

The fiscal impact of population aging in Brazil: 2005-2050*

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In this paper, we estimate the fiscal impact on population aging in Brazil from 2005 through 2050. We focus on three key areas of public spending: education, pensions, and health care. Our projections are based on a simple model in which aggregate public expenditures are driven by changes in the age structure of the population as well as by changes in the average public benefits received per age. We assess the likely increases in public spending over the coming decades, contrasting the divergent trends in public spending on education, pensions, and health care. We also assess the magnitude of these changes in terms of growth in spending relative to GDP annually through 2050 and estimate the present value of the increase in spending. We find that changing population age structure will lead to increasing cost pressures in health care and especially in pensions. Our projections show that beginning around 2015, public spending will begin a sustained and rapid increase lasting several decades rising from 18% of GDP to reach 27% of GDP by 2050. The needs for increased investment in students will compete against those for sustaining pension benefits and facing increasing demands for health care. In particular, our projections show that an ambitious educational reform aimed at reaching the OECD level of investment per youth within a decade would amount to only about one fourth of the projected cost increases in public health and pension programs.

Keywords: Public expenditures. Population aging. Population projection. Health. Education. Pensions.

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Introduction

The age distribution of the Brazilian population will change dramatically over the coming decades. The number of children in Brazil reached a peak of nearly 70 million around 1999 and has been steadily declining since then. Meanwhile, the number of elderly in Brazil has doubled over the last 20 years and is projected to double again in the next 20. By sometime around 2045, the elderly are projected to outnumber children in Brazil. This paper explores the likely fiscal impact of this population aging.

How do we measure the magnitude of this impact? In this paper, we focus on three key areas of public spending: education, pensions, and health care. Our projections are based on a simple model in which aggregate public expenditures are driven both by changes in the age structure of the population and by changes in average public benefits received at each age. We assess the likely increases in public spending over the coming decades, contrasting the divergent trends in public spending on education, pensions, and health care. We assess the magnitude of these changes in terms of annual spending relative to GDP thru 2050 and estimate the present value of this increased spending relative to current GDP.

There are many who discount the validity of long-run forecasts such as those offered in this paper. There is considerable uncertainty about the future course of the economy and future policy decisions about the generosity of public programs in education, pensions, and health care. In addition, there is considerable demographic uncertainty about how quickly and to what level fertility will decline and about how quickly mortality rates will continue to fall. But we are much more certain about forecasting population age structures because they change slowly over time in very predictable ways. All of the individuals who will comprise the population of retirees in the year 2050 have already been born – which makes predictions about their future considerably more certain than predicting economic growth rates in the year 2050. Population aging in Brazil is inevitable and will unfold in predictable ways over the next several decades. Mortality may fall more rapidly or less rapidly than we anticipate – but there is no doubt that the population of elderly in Brazil will soar over the coming decades – more than tripling in size as a share of the total population.

Demographic change is one of the most important forces shaping the outcome of social policy, but it cannot be observed in the short term – since the change is so gradual. But its impact is readily apparent in the long-term projections of the sort we present here. The gradual changes in age structure unfolding in the coming decades will present different challenges and opportunities to education, health, and pension programs. Projecting all three expenditure paths with a comparable methodology provides insight into the interconnections and tradeoffs available to national policymakers. Too often, policy reforms of pension, health care, and education systems are debated, analyzed, and implemented in isolation from each other without considering the fact that these systems are linked fiscally.

Mindful of the growing fiscal impact of population aging, a number of governments have begun to issue official long-term budget projections: the European Union (EUROPEAN

COMMISSION DIRECTORATE GENERAL FOR ECONOMIC AND FINANCIAL AFFAIRS, 2012), the United States (U.S. CONGRESSIONAL BUDGET OFFICE, 2009), Australia (COMMONWEALTH OF AUSTRALIA, 2007), and New Zealand (NEW ZEALAND TREASURY, 2006). This paper presents long-run expenditure forecasts for Brazil – an important step toward long-run fiscal forecasts.

