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Population Aging and Pension Reforms in China

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ABSTRACT: China is experiencing rapid population aging and a declining workforce, posing significant economic and fiscal challenges, especially to the pension system. This paper examines the evolution of China's pension system, assesses its gaps relative to international peers, and evaluates the macro-fiscal implications of population aging and various pension reforms. Using a calibrated overlapping generations model that explicitly incorporates the rural–urban disparities, we project that population aging alone can slow annual GDP growth by about 2 percentage points between 2024 and 2050, while pension spending can rise by nearly 10 percentage points of GDP. The 2024 retirement age reform eases some of the long-term growth and fiscal sustainability pressures, raising GDP growth by 0.2 percentage points annually and reducing pension spending from 15.3 percent to 11.9 percent of GDP by 2050. We also use the model to examine a set of policy-relevant reforms—doubling Residents Pension Scheme benefits which are currently inadequate, linking benefits to life expectancy, further increasing the retirement age, and promoting urbanization—and find significant effects on fiscal and macroeconomic outcomes.

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I. Introduction

China is experiencing a significant demographic transformation characterized by rapid population aging, a shrinking labor force, persistently low fertility rates, and increasing urbanization. The old-age dependency ratio—estimated at 21.2 percent in 2024—is projected to double by 2041.[2] A similar doubling in old-age dependency took 19 years in Japan, compared to a projected 17 years in China. Annual births have declined steeply, falling to 9.5 million in 2024 from roughly 18 million in 2016. Meanwhile, the working-age population (ages 20–60) is expected to contract from 840 million to 614 million by 2050, corresponding to an average annual decline of about 1.2 percent. At the same time, urbanization has progressed rapidly, with the urban population share increasing from 17.2 to 64.6 percent over the past five decades.

The aging population and pronounced urban-rural disparities in China place significant and unique pressures on the government. The authorities face the dual challenge of ensuring adequate living conditions for an increasingly elderly population (particularly in rural areas that often have limited access to essential services compared to urban regions), while also strengthening the sustainability of the pension system to accommodate growing numbers of retirees without imposing an excessive fiscal burden. Achieving these objectives requires further reforms to pension frameworks.

Against this background, this paper examines three sets of key questions.

- First, how has China's pension system evolved over time?
- Second, how does it compare with international peers? What progress has been made, and what gaps remain?
- Third, how will population aging affect the economy and fiscal sustainability? What is the macro-fiscal impact of the 2024 retirement age reform as well as other reform options?

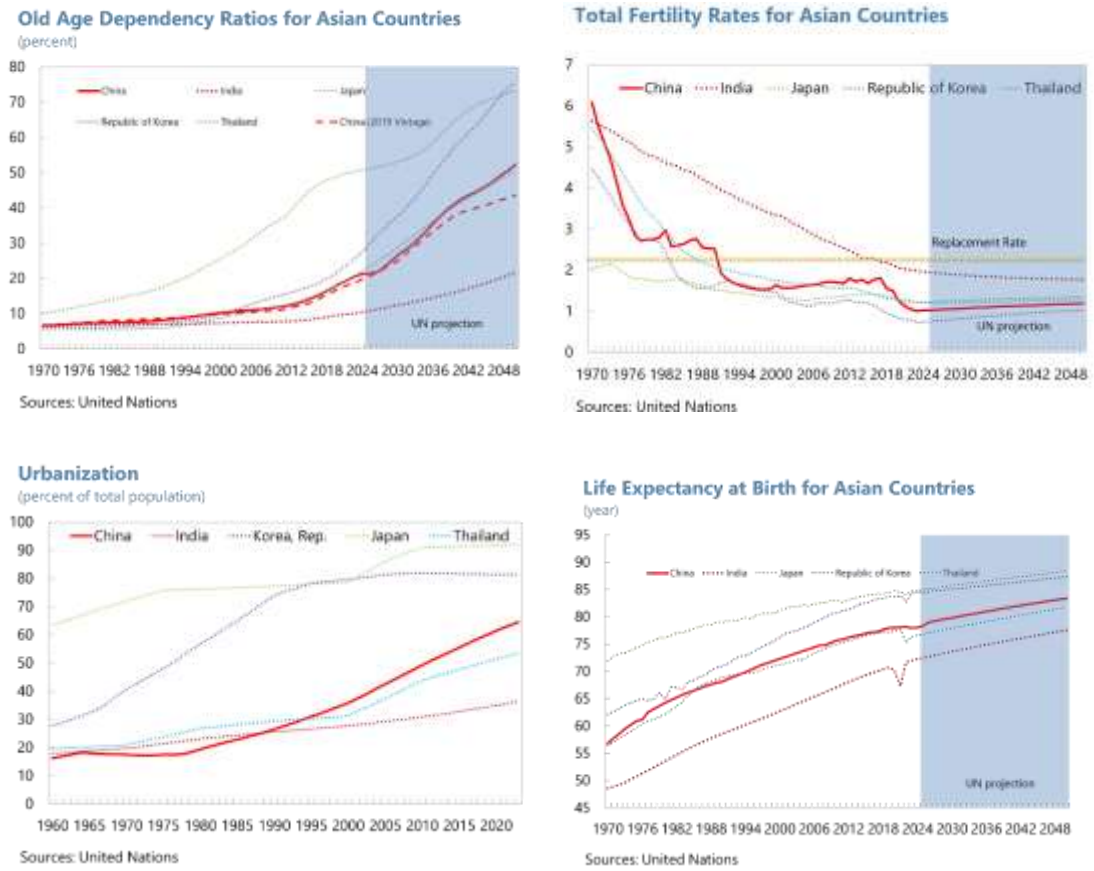
China's pension system has undergone a profound transformation over the past several decades, evolving from a state-owned-enterprise-based model to a multi-tier system with near-universal coverage. Beginning with the dismantling of the "iron rice bowl" in the late 1970s, successive reforms expanded coverage to private sector and rural workers, as well as workers with flexible employment (e.g., gig workers). With the establishment of the Residents Pension Scheme (RPS) and the Urban Employees' Pension Scheme (UEPS), near universal pension coverage was achieved. A landmark 2015 reform integrated government employees into the urban system, aligning benefits and contribution rules across the public and private sector. Reforms in 2018 and 2022 aimed to address the decentralized and fragmented nature of the pension system, while the 2024 retirement age reform can help mitigate some fiscal pressures. After the many waves of reforms, China's pension architecture now consists of three pillars: a broad-based public system (Pillar 1), limited occupational pensions (Pillar 2), and emerging private savings schemes (Pillar 3). These reforms have markedly reduced inequalities and extended pension coverage to over one billion people, representing a major milestone in China's social protection system.

However, comparing China's pension system to international peers reveals remaining gaps. First, retirement ages, particularly for women, remain low by OECD and regional standards, including when comparing to countries with similar demographic characteristics as China. Second, benefit adequacy is uneven: contribution

[2] The number of people aged 65 or older per 100 people of working age (15-64 years old).

and replacement rates in the urban scheme are relatively high, while rural pensions remain modest and fall short of levels typically seen in many other countries. Moreover, some pension parameters are not yet linked to rising life expectancy, creating additional fiscal pressures. Third, while the system has achieved near-universal old-age coverage, participation in the urban scheme is constrained by high minimum contribution requirements, undermining its role in consumption smoothing. Fourth, despite efforts to centralize and harmonize the system, China's pension landscape remains fragmented, imbalanced, and with portability barriers. Therefore, there remains further scope to align the pension systems structure, objectives, and financing mechanisms with demographic and labor market realities.

Figure 1 Demographic Challenges in China



To quantify the macroeconomic and fiscal impacts of population aging, ongoing and potential policy reforms, we extend the state-of-the-art 80-cohort overlapping generations framework of Cao et al. (2024) to incorporate key institutional and demographic features of China's pension system.[3] The model explicitly differentiates between urban and rural sectors, capturing population dynamics, household behavior, and pension structures. Urban households contribute to and receive earnings-related pensions, while rural households receive fixed transfers without contributing.[4]

[3] The model assumes a closed economy without endogenous human capital accumulation or migration.

[4] In practice, rural households are required to contribute, but their contributions are minimal compared to those of urban households. Given their small size, abstracting from these contributions in the model does not significantly affect the calculation of overall pension spending or its macroeconomic impact. Additionally, many existing retirees are receiving pension benefits without having contributed in the past.

We simulate the OLG model over a 240-year horizon starting from 2024, focusing on the results for transitional dynamics through 2050. The model is used to assess the impact of the demographic transition, legislated pension reforms, as well as various reform scenarios:

- **Population aging:** As a starting point, the model is used to simulate the effects of the expected demographic transition as per the latest UN population projections. The model suggests that population aging significantly constrains economic growth and undermines fiscal sustainability. Between 2024 and 2050, real GDP growth declines by approximately 2 percentage points in the model due to the shrinking labor force and the resulting decline in capital accumulation. Simultaneously, pension expenditures surge from 5.4 percent to 15.3 percent of GDP, driven by a rising old-age dependency ratio—exacerbating long-term fiscal pressures.
- **The legislated retirement age reforms:** Building on the population aging scenario, we incorporated the 2024 retirement age reforms. Gradually raising the retirement age by three years mitigates some of the economic and fiscal pressures by increasing labor supply and encouraging capital accumulation. This reform boosts GDP by 5.6 percent by 2050, equivalent to lifting average annual growth by roughly 0.2 percentage points, and reduces pension expenditures from 15.3 percent to 11.9 percent of GDP. Notably, national saving increases as urban workers—particularly those who would have retired in the absence of the reform—raise their savings in response to delayed pension access, while the size of the retired workforce that dissaves is smaller.
- **Other reform scenarios:** We evaluate four additional reform scenarios targeting key dimensions of the pension system: (i) doubling RPS benefits, (ii) aligning the UEPS benefits formula to reflect rising life expectancy, (iii) accelerating the retirement age increase to 65 for all workers, and (iv) fostering faster urbanization through increased rural youth migration. The results are as follows:

  First, compared to the legislated policy, doubling RPS pensions raises pension expenditure marginally by 0.6 percent of GDP by 2050, but significantly improves consumption-equivalent welfare for elderly rural residents— in some cohorts by more than 10 percent—while narrowing overall consumption inequality. The saving rate falls, especially among rural households. Second, aligning the UEPS Notional Defined Contribution (NDC) divisor in line with rising longevity lowers the replacement rate for urban pensions by 8 percentage points, raising GDP by 2 percent and reducing pension expenditures by up to 1.3 percent of GDP.[5] Third, raising the retirement age to 65 for all workers boosts GDP by 3 percent and reduces pension spending by an additional 1.8 percent of GDP by 2050. Finally, increasing urbanization from 66 to 74 percent through greater rural youth migration lifts GDP by 6 percent and lowers pension expenditures by 0.7 percent of GDP by 2050.[6] However, this structural transformation may introduce long-run fiscal pressures as newly urbanized workers eventually reach retirement.

