

# Fiscal Implications of Population Aging and Social Sector Expenditure in China

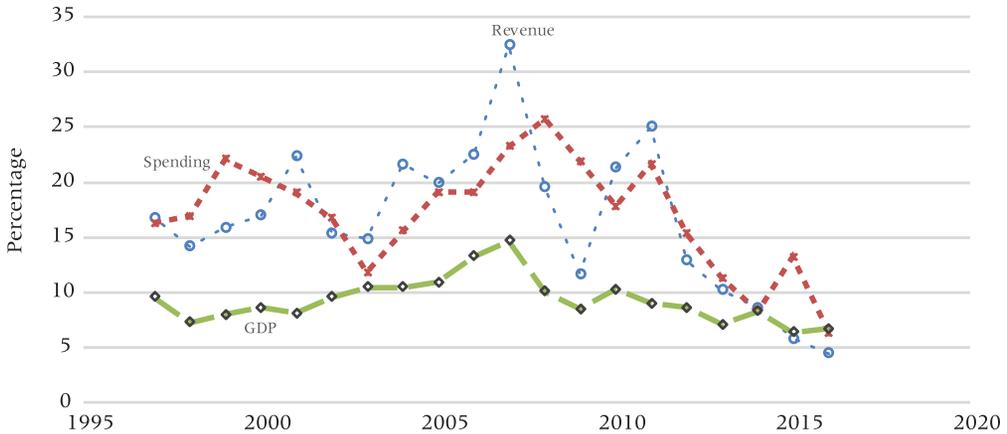
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## Introduction

BUILDING ON ITS ECONOMIC BOOM and wealth accumulation over the past few decades, China has taken ambitious steps to revamp and rebuild the social programs, especially since the start of the new millennium. A new social benefit regime is now taking shape, including expanded healthcare coverage for both the rural and urban population, a new pension system that includes rural residents, and an increase in public education funding that provides free, nine-year basic education for all. Many of those efforts are to address the social ills which emerged in China's economic liberalization, such as rising inequality and skyrocketing health care costs. But they are also responses to demographic pressures—accelerated aging among the most obvious and prominent ones. China has announced its intention to further expand social spending and improve the quality of its health care, pensions, and education programs. While such reforms are generally popular, there is also a strong wariness about their fiscal sustainability in the longer term.

First, China's population ageing has been and will continue to occur at an accelerating pace, to reach a scale unprecedented in human history. According to the United Nations Population Division's 2017 medium fertility scenario, which assumes a moderate and gradual fertility recovery, China's population aged 65 and over is expected to increase from 135 million to 246 million between 2015 and 2030, and to 359 million by 2050; over one in four (26.3 percent) of the total population. Rapid ageing makes reform of social protection for the elderly population—pensions, social assistance, health, disability, etc.—a top priority, as many of the elderly are unlikely to rely fully on traditional family support in light of the fertility reduction and the large number who have only one child.

**FIGURE 1 Annual growth rate of GDP, government revenue, and spending—China, 1997–2016**



SOURCE: China Statistical Yearbook 2017

Second, even the current modest social protection system has already shown signs of strain. For example, a 2017 government report revealed that one of China's 31 provinces is already running a deficit of over US\$30 billion in its pension fund, and funds in 13 more have less than one year of reserves.<sup>1</sup> The urban employee's pension system is already characterized by a high contribution level, with a combined employer-employee contribution rate of 28 percent. China's overall tax and contribution rate (as percent of profit) for a medium-sized domestic manufacturer, at 67.3 percent in 2017, is also already among the highest in the world (World Bank and PwC 2017). To subsidize pension funds, China has also resorted to another source, selling off stock shares of its state-owned enterprises (Lin et al. 2009). The health sector is also struggling to keep pace with rising demands placed upon it: according to a newspaper report in December 2017, many hospitals had to ration a range of surgical supplies because they had used up their reimbursement allowance.<sup>2</sup> Further expansion of social protection coverage and/or increase in its generosity will put more stress on the system.

Third, since the early 2010s, China's double-digit economic growth has come to an end, with its annual rate of growth on a continuous downward slide from 10.5 percent in 2010 to less than seven percent since 2015. Most economists and government officials in China have come to the realization that even slower growth is ahead, a view strengthened by the trade war with the United States. What is most alarming about this economic slowdown is its potential impact on fiscal revenue. During the first decade of this century, the annual growth rate of government revenue averaged nearly 20 percent, double that of GDP growth. By 2016, the growth rate of government revenue had dropped to only 4.5 percent (Figure 1). At the same time, the growth of government spending continues to outpace that of

government revenue. Economic slowdown and population ageing, coupled with an inevitable increase in consumption resulting from income growth and generational shifts in consumption attitudes, could exhaust the surplus of labor income over consumption, as early as within the next decade and half (Cai et al. 2014).

Fourth and finally, the Chinese economy is now awash in debt. In 2008, on the eve of the global financial crisis, China's total leverage—as measured by a ratio of credit to GDP—was 132 percent, relatively low by international standards. It rose to 160 percent in 2012 after a large government infusion of funds to encounter the effects of the global financial crisis. More recently, it further rose to 258 percent and is estimated to reach 288 percent by 2021, a level that is well above the global average for emerging economies, which is at 189 percent.<sup>3</sup>

With this as context, this article examines the fiscal impacts of population change, especially population age structure change, combined with China's political commitment to scale up social spending. We focus on three types of government expenditures: education, health care, and pensions, the three most important components of the social sector, leaving aside other less costly social policy budget lines like disability, social assistance, family allowances, and unemployment insurance. Based on recent population projections by the United Nations Population Division and per capita age-specific public expenditure in education, health care, and pensions—all derived from analyses using the National Transfer Accounts (NTA) methodology—we project future total public expenditures in these areas under several scenarios.

In the sections below, we first introduce the methodology and data used for our examination. We then apply an aggregate decomposition method to examine the current fiscal weight of China's nascent and fragmented social welfare system and to make comparisons with Latin American and average OECD countries, in order to assess the relative contributions of population age structure and spending per eligible member of the population. We turn next to use an age-based decomposition method to project the fiscal impacts implicit in the dual challenges of population ageing and social spending expansion, using various population change and per-beneficiary spending increase assumptions. We conclude with a brief discussion of policy implications.

