

## WORKING PAPER

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# **The Notional and the Real in China's Pension Reforms**

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*Bei Lu*

*John Piggott*

*Bingwen Zheng*

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**Bei Lu**

[lubei@unsw.edu.au](mailto:lubei@unsw.edu.au)

**John Piggott**

[j.piggott@unsw.edu.au](mailto:j.piggott@unsw.edu.au)

**Bingwen Zheng**

[zhengbw@cass.org.cn](mailto:zhengbw@cass.org.cn)

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Corso d'Italia 33  
00198 Roma, Italia

Tel. +39 06854471  
Email: [urp@inapp.org](mailto:urp@inapp.org)

[www.inapp.org](http://www.inapp.org)

# ABSTRACT

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## The Notional and the Real in China's Pension Reforms\*

This paper discusses the potential expansion of the role of the notional defined contribution (NDC) paradigm in the ongoing reforms of retirement provision in China. It finds that mature age life expectancy is remarkably uniform among formal sector workers at the time of retirement, although greater heterogeneity does exist for Rural and Urban Residents Pension Scheme members. The implications of a stylized NDC structure are examined covering China's major pension systems, calibrated to be actuarially neutral. Each system has a different contribution rate and retirement age, consistent with different life expectancies. A complementary social pension is also proposed. The paper concludes that an increased presence of the NDC paradigm has the potential to raise aggregate welfare.

**KEYWORDS:** Pension Reform, Notional Defined Contribution, China

**JEL CODES:** C6, G18, H55

### Abbreviations and Acronyms

|        |  |
|--------|--|
| DB     | Defined Benefit  |
| DC     | Defined Contribution                                   |
| GDP    | Gross Domestic Product                                 |
| IPD    | Implicit Pension Debt                                  |
| MOF    | Ministry of Finance                                    |
| MOHRSS | Ministry of Human Resources and Social Security        |
| NDC    | Notional Defined Contribution                          |
| OECD   | Organisation for Economic Co-operation and Development |
| PAYG   | Pay-As-You-Go  |
| RURPS  | Rural and Urban Residents Pension Scheme               |
| UEPS   | Urban Employee Pension Scheme                          |

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## 1. Introduction

This paper discusses the potential role of the notional defined contribution (NDC) paradigm in the ongoing reforms of retirement provision in China, in the context of the continuing growth and development of one of the world's largest economies.<sup>1</sup> China has remarkably high nominal retirement provision coverage of its population. Four separate pension systems and a (non-age-specific) minimum living allowance ("Dibao") combine to offer financial support for people in the later stages of their lives. At the same time, issues of sustainability, equity, and governance are challenging and real. While coverage is very comprehensive, benefit levels for some major plans are very low. Further, while many broad policy guidelines are set by the central government, jurisdictions at other levels – province, city, and sometimes even district – have major control over implementation, covering administration, benefit rates, and other important features of retirement policy. Economic and social conditions vary dramatically between these administrative regions, suggesting serious limitations around the extent to which effective centralization can be achieved.

The NDC paradigm is already effectively embodied in one part of the most important contributory plan, the Urban Employee Pension Scheme (UEPS), although it is not so labelled. Currently, a mandatory 8 percent employee contribution within the UEPS is paid into an "individual account," supplementing a defined benefit (DB) supported by a 20 percent employer contribution, which is the scheme's heart. Although these individual accounts were originally conceived to be prefunded, due to fiscal pressures in China's retirement space they have remained "empty" almost since their inception.

Policy debate about how to improve what exists is ongoing. Retirement policy and provision, regardless of the approach adopted, are necessarily shaped by the labor market experience of fund members. In China, labor market heterogeneity is dramatic across provinces and between urban and rural settings – in development stage, cost of living, formalization level, and other characteristics. In this sense, China might be viewed as multiple countries.

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<sup>1</sup> The NDC paradigm is well explained by Ayuso, Bravo, and Holzmann (2016), Barr and Diamond (2011), Boskin, Kotlikoff, and Shoven (1988), Holzmann (2017), Holzmann and Hinz (2005), Holzmann and Palmer (2012), Holzmann (2017), and Lu and Piggott (2008). It is not further elaborated here.

An expanded NDC paradigm was previously recommended for China, and was the centerpiece of the commissioned review by Barr and Diamond (2010). More recently, Zheng (2012) provided projections of a “hybrid” defined contributions (DC) model, replacing the current UEPS, that embodies many of the ideas behind the NDC paradigm, although the projections themselves, which assumed convergence to a reformed system by 2020, have been largely overtaken by events (or rather, nonevents). Oksanen (2012) provides an excellent overview of proposals up to that time.

Zheng et al. (2015) produced a thorough NDC proposal that includes projections under a range of policy scenarios, as summarized in this paper's appendix. Barr and Diamond (2010) recognize that moving to a true national system involves a major power shift away from local officials and a geographic redistribution of costs and benefits, but they otherwise pay little detailed attention to the institutional constraints that China confronts. Zheng et al. (2015) do not seriously consider complementary social support for those whose earnings capacity has been exhausted, and which would need to be part of any comprehensive NDC-based reform.<sup>2</sup>

This paper's contribution is therefore threefold. First, it documents the existing pension policy landscape (section 2), and explains the demographic and institutional constraints within which any pension plan in China must operate (section 3). Second, the paper offers stylized projections of benefits, coverage, and liabilities of alternative policy scenarios that expand the NDC system within the UEPS (section 4.1). In undertaking this, attention is paid to induced or regulated increases in retirement age, which is critical in improving sustainability with an aging demographic; the “limited” heterogeneity in mature age life expectancy across pension groups is also taken into account (section 4.2). Third, the paper examines the costs of alternative and complementary retirement-based social support mechanisms (section 4.3). It then discusses how the costs of pensions in the future might be managed under an NDC paradigm, taking into account the cost of a social pension (section 4.4).

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<sup>2</sup> Zheng et al. (2015) do suggest a minimum pension of 5 percent of the national average wage, but they do not consider those who are not eligible for the UEPS pension.

Section 5 concludes that an expansion of the NDC paradigm within the UEPS is likely to be welfare improving. While the NDC paradigm has advantages in terms of sustainability and mature labor supply incentives, it also exposes individuals to risks that, given this paradigm, can only be covered by a social pension. Overall costs of reform are therefore greater than those associated with the NDC paradigm alone.