A growing body of research has examined the institutional and fiscal challenges of China's pension system, particularly in light of its rapid demographic transition. These studies emphasize structural disparities and policy gaps. For instance, OECD (2023, 2024) provides comparative benchmarks, noting China's relatively high

[5] Under the UEPS, a portion of each worker's contributions is credited to an individual account. Upon retirement, the monthly pension from this account is calculated by dividing the accumulated notional balance by a policy-set annuity divisor, known as the NDC divisor. This divisor is designed to approximate the expected number of months a retiree will receive benefits, based on life expectancy at retirement. In China, the divisor was set in 2005 at 139 months for retirement at age 60. The outdated annuity divisor based on past life expectancy assumptions underestimates the current life expectancy after retirement. The impact of updating the NDC divisor depends on the assumption for the share of total pensions that are attributable to the DB and NDC components. As this split is not known, we present a range based on two assumptions in the simulation section.

[6] Urbanization rate of 74 percent is consistent with projections by Liu et al. (2017) and Pathak Raimedhi (2023).

contribution rates and fragmented benefit structures. Zou (2014) and Soto and Gupta (2017) provide important context for the fiscal and equity implications of pension reforms in China and other emerging markets, while ILO (2023) highlights persistent urban-rural inequities, low benefit adequacy in rural schemes, and fiscal fragmentation. Gai et al. (2025) offer a rigorous empirical and quantitative analysis of China's new Rural Pension Scheme, demonstrating that the policy reduces migration costs, improves labor allocation, and raises aggregate income and welfare. The actuarial assessments by the Chinese Academy of Social Sciences (2019) further underscore the fiscal vulnerabilities facing the system. Khan, Li, and Zhao (2025) explore the link between pension reform and financial market development.

Overlapping generations (OLG) models have become essential tools for assessing the macroeconomic consequences of demographic change (McGrattan and Prescott, 2017). In the Chinese context, these frameworks have been applied to evaluate the effects of aging on economic growth, savings behavior, and pension sustainability. Notably, Zhai (2024) employs a dynamic OLG framework to estimate that population aging could reduce China's average annual growth by 1.1–1.4 percentage points over five decades. He, Ning, and Zhu (2019) and Zhang et. al. (2025) explore how demographic shifts have contributed to rising household saving rates. IMF (2025) underscores the fiscal risks of aging using a multi-country general equilibrium framework.[7]

Our paper contributes to this literature in two ways. First, we adapt a state-of-the-art OLG model to explicitly account for China-specific characteristics, most notably the urban-rural heterogeneity in demographics, labor markets, and pension structures—dimensions often simplified in existing models. Second, we compare China's pension system to international peers and use these insights to quantify the macro-fiscal impact of reform options, including retirement age increases, benefit adjustments, and urbanization strategies.

The paper is structured as follows. Section II provides an overview of the historical development of China's pension system, including international comparison. Section III introduces a quantitative framework to assess the macroeconomic and fiscal impacts of demographic change and various pension reform options. Section IV concludes.

II. Pension System Development and International Comparison

China has implemented several waves of pension reform, transitioning from an SOE-based system with limited coverage to a multi-tier system with near-universal coverage. However, gaps in benefit adequacy persist, particularly for rural workers. This section provides an overview of the key reforms to the pension system over the last 5 decades, then describes key features of the current framework, and finally compares the current framework to international peers.

[7] Our results align broadly with the empirical findings on the relationship between aging and growth in China presented by Muir et al. (2024), as well as evidence on the impact of social security reforms on saving rates in China provided by Xu et al. (2026).

A. Evolution of China's Public Pension System (1949–2024)

China's early pension system between 1949 and 1978 was primarily based on the "iron rice bowl" model, where state-owned enterprises (SOEs) provided lifelong employment and benefits, including pensions, to their workers. No pension schemes existed for people not working for SOEs or the government, leaving many (mainly rural) workers uncovered.[8] Economic reforms starting in the late 1970s under Deng Xiaoping led to the privatization of many SOEs. This coincided with the rapid expansion of the private-sector workforce, which largely lacked pension coverage, highlighting the need for a comprehensive reform of the pension system.

To address the increasing coverage gap, China launched a multi-tier pension scheme in 1997, with earnings-related and redistributive benefit elements, covering the rising number of urban salaried private sector employees. Reforms in 2009 and 2010 further extended pension coverage to rural residents and non-salaried urban workers, culminating with the establishment of the new Residents Pension Scheme in 2014 which was largely subsidized by the government and made coverage almost universal though with low benefit levels for rural residents and non-salaried urban workers (discussed below). Throughout this period, government and SOE retirees continued to receive significantly higher benefits than private sector workers without having paid any pension contribution (Fang and Feng, 2020).

Further reforms were initiated in 2015, which integrated government employees into the urban system, reducing inequities by aligning benefits and requiring contribution payments. After the 2015 reform, benefit rules for public sector employees have been aligned to the private-sector scheme, with transitional rules applied for new retirees until 2024 (MOHS, 2016). Additionally, government employees are also required to contribute 8 percent of their salaries to the pension fund, with their employers contributing an additional 16 percent. Still, funds for private and public sector workers are separate.[9]

Continued reforms in 2018 and 2022 aimed at addressing the decentralized and fragmented nature of China's pension and increasing inter-provincial assistance. The pension system has historically been highly decentralized, with distinct pension funds operating across provinces and, in many cases, municipalities.[10] Due to the large differences in demographics and labor market conditions across provinces, financial balances of urban pension funds vary widely, with large surpluses in provinces like Beijing and Guangdong and high deficits in other provinces (Figure 2).To help provinces facing pension shortfalls, a central adjustment fund for the urban employees' pension scheme was implemented in 2018, pooling at least 3 percent of each province's revenues.[11] In 2022, this evolved into a full national-level pooling system, involving substantial cross-province transfers (~RMB 244 billion), the rollout of a unified pension data and risk-control platform, and enforcement of nationwide operating standards—marking major strides toward central coordination, even though provinces still oversee their own funds.

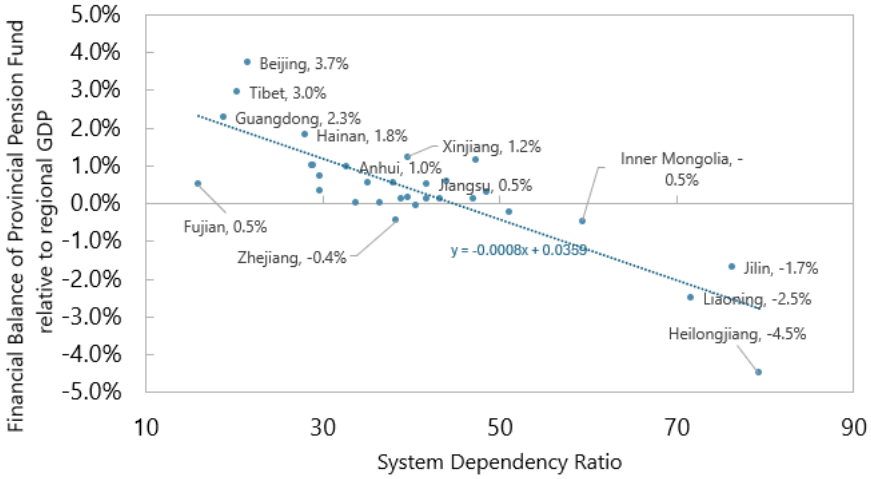
[8] Apart from workers in collective enterprises.

[9] The basic pension insurance fund for government agencies and public institutions is accounted for separately and managed and used independently from the basic pension insurance fund for enterprise employees **(MOHS, 2015)**

[10] As of 2000, China's urban pension system showed substantial provincial variation. According to Yang (2001), just five provinces had fully implemented province-wide pension pooling, seventeen operated semi-integrated systems where municipal schemes contributed to provincial relief funds, and the remaining eight provinces continued with fragmented arrangements administered at municipal or county levels.

[11] For further details on regional differences in financing and pension rules see Cousins (2021).

Figure 2 Provincial Demographics Affect Pension Finances



Sources: MoHRSS (2025), National Bureau of Statistics (2025) and Staff estimates
Notes: The system dependency ratio reflects the number of retirees per 100 contributors.

In 2024, China legislated a gradual retirement age increase and a longer minimum contribution period to enhance pension sustainability. The reform increased the retirement age of the urban employees' pension scheme by three to five years depending on gender and job type, phased in between 2025 to 2040. Additionally, the minimum contribution period to receive a pension benefit was increased from 15 to 20 years. Individuals who do not fulfill this criterion may pay a lump sum[12]—often considered insufficient to cover the resulting long-term pension liability (Wong and Yuan, 2020). Box 1 provides further details on the 2024 reform and its representation in print media.