## Decomposing change in social expenditure

While the broad macroeconomic implications of population ageing are debated, the narrow fiscal implications are more straightforward. Such are the findings from a major study of the National Research Council of the United States (NRC 2012). In the US, for example, a country that will encounter only moderate ageing by international comparison, the overall impact of

ageing on economic growth is likely to be modest. Yet, even for the US, population ageing can have major effects on costs of supporting the elderly (NRC 2012, p. 29). Federal spending for old age and survivor's insurance ("Social Security") in the US could increase noticeably from 4.9 percent of GDP in 2017 to 6.3 percent in 2047 (CBO 2007). For other countries, the projected trajectories are more dramatic, with public pension spending as a share of GDP rising from 10 percent in 2010–15 to 12.5 percent in 2050 in Germany, 8.1 to 14.9 percent in Russia, 6.3 to 17.0 percent in Turkey, 1.7 to 12.5 percent in South Korea, and 9.1 to 16.8 percent in Brazil (OECD 2015).

Turning to China, one recent study projected that total public spending on education, health, and pensions would rise from 11.2 percent of GDP in 2014 to 13.5 percent in 2030 and 14.6 percent by 2050 (Lu 2016). But these estimates were based on the assumption of constant age-specific expenditure levels as a share of GDP per capita and a constant total fertility rate (TFR) of 1.55 children per woman. Another study projected that public subsidies to the urban employee pension scheme, only one of China's pension schemes, will account for six to eight percent of GDP by 2030, and 9.5 percent by 2050. That study was based on multiple assumptions on the urbanization rate, coverage, contribution compliance rate, replacement ratio, and economic growth (Yuan et al. 2016, 303).

In their comparative study of 10 Latin American countries, Miller et al. (2011) developed an age-based decomposition methodology, largely derived from the NTA approach (Bommier et al., 2010; Lee and Mason, 2010, 2014). The NTA methodology characterizes the economic life cycle by estimating how people at each age produce, consume, share resources, and save for the future (Bommier et al. 2010; Lee and Mason 2010, 2014). Since its global launch in 2003, the NTA approach has been adopted by research teams in over 80 countries across six continents. NTA employs both micro-level and macro-level data to derive raw estimates of age-specific economic flows (income, consumption, public and private transfers, etc.) and further to adjust these raw estimates to match the national totals as reported by government. As applied by Miller et al. (2011), the NTA approach is employed to decompose public social spending into two components: the demographic component and the benefit level component, providing a straightforward explanation for how fiscal impacts resulting from population ageing and social spending expansion may emerge. The method, though deterministic, also allows for making simplified and comparable assumptions on program benefit levels to facilitate international comparison and projection. Based on their analysis, in the 10 Latin American countries covered, Miller et al. (2011) estimated that demographic forces alone will raise the average total public spending in education, health care, and pensions as a share of GDP by 4.9 percentage points between 2005 and 2050. In the meanwhile population ageing coupled with gradual convergence of expenditure per member

of the eligible population toward high-income countries' levels could lead to an increase of 6.5 percentage points.

The GDP share of public spending on education, health care and pensions can be modeled as:

$$\begin{aligned} EXP/Y &= [(EXP/BEN)/(Y/W)] * [BEN/ELIG] * [ELIG/W] \\ &= [(EXP/ELIG)/(Y/W)] * [ELIG/W] \end{aligned} \quad (1)$$

where  $EXP$  is aggregate public expenditure in the relevant area,  $Y$  is GDP,  $BEN$  is program beneficiaries (e.g. students enrolled in public schools for education or pension recipients for pensions),  $W$  is working-age population (aged 20–64), and  $ELIG$  is the population eligible to receive the benefit.  $ELIG$  refers to student-age population (ages 3–22) for the education sector.<sup>4</sup> For the pension sector,  $ELIG$  is the population aged 65 and over. For the health care sector,  $ELIG$  can be estimated at the population-wide level as the number of persons close to death, assumed to be 10 times the annual number of deaths, as previous studies show that most of health expenditures occur in the final decade of life (Miller et al. 2011; Lubtiz et al. 2003).

With equation (1), public spending as a share of GDP is decomposed into the products of economic and demographic components: (1) expenditure per member of the eligible population for the benefit scaled by GDP per working-age adult, which following Miller et al. 2011 we call the “Benefit Generosity Ratio” (BGR) and (2) the eligible beneficiary-worker ratio ( $ELIG/W$ ), a variant on the demographic dependency ratio. BGR, expressed as  $[(EXP/BEN)/(Y/W)] * [BEN/ELIG]$ , is the product of two factors: expenditure per beneficiary relative to GDP per working-age adult and the coverage rate under each type of spending (beneficiaries over eligible population).

Following Miller et al. (2011), the aggregate decomposition above can be expressed in single-year age group terms:

$$EXP/Y = \sum_x [EXP(x)/Y] = \sum_x [BGR(x) * POP(x)/W] \quad (2)$$

Where  $EXP(x)$  is public spending on population aged  $x$ ,  $Y$  is GDP,  $BGR(x) = [EXP(x)/POP(x)]/[Y/W]$  is the BGR at age  $x$ , and  $POP(x)$  is population aged  $x$ , with  $W$  being the working-age population aged 20–64.

In this study, we rely on micro-level data from the 2014 wave of China Family Panel Studies (CFPS), a nationally representative household survey (Xie and Hu 2014), as well as macro-level data from government statistics (NBS 2015). We estimate age-specific public spending per capita in each program by multiplying spending per beneficiary by the coverage rate for each age group. Specifically, for education, public spending per student for each level of education is reported in government statistics, and the

coverage (i.e., enrollment) by level of education and age is estimated using the CFPS sample. For pensions, benefit per pensioner and the pension coverage rate by age are both constructed from the CFPS sample. Estimating age-specific public health care spending, which includes cost of health care provided by public hospitals and health care purchased by individuals and reimbursed through public programs, is more complicated and more subject to error (United Nations 2013). In China, the former is available in neither household surveys nor administrative records, and hence we estimate the total health care expenditures by age using the CFPS sample as a substitute, assuming it is proportional to government-provided health care. The latter, reimbursements through public programs, is also constructed from the CFPS sample. With some necessary smoothing for age profiles of these raw estimates on a per capita basis, the aggregate public spending adjusted by population age structure is compared with the national fiscal spending for each program as reported by government, and then an adjustment factor is calculated and applied to the raw estimates. The adjusted age-specific public health spending per capita, divided by GDP per working-age adult, produces the values of the age-specific BGR.