Most of the existing studies of the fiscal impact of population aging in Brazil have focused on social security. The Brazilian government issues long-run projections for public pensions, but to date has not issued long-run expenditure forecasts for the entire public sector. The most recent long-run forecast of RGPS finances (social security contributions and benefits for non-public workers) (BRASIL, 2013) shows a large fiscal impact of population aging on the program despite recent reforms: a near doubling of the size of the program relative to GDP between 2013 (7.3%) and 2050 (12.6%). A counterfactual study by Giambiagi et al. (2004) found a wide range of outcomes for RGPS finances depending on future economic and policy changes: age of retirement, length of contribution, GDP growth rate, and minimum wage. Their counterfactual forecasts of RGPS spending relative to GDP in 2030 ranged from 5.6% to 10%. Turra and Queiroz (2009) expand on this work to examine how pension support ratios (contributors divided by beneficiaries) would be affected by changes in demography as well as change in labor force participation rates and program characteristics such as the generosity of program benefits and tax evasion. Of the factors they consider, population aging due to fertility decline had the largest impact on long-run program finances. Focusing on the fiscal impact of population aging on public pensions, Queiroz and Figoli (2011) forecast pension spending relative to labor earnings. In their counterfactual baseline scenario, they hold average pension benefits constant and find that changes in population age structure would lead to a near tripling of program costs relative to labor income between 2005 (31%) and 2050 (86%). Their evaluation of economic and policy alternatives such as postponement of retirement, growing participation of women in formal labor markets, and reduction in benefit levels toward German or Italian levels demonstrate the large potential impact of policy action in limiting the fiscal impact of aging – with reductions in pension costs of 25% to 50% relative to their baseline projection.

Wong and Carvalho (2006) in this journal examined the overall fiscal impact of population aging by considering pensions, health care, and education programs combined. Using estimates of benefits by age and taxes by age from Turra (2001), they examine a counterfactual in which these age profiles are fixed at current levels while the population ages. They project faster growth of aggregate benefits relative to taxes caused by population aging. This leads to a fiscal shortfall, as taxes would cover only 84% of program expenditures in pensions, health care, and education by 2025 and only 57% by 2050.

This paper continues in the tradition of that work with the following innovations. First, we examine the fiscal impacts of each program separately (education, health care, and pensions). Second, rather than hold the age profiles of benefits constant, we allow them to change over time as the economy grows. Third, we present a decomposition formula useful for comparing the generosity of benefits across programs as well as between countries. Fourth, we project

expenditures as a share of GDP. And lastly, we update their results by using a more recent population projection (CELADE, 2009).

The projection model

A two-component model

Public expenditures on education, pensions, and health care as a share of GDP can be decomposed into two components: a demographic component and an economic/policy component. The demographic component is measured by the population at each age relative to the working-age population. The economic/policy component is measured by the average annual public benefits received at each age relative to GDP per working-age adult. Equation 1 presents this decomposition.

$$\text{Equation 1. } B(t)/GDP(t) = \sum \text{ over } x \{ b(x,t) * P(x,t)/P(20-64,t) \}.$$

Where

$B(t)$ = aggregate expenditures in year t ;

$GDP(t)$ = GDP in year t ;¹

$b(x,t)$ = average public benefits (in education, health care, or pensions) received at age x in year t relative to GDP per working-age adult in year $t = B(x,t)/P(x,t) / GDP(t)/P(20-64,t)$.

$P(x,t)$ = Population at age x in year t .

$P(20-64,t)$ = Working age population (ages 20 to age 64) in year t .

The decomposition is useful for several reasons. First, it highlights the importance of age structure in translating social effort (aggregate spending) into individual welfare (spending per beneficiary). Second, by measuring benefits relative to GDP per working-age adult, we can judge the relative generosity of a country's public benefits relative to international standards. This international comparison also serves as a useful guide for plausible changes in the generosity of public programs (for example, using OECD levels of generosity as long-run targets). Third, this benefit measure provides an easily understood metric for comparing benefits across public programs. GDP per working-age adult will be roughly equivalent to the average annual wage since wage remuneration is about two-thirds of GDP and workers comprise about two-thirds of the working-age population. Therefore, program benefits as fraction of GDP per working-age adult are roughly equivalent to program benefits as a fraction of the average annual wage.

¹ The formula in Equation 1 implies that the wage bill is a constant share of GDP, which is consistent with a Cobb-Douglas production function. GDP can be forecast based on an assumed rate of productivity growth (2.5% per year) and the projections of the working-age population.