## **2. China's retirement and pension landscape**

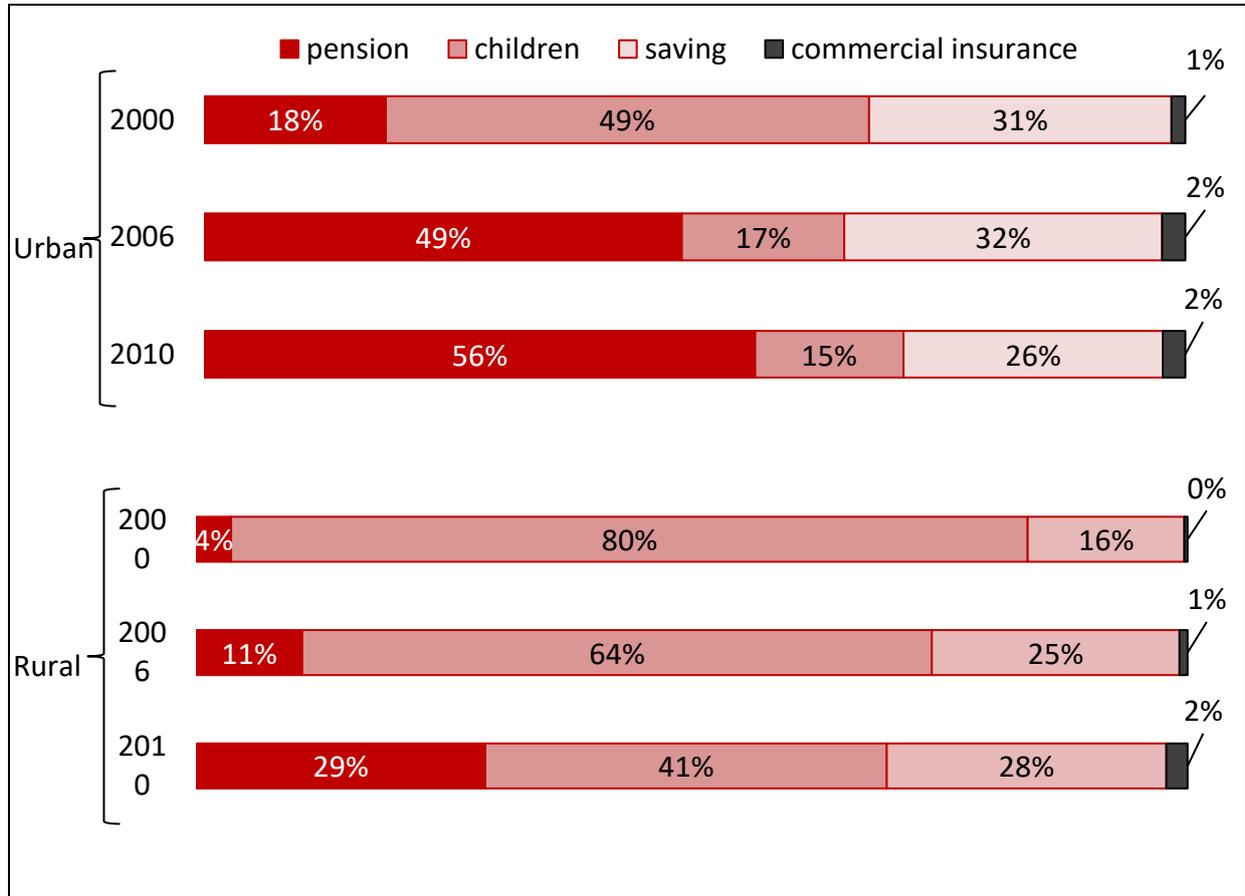
Traditionally, most support in later life for most Chinese came from self-provision and family. At the beginning of this century, less than 20 percent of the urban population aged 60 and above listed "pension" as their main source of retirement income; in the rural sector, the proportion was less than 5 percent. This is changing rapidly. By 2010, more than one-half of the urban group listed "pension" as the main source of retirement income, as did nearly one-third of rural residents (Figure 2.1). This provides a pension take on both the rapid growth of China, partly through formalization of its workforce, and its rapid aging. These underlying economic forces lend urgency to pension reform in China.

The centerpiece of China's current retirement provision policy is the UEPS, established in the late 1990s, as state-owned enterprises shed their "cradle to grave" obligations. The UEPS currently has 403 million members, including both workers and retirees. In common with many emerging economies, China also has a generous, noncontributory and unfunded Public Sector Pension Scheme, although this has now undergone major reforms. Third comes the "Enterprise Annuity" scheme, essentially a DC plan for high-income individuals. Finally, over the last decade, two interrelated plans targeting those who have no other pension affiliation were established – the Rural and Urban Resident Pension.

Table 2.1 lays out the essential characteristics of these four plans. In terms of aggregate revenue flows, the UEPS is by far the largest plan. The overall contribution rate of 28 percent is split between employers and employees, with the latter making an 8 percent contribution to the "individual account." The pure pay-as-you-go (PAYG) DB component of the UEPS relies on a contribution of 20 percent of the scheduled wage to deliver a retirement income of about 35 percent of the scheduled wage after 35 years of contribution.

The individual account is estimated to deliver a further 24.5 percent, for a total of about 60 percent of the scheduled wage.<sup>3</sup>

**Figure 2.1: Changes in main source of retirement income in China by urban and rural populations between 2000, 2006, and 2010**



Source: Authors' summary from three waves of the Sample Survey of the Aged Population in Urban/Rural China in 2000, 2006, and 2010, conducted by the National Ageing Committee.

Benefits are calculated according to a benefit formula reflecting both wage level and years of contribution. Fifteen years of contributions are required to vest. A crediting rate is applied to the individual notional account balance, which was until recently differentiated

<sup>3</sup> The term "scheduled wage" used here is the wage upon which the 28 percent contribution is calculated. In many cases, the wage used is 60 percent of the average wage, which is the minimum base for a 28 percent contribution. Many employers make additional payments to employees that are excluded from the social security calculation.

by province.<sup>4</sup> In 2016, this was set at a uniform 8.6 percent nationally, approximately reflecting member wage growth. Benefits are available at between 50 and 55 years of age for women, and at 60 for men, although various exemptions exist for specific occupations granting earlier benefit access. No earnings test applies.

The UEPS is coming under increasing stress as lifetimes expand, and an important piece of the ongoing reform debate revolves around increasing the access, or retirement, age. This has been under review for some time, but thus far no final decision has been made.

**Table 2.1: China's existing pension schemes as of 2015**

| Schemes                           | Urban Employee Pension  | New Rural and Urban Resident Pension  | Enterprise Annuity      | Public Sector Pension (reformed in 2016) |
|-----------------------------------|---|---|-------------------------|--|
| <b>Contribution</b>               | 20% of wage to social pooling; 8% to individual account (60–300% of wage base).   | RMB 100–2,000 per year  | 12% of wage free of tax | No contribution                          |
| <b>Benefit</b>                    | Social pooling: DB formula based on covered years, contribution amount, and local average wage. Ad hoc adjustment after retirement. | RMB 70 per month plus annuitized personal contributions and government subsidies by retirement. | DC plan                 | 82–88% of final wage                     |
| <b>Contributors (millions)</b>    | 263   | 357   | 22                      | 8  |
| <b>% of population aged 15–59</b> | 28  | 39  | 2                       | 1  |
| <b>Pensioners (millions)</b>      | 91  | 148   | N/A                     | 9  |
| <b>Access age (years)</b>         | Women 50/55<br>Men 60   | Women 60<br>Men 60  | Women 55<br>Men 60      | Women 55<br>Men 60                       |

<sup>4</sup> The “Social Security Law” (section 14) in 2011 authorizes that any remaining individual account balance can be inherited if the pensioner dies.