This age-based decomposition method within the NTA framework has several advantages compared to traditional methods used to project future fiscal trends. First, it clearly incorporates the age distribution of social spending from a life-cycle perspective, and the estimates of age profiles from various data sources are reconciled with national spending totals. Second, BGR, as a relative measure of benefit levels, facilitates comparisons across countries at different stages of economic development. Third, it specifies the relative contributions of demographic and economic factors to future fiscal trends in a straightforward manner. Age profiles of BGR for the baseline year can be easily combined with projections of population by age to show how demographic change alone can influence future fiscal expenditure. BGR can also be adjusted to reflect the upgrading of social sector programs, as we do in this exercise (i.e. to examine changes in the fiscal situation as the generosity of social spending rises).

### **China's public expenditure in social sector**

The Chinese social benefit programs are still relatively new and highly fragmented (Gao et al. 2013; Shen et al. 2018). In the early 1950s, China created a social welfare system rooted in its socialist ideology and planned economic system. One distinctive feature of that system was its vast urban-rural disparity (Whyte 2010). Under it, the government assumed responsibilities for providing comprehensive employment-based social benefits for urban workers, including pensions, health care, education, food subsidies and housing. Rural social programs, by contrast, were financed and administered by rural collectives with meagre government support

(Selden and You 1997). After China launched its market-oriented economic reforms in the late 1970s, a series of dramatic changes—such as the collapse of rural collectives, large-scale labor migration, and massive state enterprise lay-offs—all but dealt a death blow to the socialist state welfare regime. In 2002, for instance, close to 90 percent of the rural population had no health insurance coverage and only about half of all urban residents, nearly all of them formal sector employees, were covered, while workers' dependents and migrant workers were left uninsured (Yip and Hsiao 2009).

By the turn of the twenty-first century, with its success in economic growth and heightened concerns over rising inequality, the Chinese government gave its full attention to developing the social sector in place with the new socioeconomic situation and emerging ideological priorities. In education, for example, starting in 2001, China mandated public funding for nine-year compulsory education. Following its efforts to universalize compulsory education nationwide, the government also initiated programs improving school infrastructure, alleviating teacher shortage, and setting up distance learning in rural and underdeveloped areas, all in order to narrow the rural-urban gap and regional differences (OECD 2016). In health, aside from the existing medical insurance for urban formal sector employees, the government launched the New Cooperative Medical System for the rural population in 2003, followed by Urban Resident Basic Medical Insurance for urban residents without formal employment (including children, the elderly, students, the disabled and the unemployed) in 2007. In the pension field, the government piloted the New Rural Pension Scheme in 2009 and Urban Resident Pension Scheme for the urban unemployed in 2011. In 2015, the government changed the non-contributory nature of the pension scheme for government employees and integrated it with the urban employee pension scheme. Over a decade and half, these programs combined to form a basic post-socialist welfare regime and extended social protection to underprivileged groups. In only seven years, by 2010, the New Cooperative Medical System had covered 96 percent of rural residents, and the Urban Resident Basic Medical Insurance scheme reached a coverage rate of 93 percent after three years of promotion (Yip et al., 2012). By 2014, about 80 percent of the adult Chinese population were enrolled in some type of public pension scheme.

To fund these initiatives, public spending on the social sector in China increased at a rate that surpassed the growth rate of the economy as a whole. Table 1 shows the results of decomposition of China's public spending on education, health care, and pension at the aggregate level. In the five years between 2009 and 2014 alone, government spending on education increased from 3.0 to nearly 3.6 percent of GDP, health expenditure increased from 1.9 to 2.8 percent, and pension spending increased from 2.5 to just over 3.6 percent. Government expenditures on national defense and public security, by comparison, both remained at 1.3 percent of GDP over the same period. It is

**TABLE 1 Public spending as a share of GDP, Benefit Generosity Ratio, and Dependency Ratio, China, 2009 and 2014**

Category	Year	Aggregate spending (% GDP)	Benefit Generosity Ratio	Beneficiary-Worker Ratio (per 100)
Education	2009	3.0	6.8	43.7
	2014	3.6	10.0	35.9
Health	2009	1.9	19.3	10.1
	2014	2.8	27.1	10.5
Pensions	2009	2.5	20.8	12.3
	2014	3.6	26.6	13.6

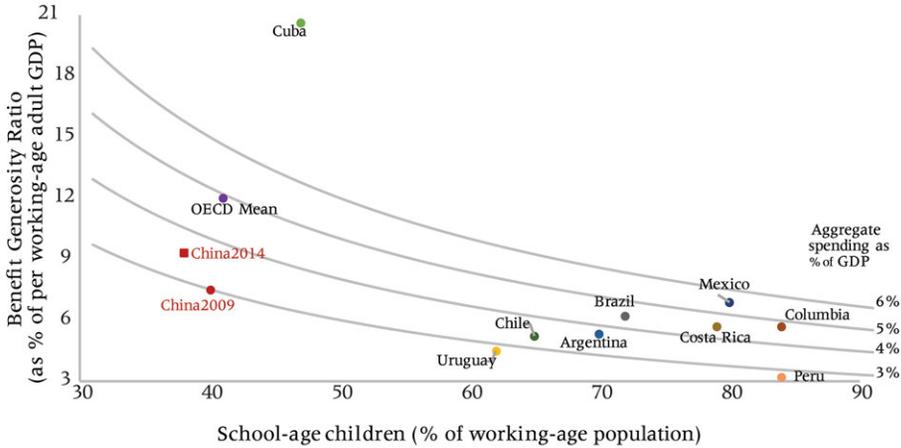
also noteworthy that China's pension spending has increased at a rate faster than education spending, and by 2014, for the first time, pension spending caught up with education spending, a turning point reached by most OECD countries only in the middle of the twentieth century (Lindert 2004). In 2013, OECD countries with the only exceptions of South Korea and Israel spent much more on pensions than on education. In Austria, Hungary, and Spain, pension expenditure was more than quadruple education spending.<sup>5</sup>

Using the aggregate decomposition approach described above, we also find that between 2009 and 2014, rising social expenditure was mainly driven by increases in benefit generosity, not population change. The BGR for education rose from 6.8 to 10.0, for health care from 19.3 to 27.1, and for pensions from 20.8 to 26.6. At the same time, the demographic component played different roles. For education, where the potential beneficiaries are the school-aged population, a decline in the dependency ratio brought some fiscal relief; for health care, the dependency ratio remained constant; and for pensions, an increase in dependency ratio intensified fiscal pressure.