B. The Three-Pillar Pension Architecture

After the many waves of reforms, the Chinese pension system now consists of three pillars:

- **Pillar 1** comprises two programs, the Residents Pension Scheme (RPS) and the Urban Employees' Pension Scheme (UEPS). The UEPS is a mandatory scheme for urban employees in the public and private sector, with self-employed individuals and small businesses in urban areas having the option to contribute voluntarily. The RPS is a voluntary scheme available to individuals not covered by the UEPS—primarily rural residents and gig workers—with extensive government subsidies and enrollment campaigns ensuring near-universal participation. The schemes combine a defined benefit (DB) component funded through social pooling—where contributions are credited to a collective account, allowing for more redistribution—with an individual account mechanism. The individual account mechanism is where contributions are recorded in notional accounts, with local governments crediting interest to individual accounts annually, with rates based on factors such as local wage growth and bank deposit rates. The accumulated balance in the notional account is converted into a stream of pension payments at the time of retirement by dividing the balance by an annuity factor which was last updated in 2005. A reserve fund—the National Social

[12] For individuals who first participated in the basic pension insurance for enterprise employees before July 1, 2011 (prior to the implementation of the *Social Insurance Law*), if they reach the statutory retirement age and have contributed for less than 15 years, they may extend contributions for up to 5 additional years. If, after the 5-year extension, contributions are still less than 15 years, they may make a one-time lump-sum payment to reach 15 years and then proceed with pension collection procedures. (see https://m12333.cn/qa/mumif.html for more details)

Security Fund—exists to support retirement payments. The contribution rates and the benefits differ significantly between the RPS and UEPS.

- For the RPS, the non-contributory DB component pays a flat pension which differs across provinces, with a minimum payment of RMB 143 per month.[13] The contributions under the notional account mechanism are small, and the combined benefits of retirees from both components averages only about 3 percent of per-capita GDP (Figure 3). While the benefit formula places this scheme in pillar 1, for some retirees who have not contributed throughout their lifetime the outcomes resemble a non-contributory pension scheme (pillar 0).
- For the UEPS, the DB component pays 1 percent of the average of the individual's wage and the province-wide average earnings for each year of contribution, subject to a minimum of 15 years of contributions. In addition, employees pay 8 percent of their wages to the notional individual accounts which adds an additional benefit at retirement depending on the accumulated balance in the notional account. The average benefit paid to UEPS retirees, combining the DB and the NDC component, has declined over the years but remains high at over 40 percent of per-capita GDP (and more than 10 times the RPS benefit).

- **Pillar 2** allows enterprises to establish voluntary occupational pension schemes for their employees since 2004 under a defined contribution framework known as enterprise annuities, while mandatory occupational annuities for public-sector employees were introduced in 2014. By 2022, total coverage remained limited, with only about 71 million participants—roughly 9 percent of the workforce—enrolled in either enterprise or occupational annuity schemes (Liu, 2023). This reflects (mostly) voluntary coverage, limited employer contribution capacity (especially in SMEs), low awareness, workers' preferences for short-term benefits and additional application requirements (Xinhua News, 2024).
- **Pillar 3,** introduced at the national level in 2022, includes voluntary individual private savings provided through private commercial insurance, also structured as defined contribution schemes. Households can contribute up to 12,000 RMB per year into tax-exempt accounts, similar to the 401(k) plans in the United States. Coverage has increased rapidly but remains at a low level, with about 70 million accounts being opened since its rollout (State Council, 2024) compared to a working population of close to 900 million people in 2024 (aged 15-59 years).

[13] The non-contributory benefit of the RPS is fully financed by central government finances in the central and western regions and to 50 percent in the eastern region. Local governments cover the remaining 50 percent of the cost in the eastern region.

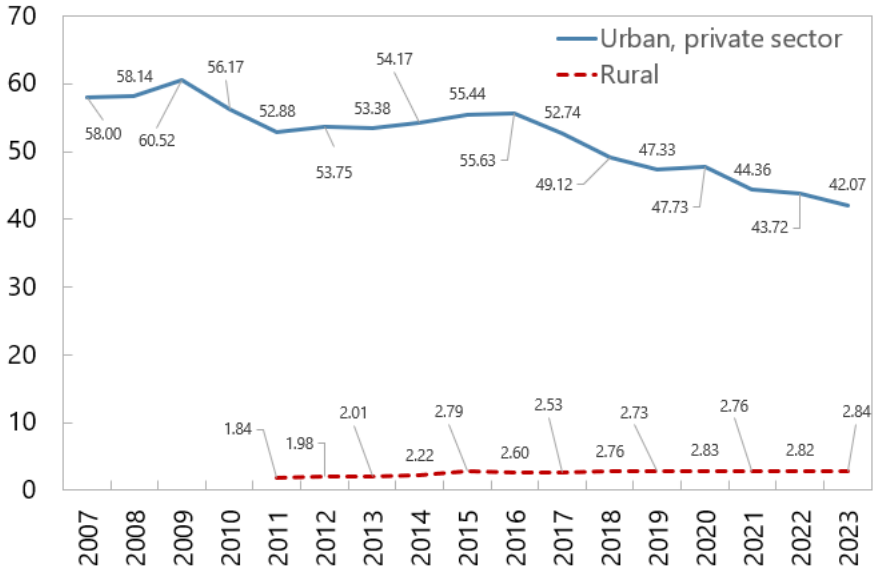
Table 1 Main Parameters of First Pillar Pension Schemes

Category	Urban Employees		Rural & Non-Salaried Residents
Coverage	Mandatory for urban salaried workers in the public and private sector		Voluntary for urban and rural residents 16 years and older not covered by urban worker scheme
Funding	Pay-as-you-go		Pay-as-you-go
Contributions	Contribution Rate: 8% worker and 16% employer Contribution Base: 60-300 % of local average wage		Contribution Choice: 300-6000 RMB monthly, depending on region; Government Contribution Subsidy: at least 30 RMB
Benefit Formula	DB: 1 % Accrual Rate DB Reference Earnings: Individual and local average earnings NDC: Accumulated balance at retirement divided by life expectancy factor. Interest rates set by the government. Longevity risk borne by the government.		DB: Flat basic pension of at least 143 RMB (differentiation by region and age) NDC: like Urban scheme
Pension Indexation	DB: Wage/Price Link (in practice discretionary) NDC: discretionary		Flat pension: Wages/Price/Social benefits Link (in practice discretionary) NDC: discretionary
Valorisation of NDC accounts	Before 2016: link to deposit rates Since 2016: Link to wages and fund balances *		In practice: Mostly linked to deposit rates *
Pensionable Age in 2024 (and future years)	men: 60 -> 63 blue collar women: 50 -> 55 white collar women: 55 -> 58		60 (men and women)
Minimum Contribution Time	15 -> 20 years (by 2039) Option to buy-in under favorable conditions		15 years (waived until 2029) **
Disability Benefits	40 % of last earnings		n/a
Survivor Benefits	Lump sum of 3-24 months of local wage + NDC Balance of deceased		n/a
	Private Sector Employees	Government Employees	
Revenues in 2023 (Billion RMB)	5337	1696	619
Percent of GDP	4.1	1.3	0.5
of which Contribution Revenues	3.3	0.8	0.1
of which Government Subsidies	0.6	0.5	0.3
Contributors or Non-retired Insured in 2023 (in million)	379	n.a	373
Relative to population aged 15–59	43%	n.a	40%
Expenditure in 2023 (Billion RMB)	4706	1651	461
Percent of GDP	3.6	1.3	0.4
Retirees in 2023 (in million)	142	n.a	173
Percent of pop. 60 and older	51%	n.a	62%
Average Annual Benefit in 2023 (Thousand RMB)	38.6	n.a	2.6
Percent of GDP per capita	42.1	n.a	2.8
System Dependency Ratio (Beneficiaries to 100 Contributors or Insured)	37.4	n.a	46.4

Sources: ISSA Country Profile (2025), Ministry of Human Resources and Social Security (2025), Staff estimates,
* Lianquan and Bingxue (2023) and ** Wong and Yuan (2020).

Figure 3 Benefit Levels Relative to GDP per Capita

(Percent, Average benefit relative to GDP per capita)



Sources: Ministry of Human Resources and Social Security (2025); and IMF Staff estimates.

C. International Comparison

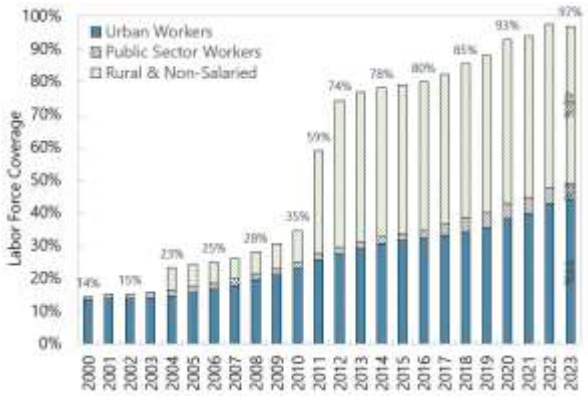
China has achieved a remarkable increase in pension coverage, reaching close to universal pension coverage of the elderly population since 2012 (Figure 4, left panel). By 2023, approximately 1.07 billion citizens were enrolled in public pension schemes, with around half in the UEPS (521 million) and the other half in the RPS (545 million). However, a comparison of China's system to OECD and other comparators suggests there are several pension parameters where China's system differs significantly.

Despite recent reforms, China's retirement age remains low compared to international peers with similar demographic characteristics, especially for blue-collar women. Over the next 15 years, the retirement age for women is set to rise to 55 for those in blue-collar occupations and to 58 for white-collar positions, which is higher than some EMs but well below the OECD average. The retirement age for men is also lower than the OECD average, though with the retirement age rising from 60 to 63, the gap relative to the OECD average is smaller for men compared to women (see Figure 5).

Figure 4 Pension Coverage over Time

a. Coverage of the Elderly

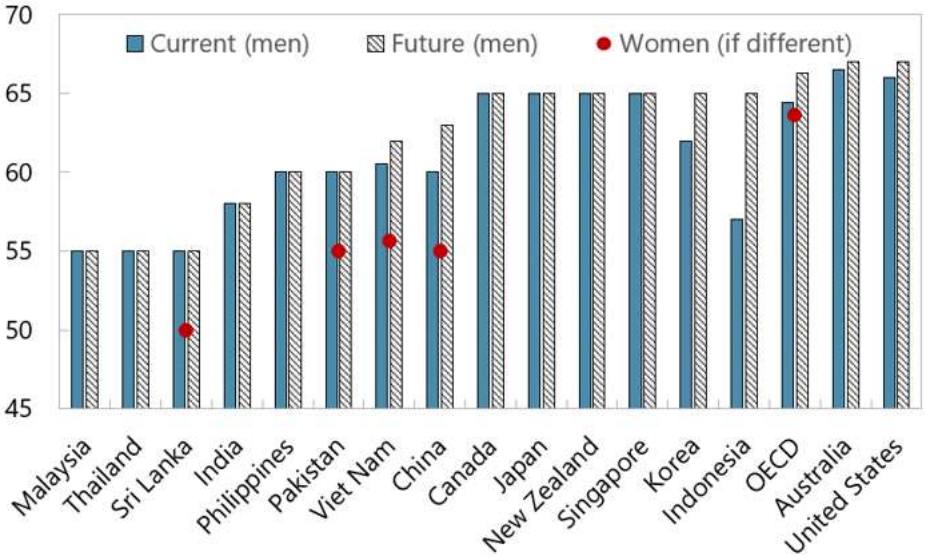
b. Coverage of the Labor Force



Sources: UN (2024); World Bank (2025); Ministry of Human Resources and Social Security (2025) and Staff estimates.
Notes: * The number of urban scheme pensioners is related to the male population aged 60+ and the female population aged 50+, given the earlier retirement age for women.