The Public Sector Pension, while embracing only a small membership, is probably the next most important, if only because of its generosity. A noncontributory scheme, it pays a full career civil servant between 82–88 percent of final wage, typically indexed to wage growth. The scheme has been under review over the last several years, however. Various groups of public sector workers have been separated from the plan and integrated into the UEPS, and civil servants remaining in the Plan who are still working have now (as of 2016) been enrolled in the UEPS, with the organization of the additional benefit still to be resolved. The government set up a supplementary occupational scheme along the lines of the Enterprise Annuity plan, but it is not yet fully implemented. This course of action at least makes explicit the additional value of the Public Sector Pension relative to the UEPS.

Since 2009, two complementary plans have been introduced that are essentially social pensions, although they have a contributory element. The Rural Residents Plan was introduced in 2009, offering residents over the age of 60 with rural Hukou<sup>5</sup> immediate enrolment and benefits. The scheme instantly became the world's largest pension fund by number of members. The basic benefit was introduced at RMB 55 per month and is now RMB 70 per month, still well under US\$1 per day. More prosperous provinces offer supplements that can substantially increase this payment. As well, those under 60 are supposed to pay a minimum of RMB 100 per year in contributions, which will be converted to an additional annuity at age 60. In 2010, a matching Urban Residents Pension Scheme was introduced, providing cover to people with urban Hukou who are not members of other pension schemes. These are treated here as a single policy, the Rural and Urban Residents Pension Scheme (RURPS).

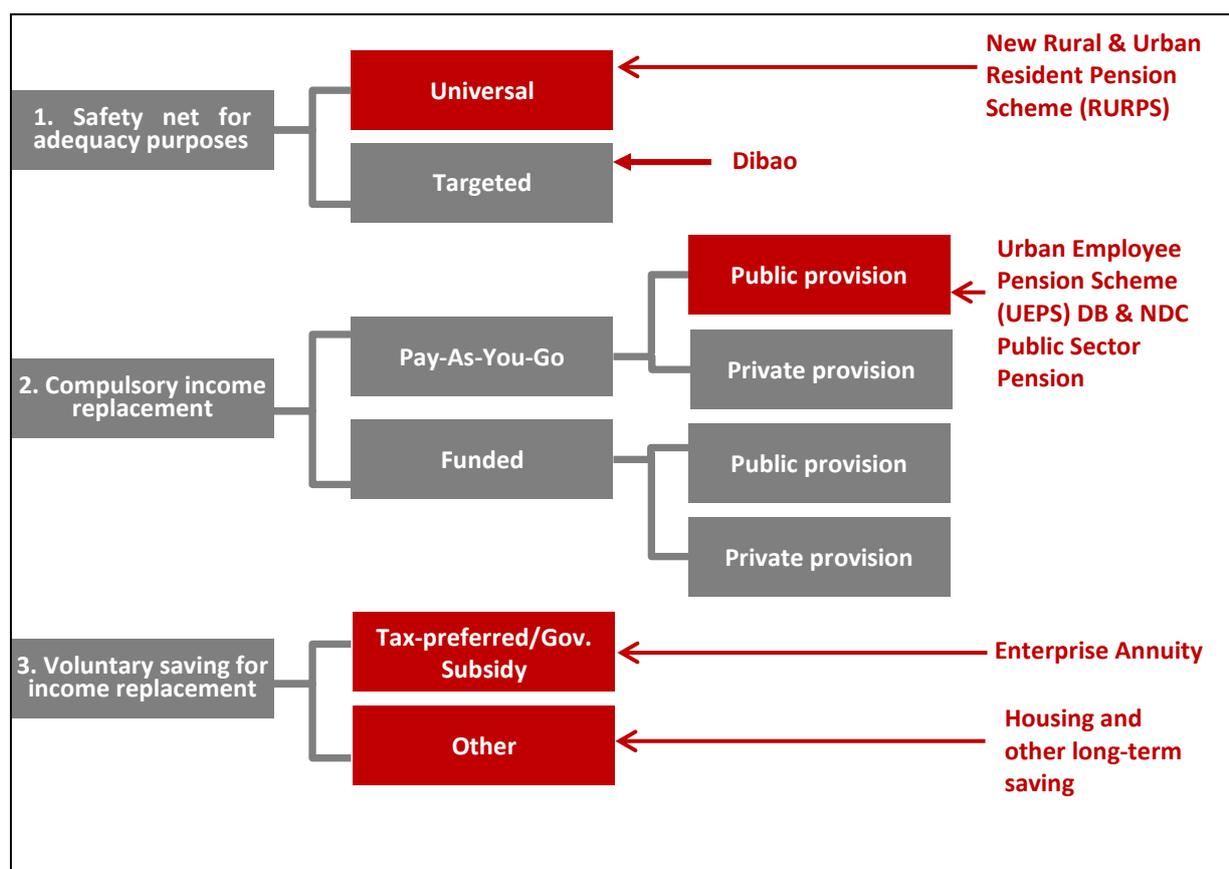
To offer some sense of the structure and function of this retirement policy, Figure 2.2 is a generic schema that identifies the functions of a retirement policy as comprising poverty alleviation (or adequacy), compulsory income replacement, and voluntary supplementary lifetime saving. The rural and urban residents' plans are seen as poverty alleviation instruments, tested against other pension resources. They are supplemented by the

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<sup>5</sup> An official document issued by the Chinese government, certifying that the holder is a legal resident of a particular area, meaning the permanent residential place, usually the registration place when the person was born unless s/he is granted with a new Hukou by another migration place.

Minimum Living Allowance (“Dibao”). This is not strictly a social pension, since it is not age-dependent, although the elderly probably perceive it as a pension payment. It is available to those with no significant labor, capital, or family resources. It is much more generous than the RURPS, but only a small proportion of those in receipt of the RURPS receive the Dibao. This may be because they hold other resources, or because they enjoy family support.

**Figure 2.2: China's retirement income system design**



The UEPS and the Public Sector Pension are both mandatory income replacement schemes. Given the current reform of the Public Sector Pension, the focus here is on the UEPS. Two important points arise. First, the benefit, while calibrated as a proportion of final salary, is thereafter not indexed. Various discretionary adjustments are made to the pension in payment, reflecting increases in cost of living and community standards. Second, while membership of the UEPS is mandatory for formal employees, these remain the minority of

workers in China. The self-employed are not compelled to join, most migrants are not members, and those who are will likely not receive full benefits because of vesting rules.