Consider educational spending as an example of these points. Measuring education spending as a share of GDP tells us how much of society's resources are devoted to education, but it does not tell us about the welfare of individual students. How much is invested in each student? Looking at educational spending in 3 countries, we find that Italy, Brazil, and Burkina Faso invest the same amount in public education: about 4.5% of their GDP (UNESCO, 2009). But these similar levels of societal effort translate into vastly different levels of investment per youth due to their different age structures. For each Italian youth, average annual public education spending amounts to about 18% of annual GDP per working-age adult – or roughly, 18% of the average annual wage. For each Brazilian youth, average public education amounts to about 10% of GDP per working-age adult -- or about half that invested per Italian youth. For each youth in Burkina Faso, average public education spending amounts to about 4.5% of GDP per working-age adult – or about $\frac{1}{4}$ that spent on Italian youth and $\frac{1}{2}$ that spent on Brazilian youth. While these educational investments should also be measured in terms of quality and not simply quantity, the difference in amounts invested per student across these three societies is striking. This is a reflection of differences in demography rather than social effort. In Burkina Faso, there is a 1:1 ratio between the youth population and the working-age population who support it. In Brazil, this ratio is about 1:2 – with each youth supported by 2 working-age adults – and hence twice the investment per student is possible given the same social effort as Burkina Faso. In Italy the ratio falls to 1: 4 – with each youth supported by 4 working-age adults. Thus, Italy with the same social effort as Brazil and Burkina Faso is able to invest twice as much per youth as Brazil and four times as much as Burkina Faso.

We can extend this example by comparing public spending in Brazil in 2005 to the average for OECD countries. In Table 1, we estimate the relative generosity of social spending in Brazil compared to OECD countries. Public spending as a share of GDP in three main program areas (education, pensions, and health care) is decomposed into a demographic component (the dependency ratio) and an economic/policy component (the benefit generosity ratio). The latter is measured as the average annual benefit relative to GDP per working-age adult. It is derived as a residual by dividing aggregate spending as a share of GDP by the appropriately defined dependency ratio. The demographic dependency ratios in Table 1 are calculated as the number of targeted beneficiaries (for education, health care, and pensions) divided by the working-age population. In the case of education, the educational dependency ratio is taken as the population ages 6 to 21 divided by the population ages 20 to 64. While education spending is also directed to other age groups, this age group incurs the majority of expenditures. The pension dependency ratio is calculated as the population 65+ divided by the population 20 to 64. The health care dependency ratio is defined as the number of high-cost users of health care divided by the population 20 to 64. The majority of health expenditures are directed toward high-cost users – those in their final decade of life and most especially their final year of life (MILLER, 2001; LUBITZ et al., 2003; MCGRAIL et al., 2000). Accordingly, our health care dependency ratio measures the relative size of the high cost user population defined as the number of people who will die within a decade. To estimate this

number we forecast cohort deaths in years $t=0$ to $t=9$ for the cohort alive at time $t=0$ based on population estimates and projections from CELADE (2009). Data on aggregate spending as a share of GDP are taken from various sources: UNESCO (2009) for educational spending; WHO (2009) for healthcare spending; and Turra and Queiroz (2010) and OECD (2009) for expenditures on public pensions.

As shown in Table 1, we find lower benefit generosity for health care and education in Brazil relative to the OECD. While Brazil lags behind OECD in both these areas, the gap is larger in education: educational benefits per youth in Brazil were just 56% of the OECD level, while Brazilian health care spending per beneficiary was 68% of the OECD level. In public pensions, however, we see that Brazil has a generous level of pension benefits compared to the OECD: double the generosity level observed in OECD countries (an average public pension benefit of 61.1% of GDP per working-age adult in Brazil versus 30.4% in OECD).

This comparison between Brazil and the OECD also serves to highlight one plausible future path for public benefits in Brazil: as GDP per working-age adult in Brazil approaches the level of OECD countries, the generosity of its public programs might also tend to approach OECD levels. This would mean a significant expansion of education and health care programs in Brazil. For education this would mean a near doubling of investment per youth (1.8 times as large), in health care a similarly significant increase (1.5 times as large). However in pensions, it implies significant pension reforms – leading to a 50% reduction in average pension generosity.

TABLE 1
Summary of Brazilian Spending in 2005

	Percentage					
	Public education		Public pensions (1)		Public health care	
	Brazil	OECD	Brazil	OECD	Brazil	OECD
Aggregate spending	4.4	4.8	6.6	8.0	3.3	6.9
Benefit generosity	8.7	15.5	61.1	30.4	30.0	44.0
Dependency ratio	50.5	31.1	10.8	26.3	11.0	15.9

Source: Celade (2009); Unesco (2009); NTA (2010); OECD (2009); WHO (2009).