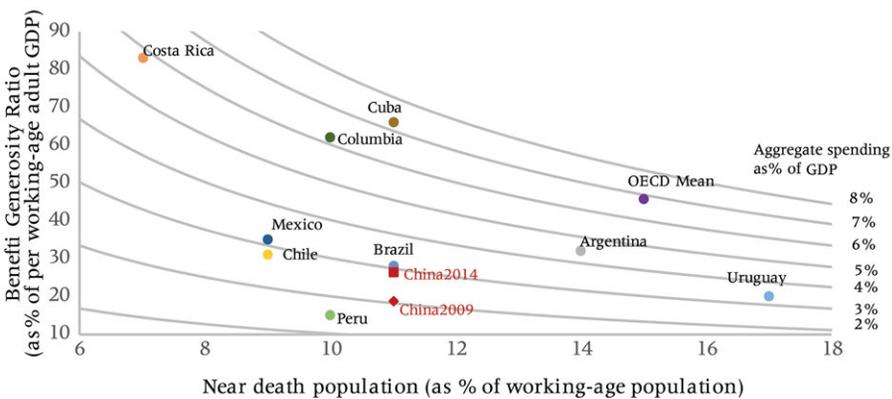
Yet, even with these rapid increases in social spending, China is still at a relatively early stage of developing its new social benefit regime. Despite significant improvements, China lags behind high-income countries and many Latin American countries. Figure 2 presents fiscal spending isoquant curves, where the combination of BGR and dependency ratio yields constant fiscal spending as a share of GDP, to allow cross-country comparisons. In 2009, China's education BGR was on par with many Latin American countries but was only about one-half of the OECD average. Coupled with a very low dependency ratio, China's public education spending as a share of GDP stood at the low end in 2009 (Figure 2, panel A). By 2014, China's BGR in education had moved up quickly, but was still only about five-sixths of the OECD average for the year 2009. Health care spending is the least favorable comparison for China, largely due to its extremely low BGR. Even with a major increase from 2009 to 2014 that pushed up China's total public spending on health by almost one percent of GDP, the generosity ratio in China in 2014 only stood higher than Uruguay and Peru, and

**FIGURE 2 Public spending on education, health, and pension as a share of GDP, decomposed by dependency ratio (x-axis) and benefit generosity ratio (y-axis)**

(a) Education



(b) Health

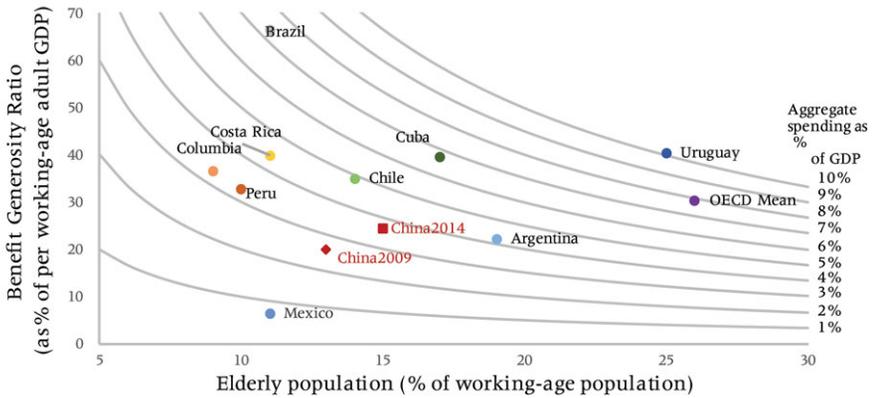


was less than one half of the value for Colombia and roughly 60 percent of the OECD average in 2009 (Figure 2, panel B).

Unlike health care where the low share of public spending is mostly due to low BGR, the relatively low level of public pension spending in China as compared with the OECD average was mainly a result of a low coverage rate. The pension BGR in China for 2014 was already approaching the OECD average in 2009 (Figure 2, panel C, 26.6 versus 30.4). However, it should be noted that the population eligible for receiving pension is defined as the population aged 65 and over, whereas ages at pension entitlement are now much younger in China: 50 or 55 for female urban employees, 60 for male urban employees, urban unemployed residents and also rural residents. Taking this factor into account, China’s actual pension BGR should be

FIGURE 2 (continued)

(c) Pension



NOTE: Data for Latin American countries and the OECD average are cited from Miller, Mason, and Holz (2011). Estimates of their aggregate spending in public education are taken from UNESCO (2009) and estimates of dependency ratio are calculated based on population estimates from CELADE (2007).

much lower than that presented here, because the actual number of people eligible to receive pension benefit is much larger than that assumed in the calculation of BGR,  $(EXP/ELIG)/(Y/W)$ . The pension BGR for many Latin American countries surpassed the OECD average. This did not necessarily mean that Latin American elders were better off than their OECD peers, for a low coverage rate offset the very generous pension benefits for those who were eligible (Miller et al. 2011; Turra et al. 2011).

