitments made during this period started retiring after 1990 (presuming an average 30-year period of employment). Increasing number of retirees coupled with higher levels of pension based on successive Pay Commissions recommendations led to rising pension payouts. The pension expenditure of the Central Government grew at a compounded annual growth rate (CAGR) of 21 percent during the 1990-2001 period as against 14.2 percent nominal growth of GDP during this period (Economic Survey, 2003). The stressed fiscal situation required a rethink of the suitability of the DB-based pension system.

The Central Government decided to recruit all new employees from January 2004 onwards under a defined contribution-based pension scheme, namely, the New Pension Scheme. Under the NPS, employees are required to contribute 10 percent of their monthly salary towards their pension. The Central Government also made a matching contribution initially at 10 percent, which was later raised to 14 percent in 2019. While the contribution by the employer is tax-free, the employee's contribution is counted as a part of current income, hence taxed at the applicable tax rates. The combined contribution is managed by three professional pension fund managers who invest funds in debt and equity instruments within the asset allocation framework decided by the government. The Central Record Keeping Agency (CRA) maintains a individual pension account for each employee. The accumulated surplus at the time of superannuation is available to the individual, who is required to invest at least 40 percent of pension wealth for the purchase of an annuity, and the remaining up to 60 percent can be taken as a tax-free lump-sum payout.

After the implementation of NPS, various concerns have been raised by government employees arguing to revert to the OPS. Employee associations have argued that the

implementation of NPS discriminates between two sets of government employees. Firstly, effective salary under NPS is reduced since the employee has to mandatorily contribute 10 percent of pay towards the pension fund, while those covered under OPS are not required to contribute despite receiving the same pre-contribution salary. Secondly, annuities under NPS would not receive the benefits of inflation adjustment and wage indexation that are available to OPS. Thirdly, the combined of 20% may not be sufficient to create a corpus which can provide an annuity equal to 50 percent of the last pay drawn. Finally, in case an employee dies at an early age, the family would suffer since the accumulation of contributions would be grossly inadequate to fund a family pension comparable to OPS (CPC, 2016).

While remaining committed to the continuation of the NPS, the Central Government made attempts to address some of the above concerns. In 2009, a provision was introduced that the dependents of any employee under NPS who dies during service will be eligible to receive a family pension as per the provisions under OPS. Further, in 2019, the government's contribution towards the corpus was raised from 10 to 14 percent to address the concerns regarding the issue of adequacy of the corpus. However, the government did not provide any details on the magnitude of annuity that employees can expect from the accumulated corpus. The issue moved from economics to politics, and some states governed by parties opposing the ruling party in Central Government have reinstated the OPS.

4c. Unified Pension Scheme (UPS)

Faced with continuous demands to bring back the Old Pension Scheme, the Centre offered a middle path by combining some of the features of both NPS and OPS options. In August 2024, the Central Government approved a Unified Pension Scheme (UPS), which retains the contributory features of NPS while also providing a defined pension. Employees who have completed 25 or more years in service would be eligible for an assured pension at 50% of the average pay received over the last 12 months prior to retirement. A minimum employment period of 10 years is required to be eligible for pension under UPS. Employees with a service period of more than 10 years but less than 25 years would be entitled to a pension on a proportionate basis (number of months served/300). The UPS retains the concept of family pension from OPS at 60 percent of the assured pension.

In terms of contribution, employees and employers are required to make equal contributions at 10 percent of the pay each. Similar to NPS, this amount would go to the

individual account of the employee and managed by pension fund managers. An additional contribution of 8.5% of the pay of all employees under UPS will be made by the Central Government to a pool corpus, which will help support assured payouts under UPS. At the time of retirement, the accumulated funds in the individual accounts will be transferred to the pooled account in lieu of pension.[5] Table 1 provides a comparison of OPS, NPS, and UPS on different parameters.