(1) Excludes civil servant pensions. In Brazil, pension payments to civil servants were 3.8% of GDP in 2005.

The data

Our projections of public spending are derived from Equation 1 by forecasting the population, $P(x,t)$, and average benefits relative to GDP per working-age adult, $b(x,t)$. The population forecasts are taken from data from CELADE (2009) for the years 2005 through 2050. The Celade forecast² is based on the cohort component method using a single set of assumptions about the future course of mortality, fertility, and migration.

² In comparison with the population forecast from IBGE (2008), Celade (2009) forecasts a rise in the Total Fertility Rate in 2030 from 1.5 to 1.7 – while IBGE forecasts that it will remain at 1.5 post-2030. Their mortality and immigration assumptions are similar.

There is considerable uncertainty about the particular path of future mortality, fertility, and migration in Brazil – and, too, there is the added uncertainty about knowing the current levels of these factors. Miller, Bay, and Ruiz (2009) have produced probabilistic population forecasts for the population of Brazil based on random sampling from the historical time series of UN member countries. Those results show the highest level of uncertainty for the school-age population reflecting the high uncertainty about how low and how fast fertility will fall in the future – but there are considerably lower levels about uncertainty for the old-age population. While uncertainty over the future course of population will affect the timing of the fiscal impacts discussed here, it does not affect the general conclusions of this paper.

Our forecasts of average benefits by age should be considered as highly uncertain. Benefit spending is determined by a combination of supply-side and demand-side factors. Technological progress, economic growth, social change, the epidemiological transition, and public policy will all contribute to determining future benefit levels. One response to this uncertainty is to assume that average benefits by age do not change over time. These kinds of “status quo” forecasts assess the impact of demographic change under the assumption that current policy and current enrollment rates do not change over time. By ignoring likely policy changes such as increases in school enrollment rates and increases in utilization of health services by the elderly, these “Status Quo” forecasts will tend to understate the likely fiscal impact of population change in these sectors. In the case of pension forecasts, the opposite is true. Holding the age profile of pension benefits constant at the high levels currently observed in Brazil ignores the impact of reforms that have already been enacted into law (e.g., raises in retirement age, changes in benefit formulas). Therefore, these “status quo” pension forecasts would tend to exaggerate future pension spending in Brazil and the fiscal impact of aging.

The data for average public spending on education, health care, and pensions by age relative to GDP per working-age adult, $b(x,t)$, for Brazil are taken from “National Transfer Accounts for Brazil, 1996” by Turra and Queiroz (2010). These data are derived from micro data sources such as household surveys and administrative data and adjusted so that aggregate values for these benefits match the information contained in official National Accounts for Brazil. Similar data for OECD countries are taken from Lee and Mason (2010). These data form part of the National Transfer Accounts (NTA) project (www.ntaccounts.org). National Transfer Accounts (NTA) is a system for measuring economic flows by age at the aggregate level in a manner consistent with National Accounts [MASON et al., 2009]. NTAs provide a complete and coherent measurement of economic relationships between population groups (by age, gender, socioeconomic status) within a national economy in the same way that National Accounts measure economic relationships between sectors (household, production, government). By allowing us to measure economic relationships between groups in an economy (between young and old, between men and women, between rich and poor), NTAs provide a way to transform National Accounts into a policy instrument that addresses population aging, inequality, and other challenges of this century. Currently, 41 countries

are participating in the NTA project: from the Americas (12), Europe (12), Asia-Pacific (11), and Africa (6). The NTA dataset has been especially useful in providing data for use in fiscal projections (MILLER, 2011).

Scenarios

How might we expect the age profiles of average benefits to change over time? In our projections we consider two scenarios for each sector: a “Status Quo Scenario” and an “OECD Scenario.” For education, the Status Quo Scenario means that the share of GDP devoted to education remains at its current level. Over time, as the school-age population declines, investments per student gradually climb toward OECD levels. In the OECD Education Scenario, we set the more ambitious goal of reaching OECD levels of investment per student within a decade, by 2020.

The Status Quo Pension Scenario is a counter-factual experiment that assumes no changes in average pension benefits. It represents a Brazilian future in which the pension reforms of 1998, 2003, and 2012 were never implemented. Like the Status Quo Pension Scenario the OECD Pension Scenario also ignores the recent reform legislation. Instead, it predicts a set of future reforms that gradually and continuously reduce pension benefit generosity toward OECD levels. The rate of this reduction is set so that once Brazil reaches the level of GDP per working-age adult currently observed in OECD countries, its average pension benefits will also reach OECD levels.