Given China's demographic trajectory, with the old-age dependency ratio projected to increase from 21.2 percent in 2024 to about 42 percent in 2041, further aligning China's retirement age with that of OECD peers with similar demographic characteristics could mitigate pressures on the pension system and the labor market. Countries such as the United States, Australia, and Korea have already implemented or planned gradual increases in retirement age from levels higher than China despite lower or similar dependency ratios and lower remaining life expectancy at the retirement age. Notably, the United States legislated a gradual increase in the full retirement age to 67 in 1983, when its old-age dependency ratio was around 15 percent—well below China's current level. Australia announced its increase to age 67 in 2009, also at a relatively early demographic stage. Korea has more recently begun raising its retirement age, with the transition from 62 to 65 implemented as the old-age dependency ratio crossed 20 percent.

Figure 5 Retirement Ages in International Comparison



Sources: OECD; and Pensions at a Glance Asia Pacific (2024).
Note: In line with OECD (2024), retirement age for each country refers to the age of eligibility for all schemes combined without penalty, assuming a full career starting at age 22. For Thailand, age 55 reflects the minimum eligibility for social security pensions, while the statutory retirement age is 60. In India, the retirement age of 60 applies only to central government employees; state governments set their own retirement ages for state employees, and there is no legally mandated retirement age for private-sector workers.

UEPS provides high theoretical replacement rates and is more progressive than the system of OECD peers, though it also has higher contribution rates. Workers earning the average wage can expect a replacement rate of 68.3 percent, well above the OECD average of about 50 percent (Figure 7). Furthermore, workers earning half the average wage can expect a replacement rate of 87.3 percent, while high earners receive a replacement rate of 58.8 percent. This progressive benefit structure is primarily driven by the defined benefit (DB) component, which gives a significant weight to the regional average wage. Compared to most OECD and non-OECD systems, which tend to offer flatter replacement structures, China's approach is notably more redistributive. At the same time, China's contribution rate of 24 percent (8 percent by workers and 16 percent by employers) significantly exceeds the OECD average of 18.2 percent and aligns more closely with levels in EU countries with older populations.

Nevertheless, some parameters of the UEPS could be adjusted to better align with international standards and preserve fiscal sustainability. Notably, the computation of the notional defined contribution (NDC) component has not been revised since 2005 and fails to reflect rising life expectancy. Under current rules, if a person retires at age 60, the pension from the individual NDC account is calculated by dividing the accumulated balance by 139 months—an outdated annuity divisor based on past life expectancy assumptions. However, life expectancy at age 60 has risen to 21.7 years (260.5 months) and is projected to increase further to 25.5 years (305.8 months) by 2050. Keeping the outdated divisor effectively renders the system increasingly generous over time, as—simply speaking—the same benefit is paid out over a longer retirement period with rising life expectancy. By contrast, international good practice in NDC systems—such as in Sweden, Italy and Poland—links the annuity divisor directly to life expectancy at retirement, with regular updates to ensure that initial benefits reflect longevity gains and preserve actuarial balance.

RPS in China provides wide coverage, reaching nearly half of the eligible population, but offers minimal support which is well below that of peers, particularly at its base level. When no contributions are made, benefits amount to just 2 percent of the average wage—among the lowest across international benchmarks.[14] As illustrated in Figure 6, China trails some countries in the region such as Thailand, Sri Lanka, and Vietnam, which offer targeted non-contributory pensions ranging from 3 to 8 percent of the average wage, while some other countries in the region do not offer universal coverage of non-contributory pensions. Advanced economies offer more than 15 percent of the average wage. This stark contrast underscores low replacement rates of China's rural scheme.

While the coverage of China's pension system is universal, the ability of the system to deliver adequate consumption smoothing at retirement remains constrained compared to peers. The universal coverage of the RPS reduces the risk of old-age poverty, but the low replacement rate limits the ability of retirees to smooth consumption. For the UEPS, while the benefits are relatively high, significant gaps remain in earnings-related coverage among the labor force, resulting in inadequate pension support for individuals who do not meet the minimum contribution requirements, undermining consumption smoothing for those that are not covered. Compared to OECD countries in the region, which have achieved both universal coverage and broad earnings-related participation over relatively short periods, China's earnings-related coverage remains lower. In 2023 only about 44 percent of China's working-age population had effective coverage in an earnings-related scheme, compared to over 70 percent in countries such as Japan and Korea (OECD, 2024).[15]

Overall, China's pension spending appears broadly comparable to countries with similar old-age dependency ratios, though headline figures may obscure important fiscal and distributional challenges. Countries with similar old-age dependency ratios—such as the United States (21.0 percent in 2005), Canada (20.5 percent in 2010), and Australia (22.0 percent in 2020)—allocated between 4.0 and 6.7 percent of GDP to public pension spending. China currently spends 5.4 percent of GDP, which is broadly aligned to these countries but likely understates future pressure given China's relatively low benefit adequacy for rural pensions and the fact that population aging in China is projected to occur significantly faster than in most other countries. The accelerated aging trajectory implies that China will face mounting pension demands over a shorter time horizon, requiring more urgent and comprehensive reforms to maintain fiscal sustainability. Japan, for example, maintains public pension spending around 9 percent of GDP despite a significantly older population—achieved through sustained reforms. Without similar adjustments in China, demographic and fiscal pressures will intensify. In addition, government subsidies totaled 1.4 percent of GDP in 2023, with 78 percent directed to the urban scheme covering private and public sector employees.[16] These subsidies may have a regressive impact, as the main beneficiaries are typically middle- and high-income groups (Li et al., 2020; Cai and Yue, 2020).

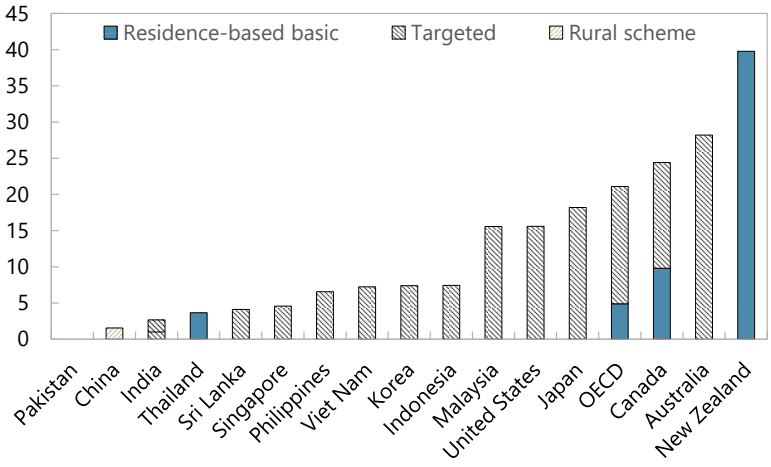
[14] The relevant comparator given both the limited benefit levels and the largely non-contributory nature of the scheme should be other non-contributory schemes in the region.

[15] This low coverage is partly driven by a larger informal sector in China compared to Korea and Japan.

[16] Effectively about 26 percent of public pension expenditures are financed via government subsidies which is close to averages in European countries with 30 percent, see Lavigne et al (2024). The definition of pension expenditures in the latter study is not fully comparable to China, as also supplementary, occupational pensions are covered.

Figure 6 Non-Contributory Social Pensions Benefits

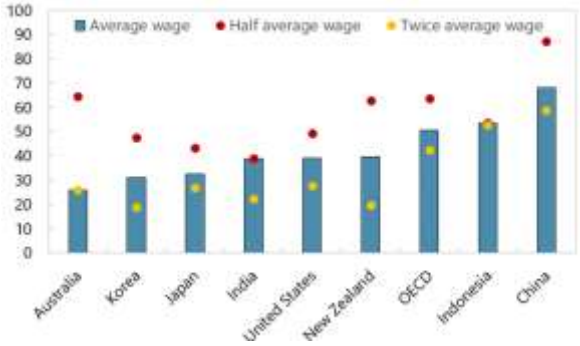
(percent of the average wage)



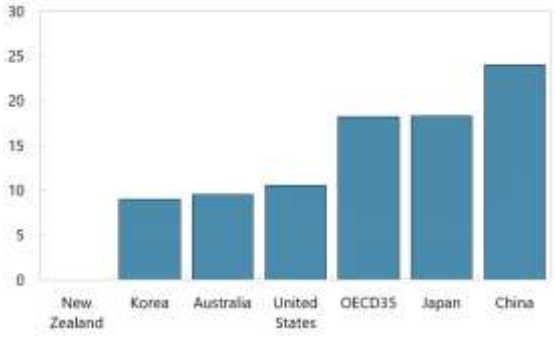
Sources: OECD Pensions at a Glance Asia Pacific (2024); Ministry of Rural Development, India and IMF staff calculations.
Note: The coverage reflects only non-contributory social pension schemes and does not include all existing non-contributory programs.

Figure 7 Theoretical Replacement Rate and Contribution Rates

a. Replacement rate by earnings level



b. Contribution rates



Sources: OECD Pensions at a Glance Asia Pacific (2024); and IMF staff calculations.
Note: Panel a: In India, only a limited number of employees in the formal organized sectors have social security coverage.