These overall benefit levels for China, while still quite low by international comparisons, also mask an additional characteristic of emerging social protection systems: vast inequality in eligibility to receive benefits. In China, both public health insurance and the pension system remain highly fragmented, with their benefit levels varying by urban-rural residence and employment type (Liu and Zhao 2014; Lu et al. 2014; Shen et al. 2018). For instance, the in-patient reimbursement rate for urban employees stood at 68.2 percent in 2010, compared with only 47.9 percent for urban residents without formal employment, and 43.9 percent for rural patients covered in the health care scheme (Yip et al. 2012). The latter two groups accounted for over 80 percent of all health care program participants in 2010. Also, in 2011, the average monthly pension of government employees was 2,914 RMB (just above US\$ 400) and of urban employees 1,632 RMB, while pensions for urban residents without formal employment and for rural residents—who numbered 332 million and accounted for over half of all pension scheme participants—were merely 78 RMB and 58 RMB per month, respectively (Wang et al. 2014).<sup>6</sup> For China, having reached the upper-middle income status and aspiring to be a high-income society in

the decades ahead, challenges remain in both upgrading the level of social spending and in making the system more integrated and equitable. During its socialist past, China classified its population by household registration status and delivered social benefits differentially. However, with the marketization of the Chinese economy in the last four decades, along with increased population mobility and urbanization and the arrival of post-reform generations, continuing such discrimination has become politically unacceptable and socially infeasible. Reforming the current system to be more uniform and equitable is now a goal shared by both the Chinese public and the government.

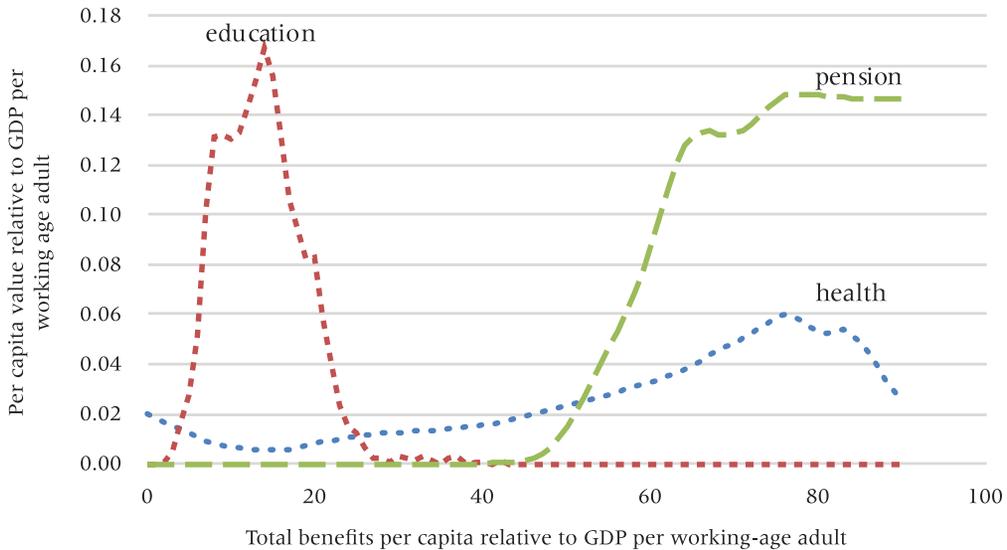
The fiscal weight of China's social programs is still light by international comparison. Only 10 percent of China's GDP was devoted to public education, health care, and pensions in 2014, an increase from 7.4 percent in 2009. The fiscal burden in China in 2014 was on par with Mexico, at 9.2 percent, much below that in Brazil, at 14.8 percent, and only about one half of the average for OECD countries at 19.8 percent in 2009 (Miller et al. 2011). With general government revenue in China rising to over one-quarter of GDP (28.3 percent in 2014),<sup>7</sup> roughly 35 percent of general government revenue was spent on these social programs. As a comparison, a majority of OECD countries spent a much larger portion of their general government revenue on these three sectors, for instance, 63 percent in Japan, 55 percent for US, 40 percent for Australia, and even for Czech Republic, 43 percent in 2014.<sup>8</sup>

## Future social expenditure scenarios

Looking into the future, it is certain that fiscal pressure of social spending in China will intensify, in part due to demographic change and in part due to the imperatives of expanding coverage and scaling up benefit levels. In this section, we employ the age-based decomposition approach to assess the increase, taking into account both population change and changes in BGRs.

We use the age pattern of BGRs in 2014 as the baseline, and population age structures based on the scenarios of the United Nations Population Division's World Population Perspective (WPP) 2015 Revision. Age-specific BGRs in 2014 estimated by the NTA method are presented in Figure 3. The peak age of receiving the public education benefit is around age 14, the age for junior high school education. This is due to nearly universal enrollment in junior high schools and also relatively high public education spending per student. The age pattern of health care benefit generosity shows a J-shaped pattern, an age pattern resembling that of morbidity and mortality. Public spending on health care per person is high in infancy, reaches its low point in teenage years, rises again following entry into adulthood, and peaks at around age 80. The rise in health care spending at the oldest ages in China is still quite modest as compared with high-income countries such as US,

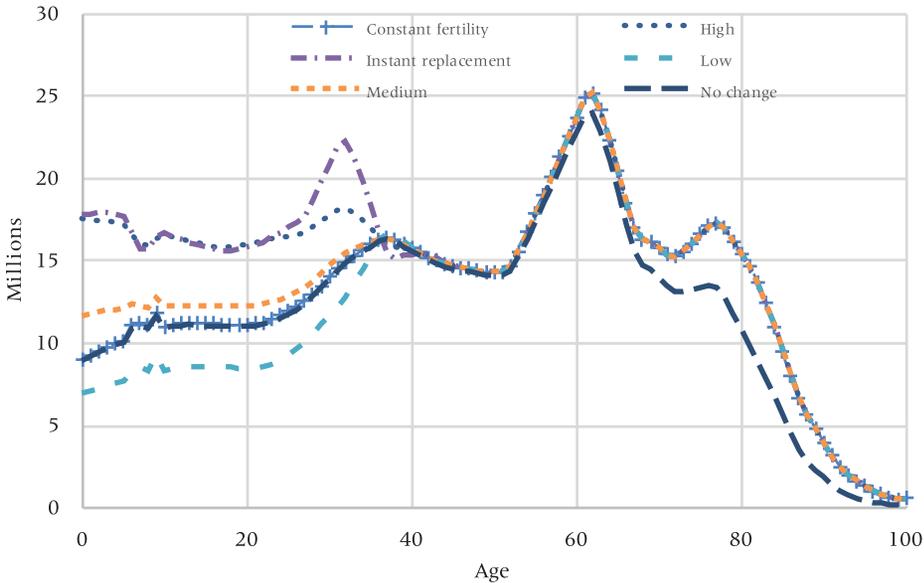
**FIGURE 3 Age-specific Benefit Generosity Ratio for education, health care, and pension—China, 2014**



Sweden, and Japan (Lee and Mason 2011). Pension benefit generosity starts to rise dramatically in the early 50s in line with the age eligibility for pension in China and reaches a plateau in the 70s.