For health care, as was the case with pensions, the Status Quo Scenario holds average benefits by age constant relative to wages – only demographic change matters. In the OECD Health Care Scenario, we assume that average health benefits relative to wages rise toward OECD levels as GDP per working-age adult increases.

On the use of simple models

Above we have outlined a simple model for forecasting expenditures based on age. In defense of this approach we offer the following observations. First, the simple model serves an important heuristic purpose in abstracting from the details in order to highlight the fundamentals driving change. Our model assesses the impact of two key trends unfolding over the coming decades: rapid population aging as reflected in changing age structure and rapid economic growth as reflected in changing levels of public benefits relative to wages. Second, we apply a single projection model in 3 different sectors: pensions, health care, and education. For this reason, we must rely on simplifications to aid in the application of the model in these different settings. Third, these simple models serve as a valuable cross-check for the more complex, sector-specific models. They can be used as a benchmark for comparisons with the complex models in order to understand to what extent the differences in rules and in composition of the population (by gender, etc.) are driving change. Finally, it is very much an open research question as to whether complex models or simple models

are better at predicting the long-run future. More detailed and more complex models are likely to be more accurate in the short-run because their additional assumptions make them a better approximation of current reality. But as the forecast horizon lengthens, the myriad of assumptions which made the complex model fit the current period so well are also likely to be violated in the long-run – leading to a decline in forecast accuracy. In a sense, the complex models are likely to “over fit” the data. For a general discussion on complex and simple models and forecast accuracy see Goldstein and Gigerenzer (2009) and Makridakis and Hibon (1979). For a discussion of the same issue in the demographic context see the special issue of *Mathematical Population Studies*, especially the article by Ahlburg (1995).

Forecasts for public education, pensions, and health

Public education

With the sharp decline in fertility in Brazil over the past few decades, the relative size of the school-age population has declined by 40% over the past 60 years. In 1950, the school-age population was 85% as large as the working-age population – a ratio higher than that observed in Burkina Faso at the time. By 2010, the school-age population was half the size of the working-age population. If fertility rates remain low in Brazil, it is expected that by 2040 the school-age population will be about 30% of the working-age population – a ratio currently observed in Italy and several other European nations. This long run decline in the school-age population greatly reduces the demographic pressures in the education sector in Brazil and would allow for a substantial expansion of educational investment per youth with modest additional social effort.

We evaluate two scenarios for projecting future public spending on education. In the Status Quo Scenario, the government maintains its current levels of aggregate spending on education at 4% of GDP. As the population of students declines over time, the average benefit per student would gradually rise toward OECD levels over the next 4 decades – but never reach these levels. The alternative scenario evaluates an ambitious expansion of educational spending to reach OECD levels of investment per student within a decade. In this scenario, spending as a percent of GDP increases sharply over the decade reaching 6.3% by 2020. Once reaching this target level of investment per student, the share of GDP allocated to education would then gradually decline in concert with the decline in the school-aged population.

What would it mean to reach OECD levels of investment per student? This investment is measured relative to the average wage in the economy. To the extent that education is a product solely of teachers salaries and average classroom sizes, then reaching OECD levels of investment per student would mean that Brazil had achieved the same level of “quantity” as measured by enrollment rates and “quality” as measured by class sizes and average teacher salaries as the OECD countries. Such an ambitious increase in educational investment would likely have profound implications for both economic growth and inequality in Brazil. Indeed, Lee and Mason (2010) present simulation results which suggest that

such investments in human capital can offset the costs of population aging. Investment in youth could play an important role in confronting the twin challenges of population aging and the persistence of high levels of inequality in the region. An analysis of the implications of reaching the OECD levels of investment per student by 2020 rather than by 2050 is beyond the scope of the current paper. Here, we evaluate the fiscal costs of this ambitious reform and of these education scenarios and compare those to costs of public pensions and health care programs.