Box 1 2024 Retirement Age Reform and Media Sentiment

According to the decision of the Standing Committee of the 14th National People's Congress on September 13, 2024, China will start raising the statutory retirement age for both male and female employees in 2025. Over a 15-year period, the retirement age for male employees will gradually increase from age 60 to age 63 (by 3 months per year). For female employees, the retirement age will rise from 50 to 55 for those in blue-collar occupations (by 6 months per year) and from 55 to 58 for white-collar positions (by 3 months per year).

Starting January 1, 2030, the minimum contribution period required for employees to qualify for a monthly basic pension will progressively increase from 15 to 20 years until 2039, with an increment of six months per year. Employees who reach the statutory retirement age without meeting the required contribution period will have the option to extend their contributions or make a one-time payment to fulfill the requirement. Employees who have met the minimum contribution period will have the option of flexible early retirement, with a maximum early retirement period of three years (without actuarial deductions). However, the retirement age cannot fall below the original statutory limits—50 or 55 years for female employees and 60 years for male employees.

The reform sparked intensified media coverage in September 2024 (Figure B1), with the frequency of mentions of pension reforms in the print media surpassing that of any other year since 2010. Key stakeholders expressing their positions in print media during the legislative month of September 2024 were the government and researchers, both exhibiting relatively positive sentiments toward the reform. In contrast, households adopted a more critical stance (with average sentiment of -2, see Figure B2) though notably less negative than that observed in international comparisons (with an average sentiment of -3). Plans to raise the retirement age were also proposed by the government already in 2012 and 2013, with heightened media debate (Figure B1), but finally not adopted.

Figure B1. News Coverage of Pension Age Reforms

(Number of stakeholder mentions in pension age articles per news outlet)

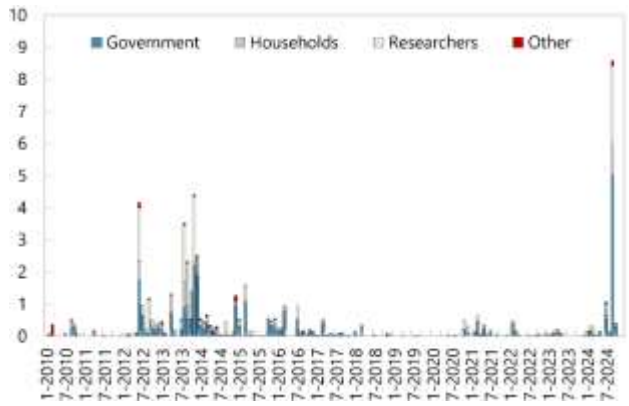
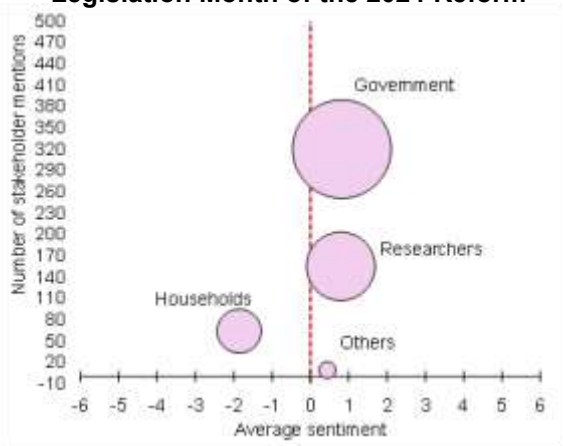


Figure B2: Sentiments Raised in the Legislation Month of the 2024 Reform



Sources: Staff estimates based on Factiva database.

Notes: The left panel shows the number of stakeholders mentions per news outlet in the period from 2010-2024. The right panel demonstrates total mentions and sentiments by stakeholder. The analysis is based on a wide sample of news articles downloaded and parsed from the Factiva database, covering both official state media and other widely read economic and financial outlets. It reflects the diversity of China's media environment, in which news reporting operates within a comparatively strong regulatory framework. For further reference on the methodology and data see Fiscal Monitor Spring 2025, Chapter 2.

III. Quantitative Evaluation of Aging Population and Pension Reforms.

This section employs a state-of-the-art OLG model to quantify the macroeconomic impact of demographic changes. Drawing on the international comparison in the previous section, the model is also used to consider various potential reforms to the pension system and evaluate its impact on the economy, including on fiscal balances.[17]

A. The model

Our model builds upon the analytical framework from Cao et al. (2024). It is an annual dynamic model with 80 overlapping generations that is specifically tailored to reflect China's distinctive demographic structure and pension system. Several key modifications are incorporated to more accurately capture the socioeconomic environment and institutional characteristics of China, especially urban and rural differences.

1. Population Structure

In modeling population dynamics, we differentiate explicitly between urban and rural sectors due to significant demographic and economic disparities, including key differences in pension systems particularly in pension adequacy. The population size at time *t* of the cohort of age *j* is given by $rural_t^j$ and $urban_t^j$ where the youngest age cohort (individuals aged 20) is denoted as $j = 1$ and *j* can take values from 1 to 80. The population growth in rural and urban areas is determined by the growth rate η_t^r and η_t^u and the total population of all age cohorts in the previous period. Specifically, the size of the youngest age cohort born at time *t* is given by:

$$rural_t^1 = (1 + \eta_t^r) \sum_{j=1}^{80} rural_{t-1}^j$$
$$urban_t^1 = (1 + \eta_t^u) \sum_{j=1}^{80} urban_{t-1}^j$$

Individuals survive from one age to the next with an age-dependent probability σ_t^j, which is the same for the urban and rural individuals. These probabilities are calibrated directly using demographic data from the United Nations,

$$rural_{t+1}^{j+1} = \sigma_t^j rural_t^j,\ j > 1$$
$$urban_{t+1}^{j+1} = \sigma_t^j urban_t^j,\ j > 1$$

To maintain technical tractability, the model abstracts from endogenous rural-to-urban migration when $j > 1$.

2. Household

Households are distinguished by their rural or urban residence and maximize lifetime utility derived from consumption, labor supply. The lifetime utility of the cohort born at time t is the following:

$$U_t^i = \sum_j \beta^j \sigma_{t+j}^j \left(\log c_{t+j}^{j,i} + \gamma \log(1 - l_{t+j}^{j,i})\right)\ i \in \{u, r\}$$

where $c_{t+j}^{j,i}$ and $l_{t+j}^{j,i}$ are the consumption and labor supply at time $t + j$ of the cohort born at time t. The urban and rural households, indexed by the superscript i, face different budget constraints.

[17] The policy discussions and recommendations are as outlined in the 2025 Article IV Staff Report for China.

- Urban Household Budget Constraint:

$$(1+\tau_t^c)c_t^{j,u} + \sigma_t^j a_{t+1}^{j,u} = (1+r_t)a_t^{j-1,u} + (1-\tau_t^{ss})w_t e^{j,u} l_t^{j,u} - Tax\left(w_t e^{j,u} l_t^{j,u}\right) + Transfer_t^u$$

- Rural Household Budget Constraint:

$$(1+\tau_t^c)c_t^{j,r} + \sigma_t^j a_{t+1}^{j,r} = (1+r_t)a_t^{j-1,r} + w_t e^{j,r} l_t^{j,r} - Tax\left(w_t e^{j,r} l_t^{j,r}\right) + Transfer_t^r$$

Both household types pay consumption taxes τ_t^c and can save in a domestic asset $a_t^{j-1,i}$ which earns an interest rate of r_t. Urban households earn income from labor with $e^{j,u}$ and $e^{j,r}$ representing the productivity of labor in urban and rural areas, respectively, and w_t being the wage per effective unit of labor. A critical difference between sectors is that urban labor characterized by higher productivity relative to rural labor (i.e $e^{j,u}$>$e^{j,r}$). Both urban and rural households are subject to a progressive labor income tax given by the schedule

$$Tax(x) = \alpha_i + \beta_i x, \qquad if\ x \in (\theta_i^l, \theta_i^h)$$

where i indexes different income bracket and x is the wage income, $\alpha_i\ and\ \beta_i$ are parameters of the income tax schedule which vary depending on the income brackets given by $\theta_i^l, and\ \theta_i^h$.

A key difference in the budget constraints relates to the pension system in urban and rural areas. Urban households are subject to payroll taxes (τ^{ss}) that fund their pension system while rural households do not contribute to a pension scheme for simplicity..[18] Urban households receive pension benefits $Transfer_t^u = \xi AvgWage_t$, calculated based on product of replacement rate ξ and average urban wages while rural households receive a fixed social security transfer $Transfer_t^r$..[19]

3. Firm

The firm will produce according to the standard Cobb-Douglas production function

$$Y_t = (1+\gamma_A)^t A\, K_t^{\alpha} L_t^{1-\alpha}$$

and capital depreciate at rate, δ.The firm's profit is defined as follows:

$$\Pi_t = Y_t - w_t L_t - \delta K_t - I_t$$

there is corporate profit tax τ_t^p, so that firm's maximization problem imply that the net return on capital and wage are, respectively,

$$r_t = (MPK_t - \delta)(1-\tau_t^p)$$
$$w_t = MPL_t$$

Where $MPK = \frac{dY}{dK}$ and $MPL = \frac{dY}{dL}$.

4. Government

Government will raise revenue through consumption tax, labor income tax, social security contribution and profit tax; spend on interest payment, government consumption, and social security transfers (including rural resident pension and urban worker pension); and finance the gap using one period government bonds (G_t).

$$\tau_t^c C_t + \tau_t^{ss} w_t e^{j,u} l_t^{j,u} + \sum urban_t^j Tax\left(w_t e^{j,u} l_t^{j,u}\right) + \sum rural_t^j Tax\left(w_t e^{j,r} l_t^{j,r}\right) + \tau_t^p \Pi_t$$
$$= G_t + \sum rural_t^j Transfer_t^r + \sum urban_t^j Transfer_t^u + r_t B_t - B_{t+1}$$

[18] In fact, the individual contribution to the resident pension scheme is minimal compared to the contribution to the urban pension scheme.

[19] This setup reflects the nature that a part of the benefit is determined by the average urban wage in the period and the effective replacement rate will be calibrated to capture the total benefits disbursed.