The UN's population historical estimates and projections are independent assessments not necessarily agreeing with the official statistics provided by the Chinese government; they are also subject to review and revision when new data and/or modeling techniques become available.<sup>9</sup> WPP 2015 includes five variants of fertility assumptions: medium, high, low, constant, and instant-replacement and one variant of mortality that assumes a general rise of life expectancy over the projection period. As a reference, the UN also includes in its published tables a "no change" scenario that assumes all demographic parameters stay constant at their level in the last observation.<sup>10</sup> The projected population age structures for China by 2050 for those six variants (five fertility variants plus "no change") are shown in Figure 4. Different fertility assumptions naturally result in different sizes of cohorts below the age of 40. By contrast, the projected population older than 40 (by 2050) is essentially the same under the five fertility variants, because these older cohorts are determined by the same cohort size born before the start of the projection and the same assumed mortality rate. The peak number of those aged around 60 by 2050 reflects the large cohorts born in the late 1980s and the early 1990s. The "no change" variant shows an increasingly large divergence for population older than 40 (by 2050) because it assumes higher mortality than the five fertility variants.

**FIGURE 4 Projected population age structure for China by 2050, various scenarios by the UN**



We consider two sets of scenarios illustrating the fiscal implications of ageing and benefit generosity. The first set of scenarios are *Ageing Only* scenarios, where  $BGR(x)$  is held constant over time and population age structure ( $POP(x)/W$ ) follows that under different fertility assumptions. Implicit in constant  $BGR(x)$  are assumptions that the rise in benefit level per beneficiary keeps up with labor productivity growth but grows no faster. Projections under *Ageing Only* scenarios are useful for tracing out the implications for current policies of demographic changes alone.

The second set of scenarios are *Ageing and Social Sector Expansion* scenarios, where both the BGR and population age structure change over time. We assume that China’s aggregate BGRs ( $EXP/ELIG$ )/( $Y/W$ ) in education, health care, and pensions will rise, by 2030, to the average level observed in OECD countries in 2009 and age-specific BGRs  $BGR(x)$  in the three areas will increase by the same proportion. At the same time, population ageing will proceed as observed in the UN’s medium fertility scenario. Such an assumption about increases in benefit generosity is based on the rationale that China aims to become a high-income country by 2030. If China can realize its economic growth goals in the next decade and half, even with an annual growth rate of GDP per capita at a historically modest five to six percent per annum, China’s per capita income could reach the OECD 2009 average level by 2030.<sup>11</sup> Also, as announced in a joint report by the World Bank and the State Council of China (2013), China is committed to providing equal access to quality, affordable education and health care for all, and also achieving

comprehensive pension coverage and reducing fragmentation across subsystems by 2030. Fulfilling such a commitment will inevitably lead to an increase in the overall per capita social expenditure.

### Education spending

All scenario results are presented in the panels of Figure 5: education, health care, and pension, and total spending for three categories combined in Figure 6. Under the *Ageing Only* scenarios, different assumptions about fertility have a clear impact on the fiscal weight of education in the next thirty years, as the effects of these changes will quickly show up among the school-aged population. As illustrated by the results shown in Figure 5, panel A, with a low-fertility scenario, a shrinking number of the young could lead to a dramatic decline in public education spending, to below 2.5 percent of GDP in the 2040s. Under constant- and medium-fertility scenarios, public education spending as a share of GDP is also expected to fall over the next decades. By contrast, under the scenarios of high fertility or instant replacement, education spending will rise along with the increase in school-aged children, to above 4 percent of GDP by 2050.

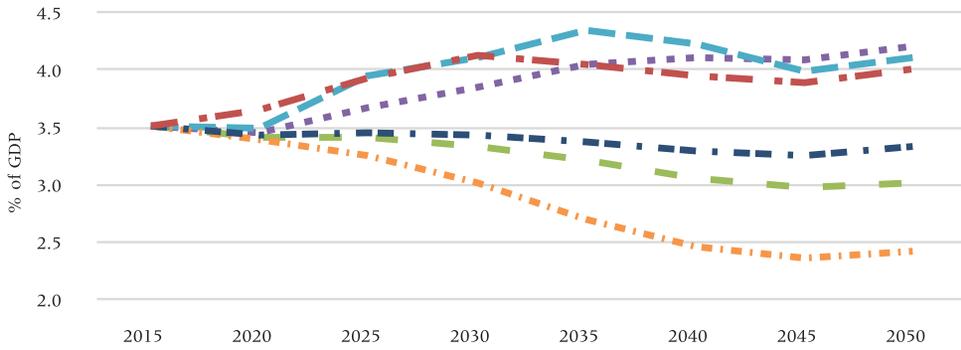
A potential rise in BGR, whether from expanded enrollment or, more likely, higher expenditure per pupil, could push public education spending to a higher level. As shown in Figure 5, panel A, with the assumption of medium fertility and constant BGR, public spending on education as a share of GDP will drop from 3.5 percent in 2015 to 3.4 percent in the 2040s. However, if China's education BGR moves up to the 2009 OECD average level by 2030, with the same fertility assumption, the fiscal weight of education will increase to 4.1 percent of GDP (*Ageing and Social Sector Expansion* scenario). Comparison of these two trajectories indicates that benefit expansion alone would raise public education spending by 0.7 percentage points by 2030. The effect of expansion on the fiscal weight of education is similar to that of the high fertility or instant replacement fertility variants.