The Enterprise Annuity Scheme is treated as a voluntary saving mechanism under the third pillar of this schema (in China, it is regarded as a second-pillar scheme). Few workers are members; benefits are mostly paid as a lump sum at retirement, rather than an annuity. It is not a major focus in this paper.

On current settings, these plans will generate large deficits into the future. Already, the annual balance between contributions and benefits is negative for the UEPS. The DB component is negative for women, and roughly in balance for men, the difference arising both from women's earlier retirement age and their greater life expectancy.<sup>6</sup> Thus far, the individual account is a minor component of retirement benefits for current retirees, but it will become more important as the system matures. Over the next period, longer lifespans and limitations to contributor growth are likely to drive ever larger shortfalls.

One longstanding policy response is to increase the overall contribution flow, sometimes by offering lower contribution rates to marginal groups such as new entrants, possibly migrants. Negotiations are often undertaken on an enterprise-by-enterprise basis to increase coverage of their employees. Compliance effort varies by jurisdiction: in general, poorer jurisdictions expend less effort on ensuring compliance, relying instead on central transfers for benefit payment. Often, additional enrolments will lead to still higher future debt, the cost of solving an immediate financial shortfall.

As well, the standard social pooling contribution rate of 20 percent is widely perceived as a disincentive to formal sector UEPS enrolment, and there have been periodic calls for some reduction. The national government recently moved to marginally reduce this rate (Lu 2017).

The present value of the implicit pension debt (IPD) is difficult to estimate, because DB promises are in fact not well defined beyond the initial payout year, and discount rates are hard to agree on. The current estimates of the IPD are considerably inflated by the legacy

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<sup>6</sup> Authors' calculations, available on request.

debt of pre-1996 arrangements, when a noncontributory scheme operated. In terms of currently accruing liabilities, it is the individual account obligations that dominate.

As a result, no consensus exists yet for the calculation of IPD costs. The Ministry of Human Resources and Social Security (MOHRSS), the Ministry of Finance (MOF), and the National Development Reform Committee (NDRC) have all estimated the IPD, with values between RMB 1.4 trillion and 6.3 trillion (based on 1995–2005 report estimates), though these figures seem low even at the upper bound. Other estimates suggest that the IPD might be much higher. The Chinese Academy of Social Science (CASS) reported that the overall IPD totaled RMB 60.6 trillion in 2014, nearly 100 percent of gross domestic product (GDP), and more than four times the current total fiscal revenue (Zhang 2015, 10; Lu 2017).

The IPD estimates reported above do point to the need for long-term pension reform, and this is acknowledged by policy makers. The NDC paradigm figures in this debate, as indicated above. But thus far, the nature and timing of reform have not been agreed upon.

The overall structure of China's retirement policy may appear piecemeal, but it is important to appreciate that it operates in a country that is itself piecemeal. The urban–rural divide, the heterogeneity in living standards across provinces, the multiple levels of administrative jurisdiction, and the range of public financing authorities for these schemes all interact to make integration challenging. As well, the different legal and background characteristics of the working (and retired) population – urban, rural, migrants – compound this issue. These institutional and social structures are discussed in section 3.

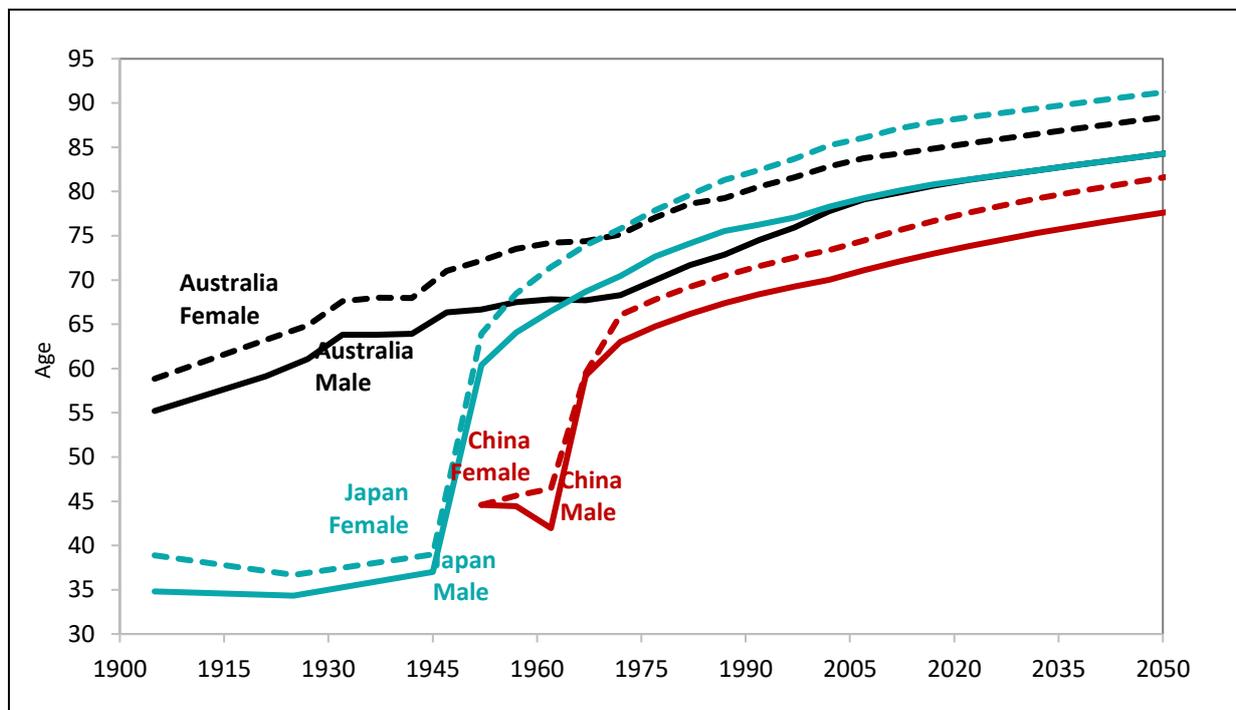
### **3. Demographic and institutional considerations**

#### **3.1. Demography**

China is one of the world's most rapidly aging economies, a phenomenon driven by both increasing lifespans and declining fertility. Both these components are important for pension design, but here the focus is principally on life expectancy and its trends through time.

Figure 3.1 depicts changes in life expectancy over time and compares these trends with those in two other countries with high life expectancy – Japan and Australia. Japan and China both experienced very rapid increases in life expectancy as they emerged from less developed status, followed by steady increases. China still falls significantly below these countries in life expectancy. This is probably because the forces behind declining mortality at mature age, which has driven most of the life expectancy increase in developed countries since the mid-1980s, have yet to manifest themselves in China's mortality statistics.<sup>7</sup> Mature age life expectancy still has some way to go in China, a point relevant to debate about pension policy, and especially access, or retirement, age.