5. Equilibrium

Labor and capital markets clearing conditions are given by:

$$L_t = \sum_j rural_t^j e^{j,r} l_t^{j,r} + \sum_j urban_t^j e^{j,u} l_t^{j,u}$$
$$K_t + B_t = \sum_j rural_t^j a_t^{j-1,r} + \sum_j urban_t^j a_t^{j-1,u}$$

The equilibrium conditions are as follows: labor, capital, and goods markets clear at each point in time; the government budget constraint is satisfied at each point in time.

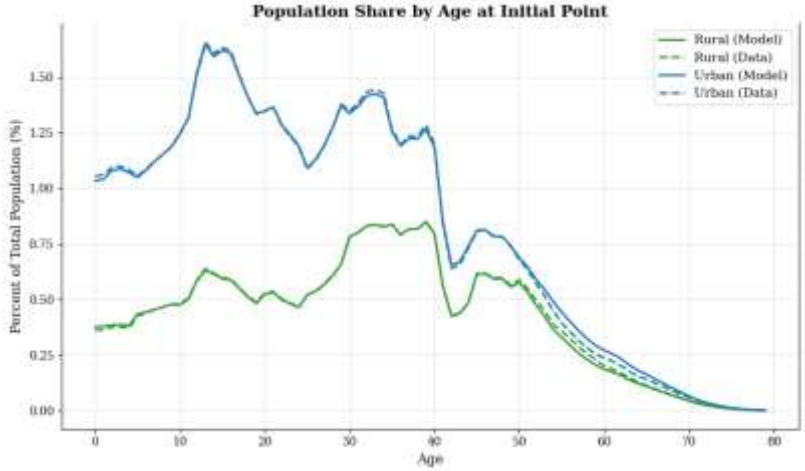
B. Calibration

Model parameters are calibrated at annual frequency to match key macroeconomic indicators and demographic characteristics of China.

1. Demographics:

Departing from standard approaches that begin the analysis from a steady-state population distribution, we initiate our simulations of interest from a non-steady-state equilibrium. A smooth steady-state distribution would fail to capture the demographic irregularities of China's 2024 population structure, which are essential for modeling pension expenditure projections. To approximate China's 2024 demographic profile, we simulate a transition path beginning from a near-steady-state distribution in 1950. Throughout this 1950–2024 transition, we assume exclusively that workforce entrance rates (η^r and η^u) vary over time; these are calibrated to align with the rural and urban distributions observed in 2024. Figure 8 illustrates the resulting population distribution at the calibrated starting point. The 2024 equilibrium outcome, including the asset distribution, serves as the initial point for our baseline simulation.

Figure 8 Population Shares by Age at Initial Point of Transition vs Data



Note: Rural and urban population shares are calculated using five-year age bin data from the National Bureau of Statistics (NBS) of China. To align this data with the model's annual structure, we assume these shares are uniform for each individual age within each five-year cohort.

2. Parameters Based on Macro Data:

We set macro-related parameters to align key macroeconomic ratios calibrated using data from the IMF World Economic Outlook (WEO) database. We set β to be 0.995 so that consumption as a share of GDP is targeted at approximately 40 percent, consistent with 2024 data. Government consumption is calibrated at approximately 20 percent of GDP, also in line with IMF WEO data. Labor preference parameter, γ is calibrated to be 2.4 so that labor supply reaches an average of one-third of available time dedicated to work.

Table 2 Personal Income Tax Brackets, Model vs Data

Data			
Income bracket		Quick deduction	Tax Rate
0	35999	0	0.03
36000	143999	2520	0.1
144000	299999	16920	0.2
300000	419999	31920	0.25
420000	659999	52920	0.3
660000	959999	85920	0.35
960000	over	181920	0.45
Model			
θ^l	θ^h	α_i	β_i
0	0.4	0	0.03
0.4	1.6	0.03	0.1
1.6	3.34	0.19	0.2
3.34	4.67	0.36	0.25
4.67	7.35	0.59	0.3
7.35	10.68	0.96	0.35
10.68	over	2.02	0.45

3. Parameters Based on Fiscal Data:

The parameters of the personal income tax schedule, $Tax(\cdot)$, are calibrated according to statutory rates (see Table 2) and the corporate income tax rate is set at 25 percent. Government debt is calibrated at 110 percent of GDP, matching IMF definition of augmented government debt in 2024 after netting out social security funds.

A key feature of the model is the rich structure for the social security system which is calibrated to match moments observed in China. In particular, the social security expenditures for the urban worker pension scheme are approximately 5.0 percent of GDP, while expenditures for the rural resident pension scheme are around 0.4 percent of GDP in 2023. In the model, the replacement rate for the urban worker pension scheme is calibrated at 0.44[20] to match the targeted 5 percent of GDP spending. A fixed payment equivalent to around 3 percent of GDP per capita is utilized to calibrate the benefit of the rural resident pension scheme. After accounting for government subsidies, net social security contributions are around 5 percent of GDP, resulting in an effective social security tax rate of approximately 8 percent of labor income to match this calibration target.

VAT is treated as a residual element to balance the government budget constraint, leading to a VAT rate higher than empirical observations. This methodological choice implicitly captures various non-tax revenues and less distortionary taxes not explicitly modeled, potentially underestimating their distortive effects. Government debt is calibrated at 110 percent of GDP, consistent with the augmented definition of government debt as outlined in IMF (2024) after netting off social security fund.

4. Parameters Based on Micro Data:

Labor efficiency throughout the lifecycle follows the profile provided by He et al. (2019). To reflect rural-urban disparities accurately, rural labor productivity is scaled to 40 percent of urban productivity, consistent with income differentials reported by China's National Bureau of Statistics (NBS) for 2024. This ensures that the model captures rural-urban income distribution realistically. We do not calibrate to match the income inequality and saving rates in the data. Under this calibration, income inequality—quantified by the Gini coefficient—is 40.4, compared to the empirical value of 46.7 in 2022 reported by the NBS. The overall model-implied

[20] This differs from the theoretical replacement rate used in international comparisons, as the figure reflects the actual benefit payments distributed across the population rather than a stylized benchmark.

household saving rate—defined as savings over disposable income—is 28 percent, with 37.8 percent for rural households and 25.3 percent for urban households.[21]

Table 3 Calibration of Main Parameters

Category	Parameter	Symbol	Value	Calibration Target	Model	Data
Macro Factors	Discount Factor	β	0.995	Consumption Over GDP (%)	40	39.6
	TFP Growth	γ_a	0.04	2024 Potential Growth (%)	4.2	4.2
	Leisure Preference	γ	2.4	Labor Supply	0.33	~1/3
	Capital Share	α	0.5			
	Depreciation Rate	δ	0.1			
Government Factors	Effective Payroll Tax	τ^{ss}	0.083	Pension Contribution (net subsidies) over GDP (%)	5	5
	Replacement Rate	ξ	0.44	Urban Pension Expense over GDP (%)	5	5
	Rural Pension	φ	0.035	Urban-Rural Resident Pension Exp. over GDP (%)	0.4	0.4
	Profit Tax	τ^p	0.25			0.25
	Government Consumption over GDP (%)	g_c	20			20
	Government Debt over GDP (%)	b0	110			108
Demographic Factors	Population Distribution	$rural^j$, $urban^j$				UN data
	New Labor Force Entry	η^r, η^u				UN data
	Mortality Rate	$\sigma^{j,r}, \sigma^{j,u}$				UN data
Micro Factors	Labor Efficiency	$e^{j,u}$, $e^{j,r}$				He et al. (2019) and NBS

C. Simulation Results

Having calibrated the model to fit macro aggregates and the population distribution in 2024, we use the model to simulate a transition to a new steady state over a 240-year horizon.[22] In the rest of the paper we focus on results for the transition dynamics through 2050. We assume a fixed debt path across all scenarios, with government debt increasing from 110 percent of GDP in 2024 to 150 percent within a decade before

[21] Based on NBS national per capita disposable income and consumption expenditure, the 2024 saving rate is 31.7 percent, exceeding our baseline. While the model implies higher retirement-saving incentives for rural households because their pensions are less generous, household survey data often show higher saving rates in urban areas—suggesting we may be missing other urban-specific drivers of saving beyond retirement motives (e.g., housing down payments and mortgage-related saving, precautionary savings for health emergencies, education and childcare costs etc.).

[22] The 240-year horizon ensures that the system converges to a new steady state after all the effects of reforms and demographic shifts have played out.

stabilizing—a trajectory that aligns with the 2024 IMF Article IV staff report.[23] To maintain intertemporal budget balance, the consumption tax rate adjusts endogenously on a period-by-period basis.[24] We present three sets of simulations to (i) quantify how population aging affects macroeconomic development and fiscal sustainability, (ii) assess the macro-fiscal impacts of the 2024 retirement age reform, and (iii) evaluate alternate reform options targeting key dimensions of the pension system.

1. Macroeconomic and Fiscal Impacts of Population Aging

To understand the macroeconomic and fiscal effects of an aging population, we simulate a scenario where demographic factors are the only changing variables with no changes in pension parameters (excluding changes in the retirement age which have already been legislated). We set labor force entry rates (η_t^r and η_t^u) to align with UN demographic projections, defined as the ratio of the 21-year-old population to the aggregate population over age 20. Mortality rates (σ_t^j) are also sourced from the UN projections. This demographic setup results in a gradual increase in the urbanization rate, from 66 percent in 2024 to 68 percent by 2050. During this period, TFP growth is held constant at 4 percent per year.

Without 2024 pension reforms, demographic changes substantially weaken macroeconomic and fiscal performance (Figure 9, red line). The working-age population (ages 20–59) declines by 26.2 percent by 2050, and the old-age dependency ratio rises from 25.4 to 45.2.[25] This reduces labor supply and slows capital accumulation, resulting in an 18 percent drop in GDP by 2050. Annual real GDP growth decelerates by nearly 2 percentage points by 2050.[26] At the same time, pension expenditures increase from 5.4 percent to 15.3 percent of GDP, well above the 8.9 percent projected in CISSS (2019). The difference in results relative to CISSS (2019) is primarily due to updated UN demographic projections, including a faster-than-expected aging process, as well as further modeling assumptions, such as fixed NDC annuity factors in our baseline estimates.[27] Meanwhile, social security contribution as a ratio of GDP remains broadly flat.