Table 1: A Comparison of Three Pension Regimes for Government Employees in India

S. No.	Parameter	OPS	NPS	UPS
1	Benefit	Defined	Not Defined	Defined
2	Contribution	No contribution. PAYG Model	10 % by employee and 14 % by employer	10 % by employee and 10+8.5 % by employer
3	Minimum Service Period for Pension Eligibility	10 years	Not applicable	10 years
4	Minimum Service Period for FULL pension eligibility	20 years	Not applicable	25 years
5	Provisions for Voluntary retirement	Proportionate pension after 10 years, starting from the date of voluntary retirement	Not applicable	Only after 25 years, starting from the date of normal retirement
6	Family Pension	60% of pension	As in OPS	60% of pension
7	Inflation indexation	Yes	No. As per the annuity plan	Yes
8	Wage indexation	Yes	No	No

5. Methodology and Data Sources

The sustainability of pension liabilities can be assessed in relation to the tax base, GDP, or wage bill, similar to how public debt sustainability is evaluated using metrics such as the interest coverage ratio or the external debt service-to-export ratio (Kane & Palacios,1996). In this paper, the wage bill approach is taken for analysis. As discussed in the previous section, the incidence of burden associated with the three pension plans are different. In the unfunded OPS, the entire pension obligation is to be paid by taxpayers in the future, while the resources for pension liabilities are fully recognized and provided under NPS as they accrue. The proposed UPS aims to fund pension liabilities yet promises a defined benefit that may create underfunded liabilities.

[5] https://financialservices.gov.in/beta/sites/default/files/2025-02/Gazette_Notification.pdf

One way to examine the implications of pension reforms for both public finances and employees is to take an average cohort recruited by the government and trace its evolution under three pension schemes. As different employees are recruited at different ages, they are likely to have different service periods, different levels of pension at their retirement, and accumulation of contributions (in the case of NPS and UPS). As the employee associations have long argued to restore OPS, it can be taken as a benchmark for comparing three schemes. This will allow examining whether the funds accumulated under NPS and UPS will be adequate for providing pensions comparable to OPS for different employee groups.

If the pension system is shifted from an unfunded to a funded pension system without affecting the rights of existing employees, then the closed system definition is the most relevant (Deboeck & Eckefeldt, 2020). This is applicable in the Indian context, where the completely unfunded pension system under OPS moved to a fully funded NPS system. Also, comparing a cohort under different pension systems is comparable to a closed system approach, as pension rights for the given cohort for its entire life are considered.

The age-wise database on total employees or new recruitment under central government is not available in public domain. However, the Pension Fund Regulatory and Development Authority (PFRDA) provides a time series of NPS subscribers under the Central Government (PFRDA, 2024). By taking the annual difference between the number of subscribers, a series of new subscribers under NPS is constructed. A publication by the Ministry of Statistics and Program Implementation provides age-group-wise new additions under NPS, which is available from 2018 onward (MoSPI, 2024). This data is used to construct an average age profile for new NPS recruits from 18 to 40 years, with an assumption that new recruits under the central government have an age profile similar to NPS recruits at an aggregate level.

The analysis is carried out in three steps: a) forecast pension under OPS at retirement based on employee entry age, current age, wage growth rate, and replacement rate, and b) calculate the NPV of the pension stream at the age of retirement, and c) calculate the value of accumulated corpus through contribution under NPS and UPS at the age of retirement. A comparison of the NPV of pension under OPS against the value of accumulated corpus under NPS and UPS permits analysis of the adequacy of the latter two contributory schemes in terms of providing a safety net comparable to OPS.

As discussed in the previous section, pension under OPS is 50 percent of the last drawn salary along with family pension at 60 percent of the pension in the case of the death of the

pensioner. Pay scales for government employees have a provision for a 3 percent annual increment along with an additional inflation adjustment, while pension is only adjusted against the inflation. Since the same inflation rate is applied to both salary growth and pension growth, a real discount rate on pension and real growth on contributed funds can be used for comparison. Retirement age is taken as 60 which is current retirement age for government employees. For analysis, age-based increments above 80 years and Pay Commission linked wage indexation available for OPS are not taken into account. The former is a recent introduction which was introduced in 2006 only, while the latter is also at the discretion of Pay Commission's for which long term forecasts are unavailable.