### Health care spending

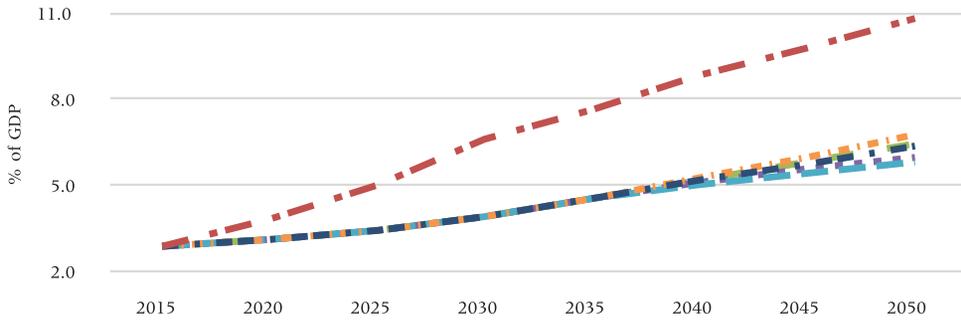
Even assuming a constant BGR, China will face a significant increase, driven by population ageing, in government health spending in the coming decades. As shown in Figure 5, panel B, different fertility assumptions will have only minor impacts on health care spending in the short to medium run, the next twenty years. Rising fertility, under the high-fertility and instant-replacement scenarios, however, could in the long run result in more young adults who represent the healthiest groups in the population. By mid-century, the difference in health care spending between the highest and the lowest fertility assumptions could be as large as about one percent of GDP.

**FIGURE 5 Projected public spending on education, health care, and pension as a share of GDP under various scenarios—China, 2015–2050**

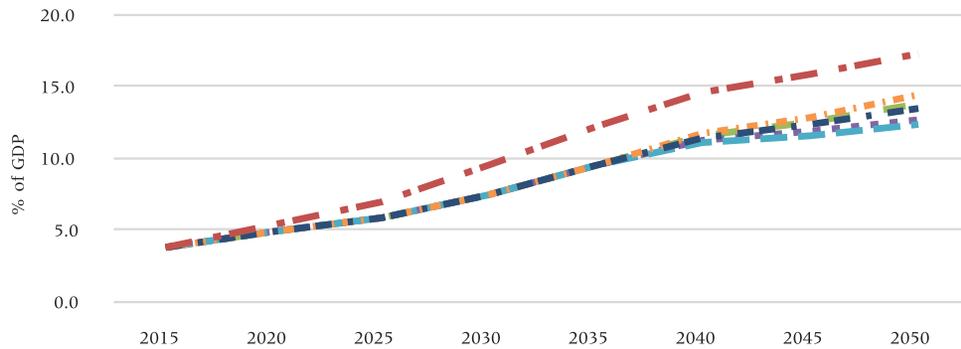
(a) Education



(b) Health

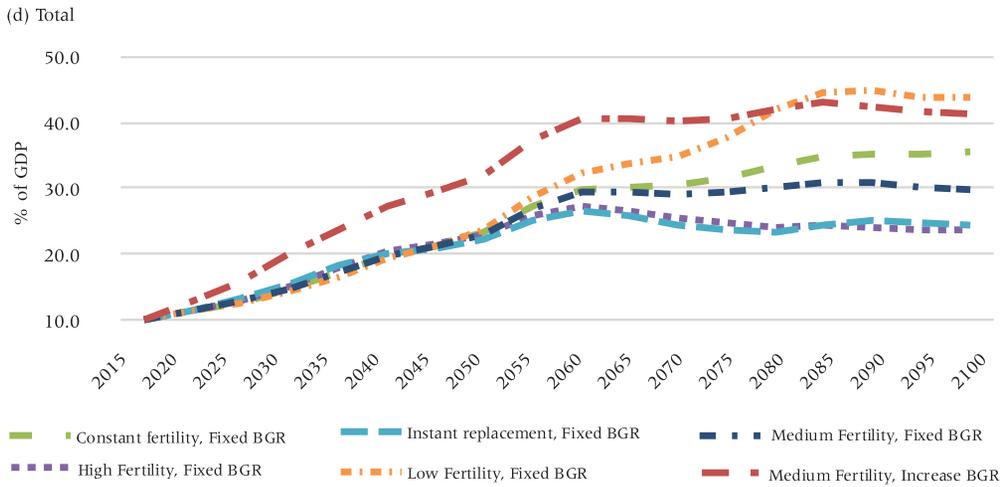


(c) Pensions



■ Constant fertility, Fixed BGR    
 ■ Instant replacement, Fixed BGR    
 ■ Medium Fertility, Fixed BGR  
■ High Fertility, Fixed BGR    
 ■ Low Fertility, Fixed BGR    
 ■ Medium Fertility, Increase BGR

**FIGURE 6 Projected total public spending as a share of GDP under various scenarios—China, 2015–2100**



NOTE: Y-axes are not on the same scale as Figure 5.

Significant as is the demographic factor, increasing coverage will play a more prominent role in driving public health spending. With no change in the BGR, public health spending will more than double between 2015 and 2050 under the medium-fertility scenario, moving from 2.8 to around 6.4 percent of GDP. Combined with demographic change, increasing the BGR to the 2009 OECD average will further increase the share in GDP of health care spending to 10.8 percent by 2050 (Figure 5, panel B). Population change, therefore, accounts for 45 percent of the rise of public health spending between 2015 and 2050, while increasing benefit generosity accounts for more than half, 55 percent. Aggressive marketing of high-tech, pharmaceutical, and diagnostic testing-intensive health care in China makes keeping the lid on costs particularly difficult.

### Pension spending

The most striking feature of these scenarios is the future fiscal burden of pension spending. Under the UN's medium fertility assumption, pension spending is expected to more than triple to reach 13.5 percent of GDP by 2050 over the next three decades, even with no change in the BGR. Near-term increases in fertility, should they occur, will only make a difference in pension spending after the mid-2030s (Figure 5, panel C): the elderly population of the mid-twenty first century has already been born and any increase in fertility now will be reflected in a larger labor force only with a twenty-year lag. However, the two extreme fertility assumptions (low fertility versus instant replacement fertility), can lead to substantial difference

in the pension burden in the long term, as large as 2.1 percentage points by 2050 (Figure 5, panel C).

Assuming a gradual increase in the pension BGR from the current level to the 2009 OECD average, pension spending would reach 9.4 percent of GDP by 2030 and 17.2 percent by 2050, more than double the 2009 OECD average (8 percent of GDP). Unlike in health care spending, in pension spending population ageing will be the dominant force, accounting for 72 percent of the increase between 2015 and 2050. This is presumably due to the dominant role of technological progress in driving OECD health care costs upward.