**Figure 3.1: Life expectancy at birth (years) by gender in Australia, China, and Japan, 1901–2050**



Source: Human Mortality Database ([www.mortality.org](http://www.mortality.org)); ABS Cat 3302.0.55.001; ABS Cat 3105.0.65.001; UN 2011;

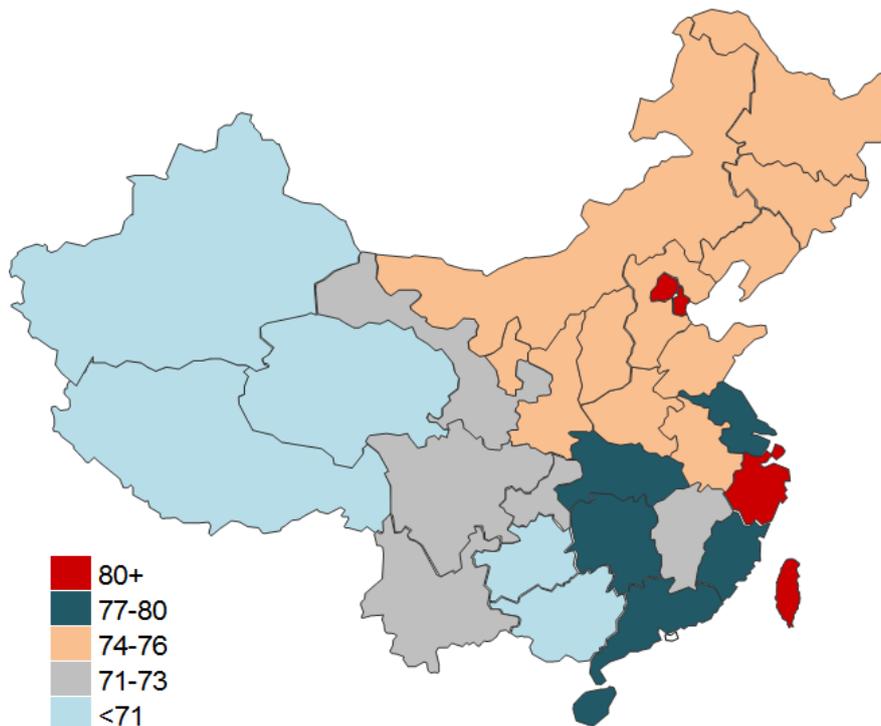
However, Figure 3.1 masks several interacting trends germane to pension policy design. First, surprisingly wide variation exists in life expectancy at birth by province – more than 10 years

<sup>7</sup> For example, the incidence of male adult smokers is about the same in China now as it was 40 years ago in Australia.

(Figure 3.2). This immediately calls into question the idea of a uniform pension plan – there is an important sense in which China can be seen as a number of countries, at different stages of development, with associated differences in socioeconomic characteristics.

Official data from 2005 suggest that life expectancy at age 60 varies much less, however – from 18.4 to 20.2 years (MOHRSS 2008).<sup>8</sup> The analysis here independently calculated provincial differences in life expectancy at 60 using 2010 census data that also suggest much greater homogeneity – an overall range of less than three years. These estimates are preliminary, and refinements may reveal more differentiation, but for now, similar lifespans after 60 on average might be assumed across provinces.

**Figure 3.2: Life expectancy at birth by Chinese province, 2013**



Source: Developed from estimates in Zhou et al. 2016.

The current heterogeneity in remaining life expectancy at retirement age can be observed by rural and urban separations, representing different income groups and economic

<sup>8</sup> Source: [http://www.chinajob.gov.cn/SocialSecurity/content/2008-11/12/content\\_479917.htm](http://www.chinajob.gov.cn/SocialSecurity/content/2008-11/12/content_479917.htm)

development stages. Table 3.1 estimates life expectancy at age 60 and 65 for the past four censuses.

The gap between rural and urban life expectancy stood at 1.7 and 1.4 years in 2000 at age 60 and 65, respectively. Inequality in life expectancy increased from 2000 to 2010 but has since declined.

Importantly, when the UEPS is considered, it is predominantly urban, even city, life expectancies that matter. Table 3.2 reports city life expectancies at birth and at age 60 for three high-income regions and three low-income regions, along with associated estimates of GDP per capita.

**Table 3.1: Life expectancy (years) at age 60 and 65 for national, urban, and rural residents and the urban–rural gap**

| Year                         | National | Urban | Rural | Urban–Rural |
|------------------------------|----------|-------|-------|-------------|
| <b>Life expectancy at 60</b> |          |       |       |             |
| 2000                         | 18.4     | 19.6  | 17.9  | 1.7         |
| 2005                         | 19.2     | 20.5  | 18.3  | 2.2         |
| 2010                         | 20.0     | 21.5  | 18.9  | 2.6         |
| 2015                         | 20.9     | 22.0  | 19.8  | 2.0         |
| <b>Life expectancy at 65</b> |          |       |       |             |
| 2000                         | 14.7     | 15.6  | 14.3  | 1.4         |
| 2005                         | 15.4     | 16.6  | 14.7  | 2.0         |
| 2010                         | 16.1     | 17.5  | 15.2  | 2.3         |
| 2015                         | 16.9     | 17.9  | 16.0  | 2.0         |

Note: Life expectancy is calculated by the authors using national census data with adjustments.

These are remarkably uniform. The difference in life expectancy at age 60 between city residents in the richest province of Zhejiang<sup>9</sup> and those in the poorest province of Guizhou is only 0.8 years. The speculation is that city residents in low-income jurisdictions are an elite group, whereas in Zhejiang, the city catchment is much broader. What matters for UEPS pension reform, however, is that life expectancies are not as heterogeneous geographically as overall provincial estimates of life expectancy might suggest.

<sup>9</sup> Excludes direct municipal cities.

**Table 3.2: Average city life expectancy (years) in high- and low-income provinces, 2010**

|   | High-income Region |          | Low-income Region |        |
|---|--------------------|----------|-------------------|--------|
|   | Guangdong          | Zhejiang | Guizhou           | Gansu  |
| <b>GDP per capita (RMB)</b>             | 44,736             | 51,711   | 13,119            | 16,113 |
| <b>Life expectancy at birth (years)</b> | 80.0               | 80.4     | 79.7              | 79.7   |
| <b>Life expectancy at 60 (years)</b>    | 22.8               | 23.2     | 22.5              | 22.4   |

Source: Authors' calculations based on provincial data of the 6<sup>th</sup> National Census in 2010 for life expectancy and GDP per capita data from the China Bureau of Statistics website.

Finally, the rural–urban migration that took place over the last three decades, and continues currently, is the largest migration in human history. In 2015, about 250 million people were “floating”: their Hukou was different from their place of residency and work. Most of these are rural residents. A small proportion joined the UEPS; the others have potential rights under the RURPS.

This presents enormous challenges to pension fund governance. The extraordinary difference in entitlements between these undocumented workers and their documented counterparts has not been at all adequately addressed in China's pension policy reform.