The national household saving rate is projected to decline from 28 percent in 2024 to 14 percent in 2050, primarily due to a growing number of retirees who tend to dissave during retirement. This trajectory is consistent with Zhang et al. (2025), who also find a large decline in the saving rate driven by demographic pressures. Because the model does not account for factors that could raise saving in old age (such as bequest motives), this projected decline may be somewhat overstated. Despite the decline in savings, interest rates falls by one percentage point, as the decline in growth prospects due to the declining labor force also lowers investment demand.

[23] Unlike official statistics, we utilize the augmented debt definition, as detailed in the 2024 IMF Article IV staff report. The macroeconomic and fiscal implication of various pension reform scenarios is unlikely to depend significantly on the choice of perimeter used to calibrate public debt.

[24] While outside the scope of this paper, McGrattan and Prescott (2017) argue that a consumption tax is an efficient instrument for financing pension expenditures, given its relatively lower distortionary effects compared to labor or capital income taxes.

[25] The old dependency ratio in the model refers to the ratio of population age 60+ over population age 20-59, which is different from the UN definition.

[26] The quantitative effects on GDP are broadly consistent with the finding of Muir et. al. (2024) that potential growth could slow to around to around 2.8 percent on average over 2031-40 in the absence of major reforms.

[27] Additionally, it should be noted that our pension projections are simplified, assuming, generally, constant pension coverage rates and contribution careers, without access to microdata to project accurately non-linearities of benefit rules and the future distribution of contributions and pension levels.

Table 4 Summary of Fiscal and Macro Implications from Model Simulations

Panel A. Demographic-only vs 2024 reform			
Indicator	**Population Aging (A)**	**legislated Reform (B)**	**Difference (B)-(A)**
Pension spending (percent of GDP)	15.3	11.9	-3.4
Δ GDP growth between 2024 and 2050 (percent)	-2.0	-1.8	0.2

Panel B. Additional pension options (differences vs legislated reform in parentheses)					
Indicator	**Increase in RPS Benefits**	**Increase in Urbanization**	**Adjust UEPS Benefits (Lower Bound)**	**Adjust UEPS Benefits (Baseline)**	**Faster retirement age increase to 65**
Pension spending (percent of GDP, 2050)	0.6 (+12.5)	-0.7 (+11.2)	-0.7 (+11.2)	-1.3 (+10.6)	-1.8 (+10.1)
CAGR GDP (percent/yr, 2024-2050)	-0.01	0.20	0.03	0.06	0.11

Note: CAGR is the compound annual growth rate: $(GDP_{2050}/GDP_{2024})^{1/26} - 1$(percent per year).

2. Assessment of the 2024 Retirement Age Reform

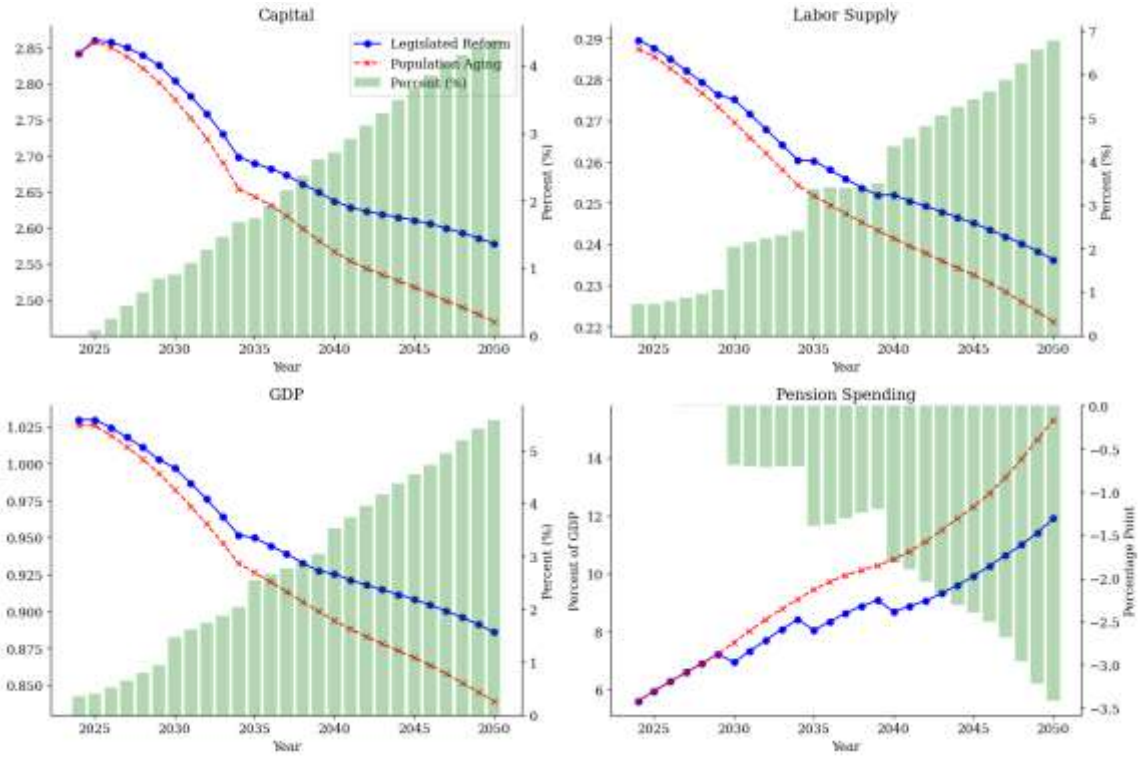
Building on the population aging scenario, we next evaluate the macro-fiscal effects of China's 2024 retirement age reform (as outlined in Box 1). To assess the implications of these reforms, we construct a simulation that adds a phased increase in the statutory retirement age of three years for urban households over the next 15 years, concluding in 2040. Due to the model's annual frequency, th ese increases are implemented in discrete steps—specifically in years 5, 10, and 15—resulting in observable jumps in the policy variable along the simulation path.[28]

Compared to the population aging scenario, the legislated reform increases the effective labor supply and encourages capital accumulation (Figure 9, blue line). As a result, annual real GDP growth rises modestly by approximately 0.2 percentage points and the GDP per capita is 5.6 percent higher by 2050. From the fiscal side, pension expenditures decline by an estimated 3.4 percent of GDP—from 15.3 percent to 11.9 percent of GDP—by 2050, easing long-term fiscal pressure.

The impact of the reforms on household savings is heterogeneous across the population. On the one hand, longer working lives reduces the savings motives for younger workers as they are saving for a shorter retirement. On the other hand, retirees have a lower saving rate than workers, and the higher retirement age reduces the share of retirees in the population. This change in composition increases the overall savings rate in the economy. On net, this second effect dominates, resulting in a 0.9 percentage point average increase in the national saving rate in 2050, relative to the population aging scenario. As labor supply expands and investment demand increases more than savings, the capital market tightens, pushing the interest rate up marginally by 14 basis points.

[28] The model does not incorporate flexible retirement behavior, meaning some individuals may still retire earlier than the statutory age. As such, the macro-fiscal impacts presented here may be somewhat overstated. Conversely, the model does not distinguish between genders, and for certain groups of women—whose statutory retirement age increases more under the reform—which may result in the model understating the true impact of the reform.

Figure 9 Impacts from population aging and the 2024 Retirement Age Reforms



Note: This chart compares macroeconomic indicators—Capital, Labor Supply, GDP, and Pension Spending—under two scenarios: Legislated Reform (blue line) and Population aging (red line), from 2024 to 2050. Capital and GDP are detrended by removing population and TFP growth, while Labor Supply is not detrended and reflects a weighted sum of population shares, efficiency units, and labor supply. Pension Spending is expressed as a percentage of GDP. The green bars (right axis) represent the difference between the two scenarios: a percentage difference for Capital, Labor Supply, and GDP, and a percentage point difference for Pension Spending.

3. Additional Reform Scenarios:

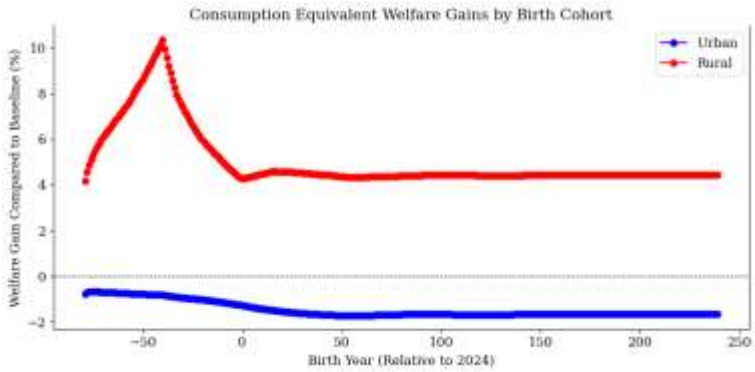
We utilize the model framework to evaluate the impact of additional pension reform options. Adopting the 2024 retirement age reform as the policy baseline, we assess a suite of complementary measures targeting key dimensions of the pension system identified in our international comparison. Specifically, we assess the macroeconomic and fiscal impacts of the following four policy options:

- Enhancing benefits under the RPS to improve old-age income security for rural households.
- Gradually reducing urban worker pension benefits by adjusting the notional defined contribution formula to reflect rising life expectancy.
- Accelerating the increase of retirement age.
- Promoting faster urbanization.

a) Improving rural resident pension benefits:

First, we assess the impact of doubling RPS benefits to show the policy tradeoffs. The model suggests that such a reform would increase pension expenditures by 0.6 percent of GDP by 2050 compared to the legislated policy baseline. GDP per capita falls modestly—by about 0.5 percent by 2050—as the higher pension benefits lead to a modest decline in labor supply relative to the baseline. However, the reform delivers significant welfare improvements, with rural households who are close to retirement seeing consumption-equivalent welfare gains exceeding 10 percent. Urban households experience minor welfare losses due to slightly higher consumption taxes needed to finance the expansion. Overall consumption inequality falls by 0.3 percentage points, demonstrating the policy's redistributive effect. Both rural and urban household saving rates decline, with an overall drop of 0.3 percentage points, largely driven by a 3.4 percentage point decrease among rural households. This reflects a reduced need for precautionary savings as pension adequacy improves.[29] The interest rate, compared to the legislated policy, increases marginally by around 1 basis points in the long run, as the demand for savings declines more than the demand for investment.