Pensions

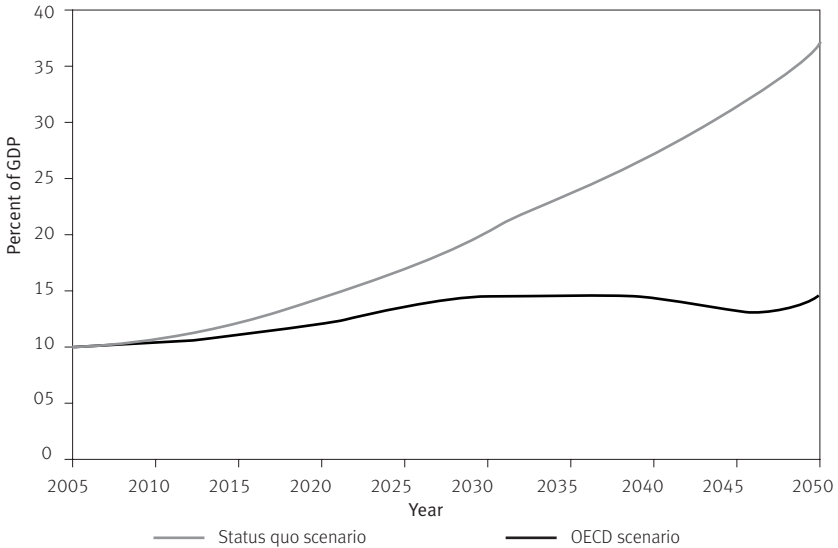
In 2005, the Brazilian government was spending one-tenth of its GDP on its two main pension programs: 6.6% of GDP on RGPS (Regime Geral de Previdência Social), which pays retirement benefits to former private sector workers, and 3.8% of GDP on RPPS (Regime Próprio de Previdência Social), which pays retirement benefits to former civil servants. The large expansion of public pension benefits in Brazil in recent decades has taken place under very little demographic pressure – as there has been relatively little change in the elderly population in Brazil relative to that of the working-age population. But this will all change dramatically in the coming decades as the population begins to age rapidly. In 2010, the elderly population in Brazil was about 11% the size of the working-age population. By 2050, this ratio will more than triple – with the elderly population in Brazil being about 39% of the size of the working-age population.

We present two scenarios for future public spending on pensions. The Status Quo Scenario assumes no change in the benefit generosity of pensions. In this case, the rapid increase in the ratio of older adults to working-age adults directly translates into dramatic and unsustainable increases in public spending – with spending on pensions tripling from 10% of GDP in 2004 to 37% of GDP by 2050. Clearly, this “status quo” path will be unsustainable.

Several recent pensions reforms (1998, 2003, and 2012) resulted in significant reductions in the generosity of pensions – both in the short- and long-runs. The new social security rules and transition to the new rules are exceedingly complex. A complete modeling of the impact of these rules is beyond the scope of the current paper and would require information on wage distributions, predictions of the future course of minimum wage relative to the average wage, prediction of behavioral responses to the new rules such as switching from retirement based on age to retirement based on contribution period, etc. In lieu of attempting to forecast the impact of the legislated reforms on pension benefits, we assume that the benefits will decline toward OECD values as the Brazilian economy grows. Specifically, we assume that the GDP per working-age adult will grow at 2.5% over the next 40 years and that the generosity of public pension benefits will fall toward OECD levels. In this “OECD Scenario” we do not model specific reforms but instead assume that reforms will be carried out in a continuous manner to lead to a smooth reduction in benefit generosity over time, as the economy grows. We find that pension costs rise modestly to about 15% of GDP. The decline in benefit generosity as the economy expands is sufficiently large so as to

offset the impact of sharply rising number of seniors. The steep rise in pension expenditures that accompany aging is not fully evident in this scenario until the late 2040s. Our OECD Pension Scenario is consistent with the recent official government forecast (BRASIL, 2013) for public pensions for private sector workers (RGPS), which showed an increase from 7.3% of GDP in 2013 to 12.6% of GDP in 2050.