### 3.2. Institutions

Institutional arrangements in China are remarkably robust. Averaging the World Bank Governance Index components, and excluding “Voice and Accountability,” China places on average at nearly the halfway mark worldwide, a remarkable achievement for a country at its present stage of development. These social structures, while robust, are also inflexible, at least those embodying the administration of pensions, and must be reckoned as institutional constraints on pension reform. This section provides a brief overview of the governance of retirement policy.

It is convenient to begin with political and administrative structure. At the immediate subnational level, China is made up of 31 jurisdictions: 22 provinces, 4 cities, and 5

autonomous regions.<sup>10</sup> At lower levels of administration, there are more than 300 cities, and nearly 3,000 towns and villages, or counties.<sup>11</sup>

Pension-related administrative agencies are located in more than 3,400 offices, which by “Social Security Law” are the operating bodies for all contribution collection and distribution records. The fund collection channels are either through social security agencies or local tax offices and ongoing disagreement remains as to which channel should be used. For example, while 14 provinces currently collect social insurance contributions through the Tax Agency and the MOF would like to have that practice standardized, the MOHRSS does not agree, for reasons of control (Lu 2017).

The “social pooling” that constitutes the heart of the DB component of the UEPS takes place within these jurisdictions. Although most provinces claim to have pooling at the provincial level, they mostly have an adjustment fund system instead of actual pooling at this level. Only a few provinces and cities (Shanghai, Beijing, Tianjin, Chongqing, Shanxi, and Qinghai) have achieved actual provincial pooling. Relatedly, agencies continue to move only slowly toward greater harmonization on data sharing. In mid-2015, the MOF connected to the MOHRSS *Jinbao* information system on social insurance for the first time, but the long-awaited Memorandum of Understanding between the two ministries to exchange more complete data in real time on Social Insurance contributors and contributions is still being discussed. Given this background of practice and context, what follows in section 4 should be thought of as illustrative.

#### **4. Pension reform and the NDC**

This section imagines that the three major pension systems identified in Table 2.1 are converted to an NDC structure, and explores implications for contributions, individual benefits, and system cash flow. Because the NDC structure offers no minimum guarantee, it must be paired with an effective social pension; this section draws on Lu, He, and Piggott (2014) to present a social pension scenario.

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<sup>10</sup> Hong Kong, Taiwan, and Macao are excluded.

<sup>11</sup> Data from China Statistics Year Book 2016.

#### 4.1. Model assumptions and parameterization

One advantage of an NDC system is to ensure the contribution history meets with the longevity trends by automatically adjusting retirement age. Parameterization of the retirement age adjustment is based here on a fixed remaining life expectancy. Remaining life expectancy is fixed at the 2010–2015 level (20.5 years at age 60). According to both the Lu, He, and Piggott (2014) projection and the Organisation for Economic Co-operation and Development (OECD 2017), overall life expectancy at age 65 is about 20.5 years in 2060–2065.<sup>12</sup>

This assumption of fixed remaining life expectancy is used as the anchor for automatic retirement adjustment mechanism for the NDC approach. Assuming a linear trend increase in life expectancy, retirement in 2035 would be 62.5, for example. Heterogeneity across pension plans is also taken into consideration, as explained below.

The calculations of the operation of an NDC reform in China are embedded in some plausible assumptions about the evolution of the Chinese economy, changing life expectancy, and the evolution of the UEPS. The scenario is informed by considerations of global convergence and of likely patterns of mortality decline, and pays some regard to long-term targets of Chinese policy.

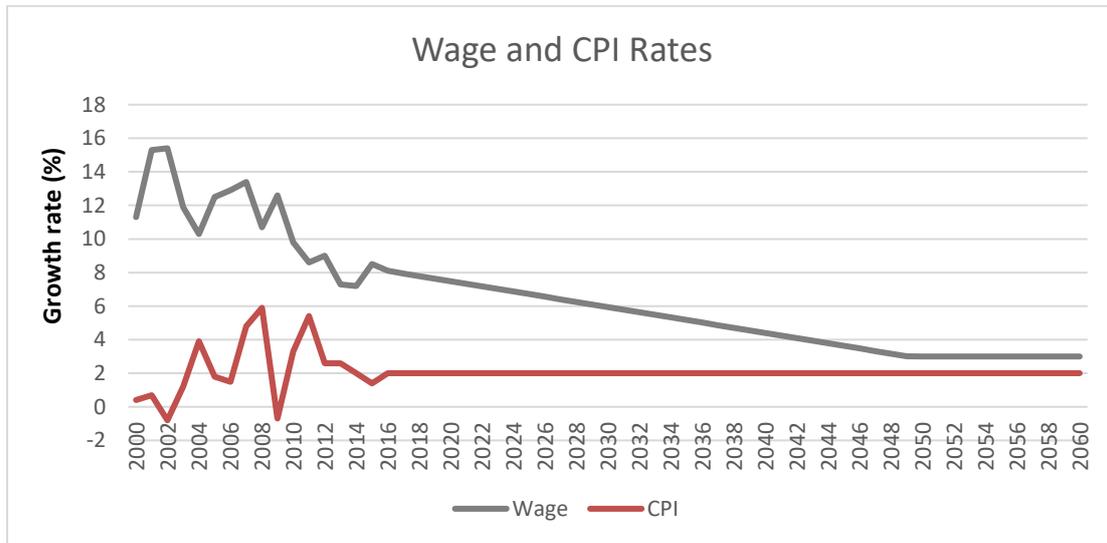
Figure 4.1 plots these assumptions on convergence of wage and GDP growth. Assumptions include linear convergence from 2017 to a steady state 3 percent nominal wage growth, and 2 percent price growth, by 2050.

In practice, countries adopting an NDC paradigm choose some index of growth, such as GDP per capita or nominal wage growth, as a guide to the crediting rate.<sup>13</sup> For present purposes, nominal wage growth is assumed as the crediting rate.

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<sup>12</sup> The OECD (2017) estimates remaining life expectancy at age 65 is 21.6 years for women and 20.1 years for men in 2060–2065.

<sup>13</sup> Notional account systems where the interest rate credited ex post is the growth rate of the average covered wage, or the growth rate of the covered wage bill, or the growth rate of gross national product, do not exhibit automatic financial stability, except in hypothetical cases where the number of contributors and the contribution rate remain constant forever (Valdes-Prieto 2000, 404). In the projection below, the number of

**Figure 4.1: Historical and projected wage and price growth in China, 2000–2060**

Source: Historical data from China Bureau of Statistics website.

Note: Projections are based on assumed convergence to productivity growth of 1% by 2050.

## 4.2. Individual contributions and benefits

The NDC paradigm can be applied to all three pension schemes in China, which are differentiated by contribution rate and retirement age (Table 4.1). In all three systems, an 80 percent contribution density ratio is assumed.<sup>14</sup>

The most radical change occurs within the RURPS. Currently, the minimum contribution is 100 yuan per year. The NDC model calculations assume a 10 percent contribution, which is likely to substantially increase the annual contribution amount, although a wide range of contributions will likely exist. It is assumed that employees and employers based in small and medium enterprises pay a 20 percent contribution, the rate currently paid by the enrolled self-employed. The current formal large-scale enterprise members as well as civil servants are assumed to maintain the 28 percent contribution scheme. Benefits, expressed as a percentage of final wage, are wage-indexed.