Figure 10 Consumption Equivalent Welfare with Increase in RPS



Note: The horizontal axis represents the birth year in the model. Negative numbers indicate agents born at the start of the simulation, while positive numbers represent future generations. The red line represents rural agents, and the blue line represents urban agents. The consumption equivalent welfare is calculated as the change in consumption needed to achieve the change in (remaining) lifetime utility for a particular cohort.

b) Aligning the NDC component with improvements in life expectancy for UEPS

Given the outdated parameters in the notional defined contribution (NDC) formula compared to projected life expectancy, we simulate a reform scenario that reduces the replacement rate by aligning the NDC component with improvements in life expectancy. In the simulation, we gradually increase the annuity divisor from 139 to 305 months over time, effectively lowering the implied NDC replacement rate and ensuring consistency with rising longevity.

Since the precise split between the DB and NDC components in China's pension system is not known, we present two illustrative simulations to anchor the analysis: a baseline and a lower-bound scenario.

- In the baseline scenario, we assume the NDC component accounts for one-third of total pension benefits, consistent with the one third contribution to notional individual accounts. Under this assumption, updating the NDC formula to reflect 2050 life expectancy reduces the overall replacement rate from 43 percent to 35.2 percent, an 8-percentage point decline.

[29] The decline in rural savings is broadly consistent with Xu et al. (forthcoming), who find that doubling of social security spending [in prefectures with a higher share of rural populations]—primarily composed of pensions—could lower the rural household saving rate by about 5 percent in the medium term.

- In the lower-bound scenario, we assume a worker contributes for 40 years at the average wage, generating a DB-based replacement rate of 40 percent (based on a 1 percent accrual per year). Given the calibrated baseline replacement rate of 43 percent, this implies the NDC component contributes 3 percent. Adjusting the annuity divisor for 2050 life expectancy reduces the NDC portion, lowering the overall replacement rate to 41.4 percent—a 1.6 percentage point decline.

Relative to the legislated policy path, the baseline simulated benefit reductions result in a 1.9 percent increase in GDP by 2050, primarily driven by higher labor force and enhanced capital accumulation. Pension expenditures decline by 1.3 percent of GDP, while social security contributions rise modestly due to a larger labor base and increased contributions. The national saving rate increases by 0.7 percentage points, and the interest rate rises as the capital-to-labor ratio adjusts upward.

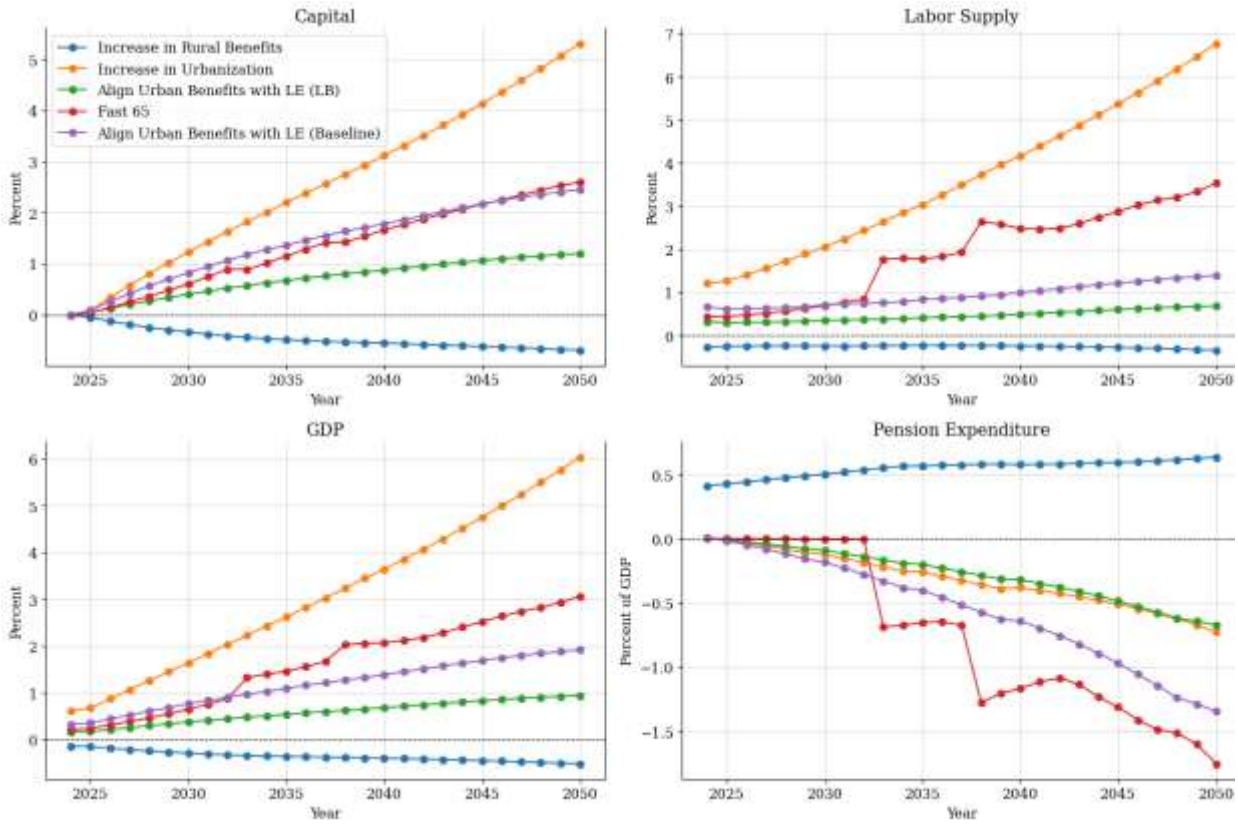
In the lower-bound scenario, where the NDC component is assumed to contribute only 3 percent to the overall replacement rate, the simulated benefit reduction is more modest. GDP increases by about 0.9 percent by 2050, pension expenditures decline by 0.7 percent of GDP, and the national saving rate rises by 0.3 percentage points.

c) Accelerating the increase of retirement age

We evaluate a more ambitious retirement age reform. In this scenario, the statutory retirement age increases to 65 by 2040, with additional increments in years 7 and 13 of the simulation—adding two years beyond the current reform trajectory. The scenario also expands the reform to increase retirement age for RPS participants..

This accelerated reform path delivers stronger macroeconomic and fiscal outcomes relative to the baseline. Compared to the legislated policy, real GDP is projected to be 3.1 percent higher by 2050, translating to an average annual growth boost of 0.1 percentage points. Fiscal expenditures decline by an additional 1.8 percent of GDP by 2050, reflecting extended work lives and delayed benefit uptake. Among rural households, the individual effect dominates: longer working lives reduce the need to save for retirement, leading to a decline in saving rates. Among urban households, the composition effect dominates: the shift toward fewer retirees and more workers—who tend to save more—raises the saving rate, even though a given individual may still save less due to shorter retirement life. Overall, the composition effect prevails, resulting in a net increase in the national saving rate. The labor supply expansion and resulting capital deepening lead to a 4-basis point increase in the interest rate despite higher savings.

Figure 11 Macro-Fiscal Impacts from Additional Reform Options Compared with Legislated Policy



Note: Each panel shows the percent difference relative to the baseline legislated policy for key macroeconomic indicators—Capital, Labor Supply, GDP, and Pension Expenditure—under five reform scenarios: Increase in Rural Benefits, Increase in Urbanization, Align Urban Benefits with LE (LB), Faster retirement age increase (Fast 65), and Align Urban Benefits with LE (Baseline). The y-axis represents percentage changes for Capital, Labor Supply, and GDP, and percentage point changes for Pension Expenditure. The x-axis spans the years 2025 to 2050.

d) Faster Urbanization Through Rural Youth Migration

Urbanization remains a central driver of structural transformation in China, with significant implications for both economic growth and pension system sustainability. Promoting further urbanization can improve earning potential and expand coverage under the UEPS, which currently remains limited. Compared to its peers, considerable room for additional urbanization persists in China, even after the substantial gains made in past decades. In the model framework, urbanization is not modeled through explicit migration but instead reflects differential model birth rates across rural and urban populations. Because the model begins at age 20, it effectively captures the typical behavior of young individuals who move from rural areas to cities for education or employment and subsequently remain in urban areas. In practice, further easing of hukou restrictions could facilitate this transition more broadly. The model does not account for endogenous migration or the selective mobility of individuals with different characteristics (such as education or fertility preferences) from rural to urban areas.

In this scenario, we assume that half of the rural new workforce transitions to urban status by 2050. This is implemented by adjusting birth rates such that $\eta^r_{new,t} = 0.5\,\eta^r_{old}$ and $\eta^u_{new} = 0.5\,\eta^r_{old} + \eta^u_{old}$, raising the

urbanization rate from 66 percent to 74 percent, which is still less than the urbanization rate of Japan and Korea. The resulting structural transformation boosts cumulative GDP per capita by about 6 percent—equivalent to an average annual gain of 0.2 percent—and reduces pension expenditures by 0.7 percent of GDP compared to the legislated policy trajectory. However, as newly urbanized individuals retire after 40 years, the reform could generate additional fiscal pressures in the long run given the higher benefits under the UEPS.

IV. Conclusion

In summary, the paper finds that China's demographic transition poses significant challenges to long-term growth, fiscal sustainability, and social equity. While recent reforms, including the 2024 retirement age adjustment, help mitigate fiscal pressures, the rapid increase in old-age dependency ratio expected over the coming decades is expected to lead to a significant rise in pension spending. Our analysis highlights several areas where international experience may offer useful insights for addressing demographic and fiscal challenges. Model simulations explore several reform scenarios, including (1) strengthening rural pension benefits; (2) broadening participation in the urban scheme through hukou reform; (3) adjusting pension parameters to reflect rising life expectancy; and (4) accelerating the increase in retirement ages. The model results suggest that as China continues to age rapidly, timely reforms can help reduce fiscal pressures and build a resilient, inclusive pension system.

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