### Putting it all together

Assuming no change in benefit generosity and with the medium fertility assumptions of the UN, the share of GDP required to fund the three types of social programs combined could increase from 10 percent in 2014 to about 15 percent in 2030, and further to over 20 percent by 2050 (Figure 6). It is unlikely, however, that with anticipated further increase in per capita income, and with its nascent welfare regime, China can remain at the current benefit level for the coming decades—nor should it, in light of its rapid development and high ambitions. As illustration, between 2014 and 2016, public education spending increased from 3.6 to 3.8 percent of GDP, health care spending from 2.8 percent to 3.2 percent, and pension spending from 3.6 percent to 4.6 percent. These short-term increases were for all intents and purposes entirely the outcome of rising BGRs. Our scenarios illustrate one future possibility: with the assumption of medium fertility, if China gradually increases BGRs to reach the 2009 OECD average level by 2030, the social spending in the areas covered here could increase from the current (2014) 10 percent of GDP to 20 percent in 2030 and over 30 percent in 2050.

In recent years, China's general government revenue (taxes, social security contributions, property income, and other income) has increased from 18.3 percent of GDP in 2007, to 24.8 percent in 2010, and to 29.2 percent in 2015.<sup>12</sup> According to the medium-fertility *Ageing only* scenario just described, and assuming no further increase in the share of general government revenue in GDP, by 2030, nearly half of all government revenue will need to be spent on education, health care, and pensions. If China elevates its BGRs to the 2009 OECD average, social spending in these three sectors could take up two thirds of general government revenue in 2030 and over 100 percent by 2050. Such a trend is, of course, unsustainable. The challenge is especially daunting for pensions, which alone could rise to 13.5 percent of GDP by 2050 with no change in BGR and to above 17 percent with increasing benefit generosity. The latter implies that pensions alone by 2050 could consume over half of the government revenue,

assuming that the latter remains unchanged as a share of GDP remains unchanged. In the next and closing paragraphs, we turn to some possible responses to this evidently insoluble predicament.

## Discussion

This article has presented fiscal scenarios calculated from an NTA-based decomposition of social sector costs under differing assumptions regarding fertility and convergence to OECD-level social sector spending. A fundamental assumption underlying such scenario analyses is that, if it is revealed that something cannot happen, it will not happen. The inevitable increase in the fiscal weight of social spending associated with population ageing and social sector development means that policy makers in China will need to make hard choices. Apart from addressing inefficiencies, scrimping on education and health seems particularly ill-advised in a global economy where human capital accounts for a steadily increasing share of economic growth. Education and health are singularly unattractive areas for belt-tightening. That suggests that the most attractive source of social sector saving is in public pensions. One area in which there is broad agreement is that the normal retirement age—60 for men and 55 for women—is too low. Raising the effective (as opposed to legal) retirement age is everywhere a challenge, but other countries have managed to do so, and China can, as well. One reason for optimism is that, as history shows, when Chinese policy makers make a decision, they implement it quickly and effectively.

In China, as elsewhere, hope springs eternal for a vast expansion of contributory pension coverage in the countryside—capital accumulation now, pension liabilities later. It is not clear that this will work in China, where the new rural pensions scheme is off to a rocky start and may crowd out the massive precautionary savings that rural residents have traditionally been forced to accumulate as a hedge against old age, ill health, and other life contingencies. The weak state of Chinese public financial management at provincial level does not inspire confidence.

China's economic ascendance to an upper middle-income country has come with heavy social and environmental sacrifices and challenges. One such challenge is to construct a social policy regime compatible with a market economy and rapidly increasing income level. The last decade and half have witnessed great strides in China's efforts to revamp and to refashion social policy, yet much remains to be accomplished in light of rapid demographic change and the still emerging and highly fragmented nature of social sector institutions. China's success in realizing its aspiration to become a high-income society will depend largely on how it can manage the challenges of the rising fiscal costs described in this article.

## Notes

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1 <https://www.reuters.com/article/china-pensions/chinas-pension-funds-struggling-to-cope-with-ageing-population-state-media-idUSL3N1OB1NM>, accessed on January 31, 2018.

2 <https://www.caixinglobal.com/2017-12-21/doctors-hurting-for-supplies-as-hospitals-restrict-medical-products-101188007.html>, accessed on Feb 5, 2018.

3 <http://www.scmp.com/news/china/economy/article/2123676/fresh-warnings-debt-ridden-china-living-borrowed-time>, accessed January 31, 2018.

4 Kindergarten: age 3–5; primary education: age 6–11; secondary education: age 12–17; college education: age 18–22. Considering education as a “benefit,” like a pension benefit or health insurance benefit, is strained, but we employ the term here in the interest of economy.

5 Sources: Data from OECD statistics.

6 Numbers of health care and pension scheme participants are from China Statistical Yearbook 2016.

7 General government revenue consists of taxes, social security contributions, grants receivable, and other revenue. Data is reported by International Monetary Fund. [http://www.economywatch.com/economic-statistics/economic-indicators/General\\_Government\\_Revenue\\_Percentage\\_GDP/2014/](http://www.economywatch.com/economic-statistics/economic-indicators/General_Government_Revenue_Percentage_GDP/2014/)

8 Sources: Data on public education and pension spending is from OECD database, and data on public health care spending is from OECD Statistics. <https://stats.oecd.org/index.aspx?DataSetCode=SHA>.

9 We choose WPP2015 over WPP2017 for two reasons. First the paper’s earlier draft was prepared before the release of WPP2017. Second, WPP2017 adjusted downwards of its life expectancy increases for China, a move with which we disagree. In any case, the difference between WPP2015 and WPP2017 for China is relative small, thus choosing one over the other does not affect our projection results.

10 International migration is expected to have little or no effect on China’s population future.

11 GDP Per capita for China, in purchasing power parity, was US\$15,529 in 2016, and for OECD countries, it was US\$33,897 on average in 2009. With a 6 percent annual increase rate, in 14 years, China’s per capita GDP would be US\$35,110 (GDP per capita data are from World Bank 2018).

12 Source: Data reported by IMF. [http://www.economywatch.com/economic-statistics/economicindicators/General\\_Government\\_Revenue\\_Percentage\\_GDP/2015/](http://www.economywatch.com/economic-statistics/economicindicators/General_Government_Revenue_Percentage_GDP/2015/)

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