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contributors remains fairly constant from 2030 onward and the assumed real wage growth converges to 1 percent as well. A stylized benefit calculation can thus be used in which access age is adjusted to maintain remaining life expectancy constant at 20.5 years.

<sup>14</sup> According to Zheng et al. (2015), the density of contribution declined over the past decade to about 80 percent. This rate is assumed to remain the same in the rest of this analysis.

Consistent with section 3's results, only minor differences in mature age life expectancy are assumed (Table 4.1).

**Table 4.1: Various contribution rates and their replacement rate scenarios in 2060**

|                                      | Contribution rate (%) | Replacement rate in 2060 (%) | # of contribution years | Retirement age |
|--------------------------------------|-----------------------|------------------------------|-------------------------|----------------|
| RURPS                                | 10                    | 18                           | 35                      | 64.0           |
| UEPS                                 | 20                    | 35                           | 35                      | 65.5           |
| Enterprise Annuity and Public Sector | 28                    | 49                           | 35                      | 67.0           |

Note: The Large-scale Enterprise and civil servants' contribution plan includes the current 8% individual account contribution to the NDC account.

### 4.3. System cash flow

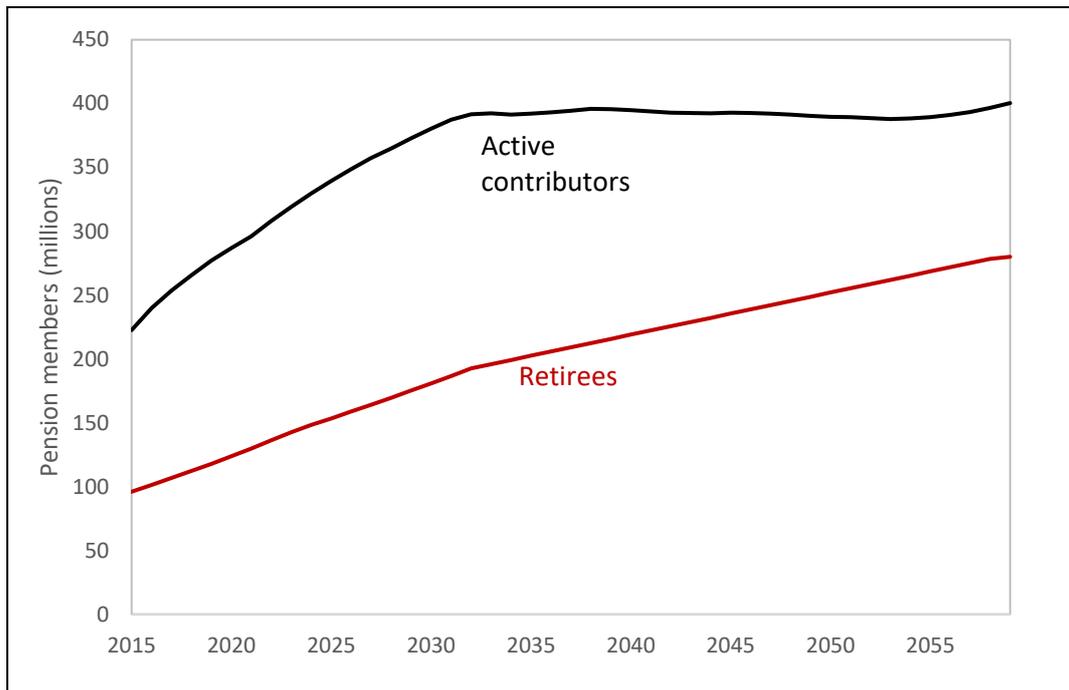
To generate estimates of system sustainability and cost, estimates of NDC membership are also needed. The assumptions made are given in Table 4.2. The urbanization rate is set according to the government target and the formal labor force participation rate is assumed to converge to current OECD levels by 2035.

**Table 4.2: Assumptions to generate projections of UEPS membership**

| Variable                   | Assumed Value  |
|----------------------------|--|
| Urbanization ratio         | From current 50% to 75% in 2050  |
| Pension system contributor | From current 40% to 65% of labor force population in 2035 and then stays constant  |
| Retirement age             | Access age is adjusted to maintain remaining life expectancy constant at 20.5 years with adjustment to three different income groups |
| # of pensioners            | From the current 101 million to 280 million in 2050 (70% of 65 and above population)   |
| Population projection      | TFR set at 1.55 (Lu, He, and Piggott 2014)   |

Note: TFR = total fertility rate.

With these assumptions, it is possible to generate the evolution of NDC membership through to 2060. Figure 4.2 depicts projections of both contributors and retirees, assuming that 80 percent of contributor accounts are active at any time (the current rate).

**Figure 4.2: UEPS system members projection, 2015–2060**

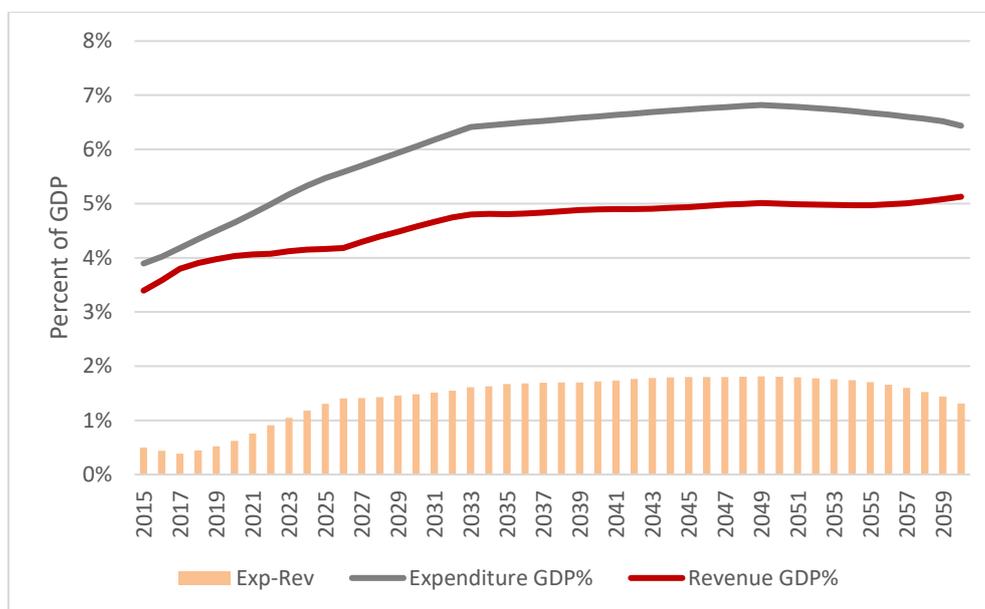
The cost of a reformed NDC system with characteristics as outlined above can now be calculated. Figure 4.3 depicts cash flow projections for a reformed system, where benefits gradually reduce from the current replacement rate to the NDC outcomes by 2060. Essentially, the net costs are the transition costs of moving from the promised UEPS benefits to those implied by an NDC paradigm – thereafter, given these assumptions, the system is self-sustaining.