Indian Individual Annuitant's Mortality Table published by the Institute of Actuaries of India has been used to forecast the longevity of pensioners and conditional expectancy of spouse's longevity after retirement.[6] Contribution rates of 24 percent for NPS and 28.5 percent for UPS are applied to the salary to calculate annual contributions. Contributions are managed by fund managers, and their value at retirement depends upon the performance of funds. A range of 2 to 5 percent real return is presumed to incorporate sensitivity analysis. The same rates have also been used to discount the pension stream after retirement.

6. Results

Table 2 reports the age distribution of new recruits. It can be seen that 64.28 percent of new recruits are below the age of 28, which increases to 89.16 percent by the 29-35 age group. Employees who have joined at an earlier age will have a longer time to contribute and accumulate higher retirement funds under NPS and UPS. However, they are also likely to see higher wage growth due to mandated annual increments of 3 percent, which will raise the level of retirement pension. Despite this, early entry is likely to provide better outcomes for the contributory pension system because an early entry allows a longer compounding period, while the expected length of retirement is relatively smaller and in a distant future.

Table 3 reports results regarding the adequacy of accumulated retirement funds under NPS and UPS compared to pensions received under OPS. The analysis is carried out for employees joining at different entry age and retiring at 60. As per the Indian Individual Annuitant's Mortality Table, the life expectancy at the age of 60 is 24 years. NPV of pension and growth of contributions made in retirement fund are calculated at 2 to 5 percent real rate.

[6] https://www.actuariesindia.org/sites/default/files/2022-05/Indian_Individual_Annuitants_Mortality_Table(2012_15).pdf

For ease of comparison, both the NPV of the pension payouts and the value of the retirement fund at the age of 60 are reported as a multiple of the annual pension.

Table 2: Age-wise distribution of New Recruits

Age -Group	% of New Recruits	cumulative distribution of recruit
18-21	4.79	4.79
22-25	31.08	35.87
26-28	28.41	64.28
29-35	24.88	89.16
> 35	10.84	100
Total	100	

Source: MoSPI (2024)

At a 2 percent discount rate, the NPV of the pension stream at the age of 60 turns out to be 20.7 times the annual pension, which is higher than the value of retirement funds accumulated by employees at any age entering under NPS. Despite higher contribution rates under UPS, only those joining at the age of 18 can expect to accumulate sufficient retirement funds under UPS. Even if the growth and discount rates increase to 3 percent, contributions will be grossly inadequate under NPS as it provides sufficient funds to only those employees joining till 20 years of age. However, the accumulated funds for UPS subscribers will be sufficient if they join prior to 26 years of age. It may be recalled from Table 2 that only 35.87 percent of employees join prior to 25 years of age.

As the growth and discount rates increase, the feasibility of meeting pensions at the OPS level will improve. For a perspective, the average 10-year CAGR return for NPS funds invested by Central Government employees has been 8.5 percent on a nominal basis (PFRDA, 2024). During the same period, the inflation rate was 4.5, translating into a real return of 3.82 percent. On the other hand, currently the 30-year Central Government's bond yield is 7.25 percent, while state government bonds trade at a higher spread of around 50 basis points. With the government targeting 4 percent inflation, the real return can be expected at 3.1 to 3.6 percent. If, on a long-term basis, pension funds can be expected to provide similar returns or at a higher level in line with their past performance, this provides a range of 3.5 to 4 percent. With the implementation of UPS, nearly 75 percent of the employees will be able to accumulate retirement funds adequate enough to provide OPS-level payouts. Since UPS provides a defined benefit comparable to OPS, the government would be bearing the burden on the remaining employees by filling the gap. However, as the employees having retirement funds will also be given only a defined pension, which at a 4 percent discount rate will be expected to amount to

20.1 of their annual pensions, these employees would be cross-subsidizing the late joiners. Effectively, with UPS, the government is likely to fund the retirement promises with the current contributions fully.