The NDC plan consists of three contribution groups. For simplicity, assume that 40 percent of pension system members will belong to the 10 percent contribution group, mainly rural and urban residents with low income. The second group comprises the self-employed and small enterprise employees, accounting for another 40 percent with a 20 percent contribution rate. The last 20 percent of the labor force are civil servants and large-scale enterprise employees, who have a 28 percent contribution rate.

The aggregated contribution rate based on this structure will be about 18 percent. The aggregate average national retirement benefit replacement rate will be 31 percent based on

the calculation of each group's replacement rate. The projected aggregate cash flow is depicted in Figure 4.3, including pre-reform entitlements.

**Figure 4.3: Cash flow projection with NDC plan by 2030 and onward under three different contribution rate groups**



In practice, however, it is unlikely that all system members will contribute for 35 years. Shorter contribution histories will naturally lower the benefit and replacement rate. The experience over the last decade in Chile has shown that a social pension is necessary to support elders with inadequate pension entitlements. Because the NDC paradigm carries no minimum pension guarantee, a social pension is seen as integral to an NDC reform. Estimates of the cost of establishing such a safety net are presented next.

#### 4.4. The role of the social pension

A central feature of the NDC paradigm is that it is not redistributive. This naturally places additional weight on the role of social pensions. Lu, He, and Piggott (2014) analyzed a social pension framework in which payments are pension tested – that is, vested members of the UEPS and the Civil Service Pension System were not eligible to receive such a pension. Table 4.3 gives costs, as a percentage of GDP, for benefits set at alternative proportions of GDP per capita, for alternative ratios of the eligible elderly and for alternative fertility rates. As

China develops, the target benefit rate would probably lie at the upper end of these projections.

**Table 4.3: Social pension cost as % of GDP at age 65: Alternative benefit levels, fertility assumptions, and rates of eligible ratios of elderly<sup>15</sup> by 2050**

| Eligible elderly ratio | TFR  | Benefit as a % of GDP per capita |        |        |
|------------------------|------|----------------------------------|--------|--------|
|                        |      | 6.60%                            | 10.00% | 15.00% |
| 75% of elderly         | 0.9  | 1.55%                            | 2.34%  | 3.52%  |
|                        | 1.55 | 1.45%                            | 2.20%  | 3.30%  |
|                        | 2.2  | 1.37%                            | 2.07%  | 3.10%  |
| 50% of elderly         | 0.9  | 1.02%                            | 1.54%  | 2.31%  |
|                        | 1.55 | 0.96%                            | 1.45%  | 2.17%  |
|                        | 2.2  | 0.90%                            | 1.36%  | 2.04%  |

Note: TFR = total fertility rate; the TFR of 1.55 is static until 2050. The low and high variants converge linearly to these long-term steady states by 2050, from the current fertility rate of 1.55 (Lu, He, and Piggott 2014).

If formal pension coverage evolves as projected above, the eligible elderly will likely reduce as a fraction of the elderly population. By 2050, it is likely that only 30 percent of the elderly will be eligible for a social pension. This will reduce costs proportionately. On the other hand, NDC members with low accumulations – and current practice suggests that there may be many such members – will require Social Pension-type support, perhaps along the lines of the recent Chilean reform, where a social pension supports those with (funded) pension accumulations that are insufficient to alleviate poverty.

## 5. Conclusion

This paper canvassed the possibilities that the NDC paradigm generates in thinking about pension reform in China. The analysis suggests an important role for an NDC structure, especially within the UEPS. In particular, the NDC model would provide additional leverage in changing access age with increasing mature age life expectancy.

<sup>15</sup> Administration costs are not calculated here. It is difficult to estimate the cost of a social pension system as staff and information systems are usually shared by various programs. According to Grosh et al. (2008, 93), targeting costs average about 4 percent of total program cost.

The NDC model also provides some help in moderating benefits: parameters set to encourage formal labor force participation generate quite modest benefits under the assumptions. Post-tax replacement rates can be considerably higher, however; in some circumstances, the standard 35 percent UEPS replacement rate under the NDC calculations will translate to more than 50 percent.

Much has been made of heterogeneity in life expectancy across regions in China, and it is certainly true that life expectancy at birth differs markedly, both between urban and rural sectors and across geographic regions. But when considering mature age workers who are covered by the UEPS, differences largely disappear. This is because considering groups at age 60 removes by definition differential mortality experience prior to that age, and also because of preselection to formal pension membership. Urban workers in western provinces, for example, appear to have mature age life expectancy very close to those in urban east coast jurisdictions, and it is these groups that will dominate UEPS membership. It is therefore anticipated that UEPS mature age life expectancy is likely to remain quite homogeneous. Somewhat greater heterogeneity does exist when membership of the RURPS is considered, but even here, mature age life expectancy varies by only a couple of years.

To the extent that the NDC paradigm becomes more widespread in China, a well-functioning and substantial social pension plan becomes more necessary. The paper discusses a proposal in Lu, He, and Piggott (2014) that describes the design and implementation of a social pension and offers some initial costings. This proposal uses lack of pension fund membership as a criterion for social pension receipt. Within an NDC structure, such a criterion would have to be replaced by some minimum notional accumulation threshold.

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## Appendix

## Summary of Zheng et al. (2015) for an NDC proposal and projection in China

| Name      | Description  | Benefit  | Heritage of individual account | NDC credit rate                  | Fund balance implication                                     | New retiree replacement rate |
|-----------|--|--|--------------------------------|----------------------------------|--|------------------------------|
| Small NDC | 20% PAYG social pooling+8% NDC individual account  | Current scheme   | Yes                            | 80% of average wage growth rate  |  |                              |
| Large NDC | 12% PAYG social pooling+16% NDC individual account | 0.5*years of contribution*average on post-basic wage (transition: 1.7*years of before-reform contribution*salary indexation) | No                             | 80% of average wage growth rate  |  |                              |
| Full NDC  | 28% individual NDC account                         | Actuarially fair payment, with a 5% replacement rate of social pension   | No                             | 100% of average wage growth rate | Fund balance to 69% of GDP by 2050 then decline to 0 by 2087 | 69% in 2050 and 62% in 2090  |
|           | 24% individual NDC account                         | Actuarially fair payment, with a 5% replacement rate of social pension   |                                |                                  | Fund balance to 50% of GDP by 2050 then decline to 0 by 2078 | 62% in 2050 and 56% in 2090  |