Table 3: Accumulated Retirement Funds at the Age of 60 (Multiple of Annual Pension)

Entry Age	2%		3%		4%		5%	
	NPS	UPS	NPS	UPS	NPS	UPS	NPS	UPS
18	17.6	20.9	21.4	25.5	26.5	31.4	33.0	39.2
19	17.3	20.5	20.9	24.9	25.7	30.5	31.9	37.9
20	16.9	20.1	20.4	24.3	25.0	29.6	30.8	36.6
21	16.3	19.4	19.6	23.3	23.8	28.3	29.2	34.7
22	16.0	19.0	19.1	22.7	23.1	27.4	28.2	33.5
23	15.6	18.6	18.6	22.1	22.4	26.6	27.2	32.3
24	15.3	18.2	18.1	21.5	21.7	25.8	26.2	31.1
25	14.9	17.7	17.6	20.9	21.0	24.9	25.2	29.9
26	14.6	17.3	17.1	20.4	20.3	24.1	24.2	28.8
27	14.2	16.9	16.7	19.8	19.6	23.3	23.3	27.7
28	13.9	16.5	16.2	19.2	18.9	22.5	22.4	26.5
29	13.5	16.1	15.7	18.6	18.3	21.7	21.4	25.5
30	13.2	15.6	15.2	18.0	17.6	20.9	20.6	24.4
31	12.7	15.1	14.6	17.3	16.9	20.0	19.6	23.2
32	12.4	14.7	14.1	16.8	16.2	19.2	18.7	22.2
33	12.0	14.2	13.6	16.2	15.6	18.5	17.9	21.2
34	11.6	13.8	13.1	15.6	14.9	17.7	17.1	20.3
35	11.2	13.3	12.7	15.0	14.3	17.0	16.3	19.3
36	11.3	13.4	12.7	15.1	14.3	17.0	16.1	19.2
37	11.4	13.5	12.7	15.1	14.2	16.9	16.0	19.0
38	11.5	13.6	12.7	15.1	14.2	16.9	15.9	18.8
39	11.5	13.7	12.8	15.2	14.2	16.8	15.7	18.7
40	11.6	13.8	12.8	15.2	14.1	16.8	15.6	18.5
NPV at the Age of 60 of pension stream (as Multiple of Annual Pension)								
NPV	20.7		20.4		20.1		19.9	

Note: % mentioned are discount rates

While it is possible that future life expectancy may increase with the improvement in income level and medical science, the government may also increase the retirement age in a healthier society. Further, it may be recalled that the Annuitant's Mortality Table has been used to calculate life expectancy in this paper, which turns out to be 24 years at the age of 60. This seems to be on the higher side compared to the general population, where life expectancy is measured at 22 years for the 55-60 age group and 18.3 years for the 60-65 age group (GoI, 2022). Annuitant's Mortality Table is based on data from 24 life insurance companies where subscribers are likely to be from a relatively affluent class with higher life expectancy. As

government employees are also from a relatively affluent class, the use of Annuitant Mortality Table will be more appropriate. Also, the use of higher life expectancy will make the results conservative.

7. Conclusion

To address the rising pension burden and to avoid the burden on future taxpayers, India implemented a defined contributory pension for new government employees joining from 2004, which is named as NPS. A combined contribution of 24 percent of salary is made by both government and employees. However, due to concerns from employees regarding the adequacy of retirement corpus, the government has introduced a hybrid scheme that provides a pension comparable to the OPS regime but aims to fund it through contributions during the employment phase.

The analysis shows that while the NPS was inadequate for the task of providing a pension comparable to OPS, increased contribution under UPS will enable the government to fully fund the retirement promises with the current contributions. Since the government is making actuarially fair contributions, it is likely that recruits at an early age would be cross-subsidizing the recruits joining at a late age. Interestingly, the combined contribution rate of 28.5 percent under UPS is comparable to contribution rates in the Chinese defined contribution program, which is targeting a replacement rate of 59 percent, though without any defined promise. With the challenge of the rising old age population, making actuarially fair contributions towards retirement can help in avoiding both future fiscal stress for the government and inadequate social security for retirees.

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