FIGURE 1
Public spending on pensions as percent of GDP
Brazil – 2005-2050



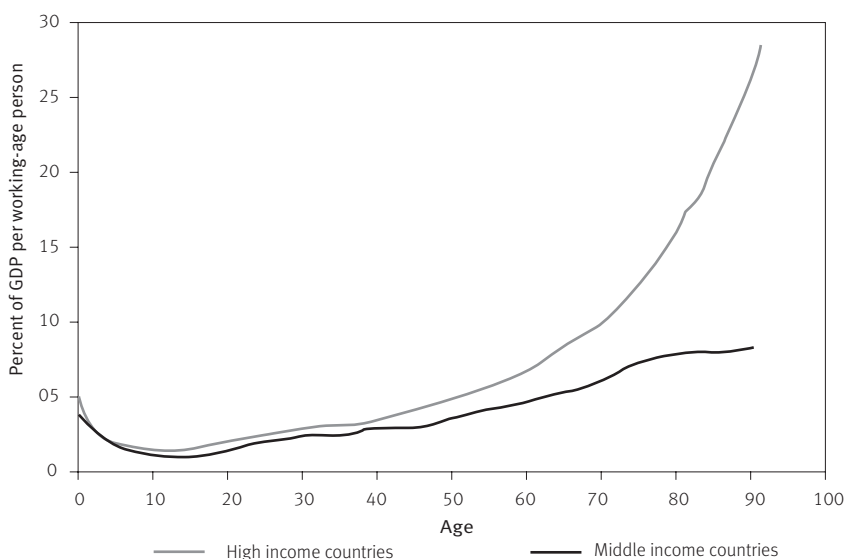
Source: Turra and Queiroz (2010) and Celade (2009).

Health care

As countries move through the demographic transition, the health care dependency ratio follows a U-shape curve. Initially, declines in mortality rates lead to declines in the proportion of the population near death – the high-cost users of health care services. Eventually as the demographic transition proceeds, the age structure of the population shifts substantially toward older persons and the population near-death begins to increase relative to the working-age population. Virtually all Latin American and Caribbean countries have reached or will soon reach this turning point beyond which the population near-death will grow more quickly than the population of working-age adults – tending to increase the financial pressures in health care. In the case of Brazil, we find that the near-death population has been declining since 1950 – when the near-death population was 19% of the working-age population. It reached a nadir of about 11% of the working-age population in 2006 and is projected to continue rising in the future. After experiencing decades of favorable demographic change, the health care system in Brazil has reached a turning point and is set to experience increasing demographic pressures over the coming decades.

But demographic change is not the only source of growing fiscal pressures. Another source is the growing use of health care services among the elderly, which accompanies economic growth. Our analysis of NTA data reveals striking differences in health care expenditures by age between high-income and middle-income countries. Figure 2 shows health care expenditures per person of each age as a fraction of GDP per working-age adult. For individuals below age 40, health spending in high-income and middle-income countries is surprisingly similar. This cross-sectional data implies that health care spending for these ages increases proportionally with income. Above age 40, the pattern is quite different. For this age group, we see that in high-income countries health care expenditures per older adult are significantly greater than in middle-income countries relative to the levels of GDP per working-age adult in those countries. That is, as incomes rise, health care expenditures at these older ages increase more rapidly than income.

FIGURE 2
Average health spending per person by age in middle and high income countries
Circa – 2005



Source: Turra and Queiroz (2010) and Celade (2009).

It is very much an open question as to why societies seem to choose this path. Some possibilities include:

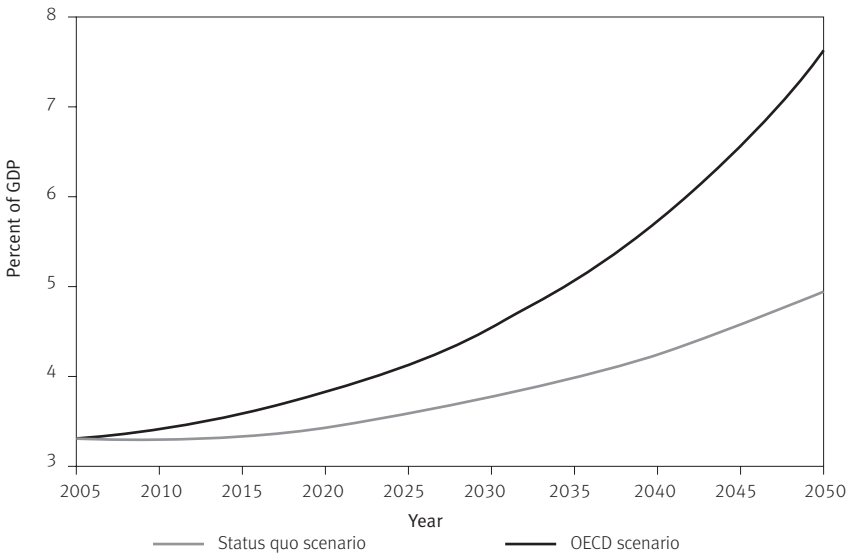
- shifts in medical protocol in which chronic diseases are more aggressively treated;
- age-biased technological change, wherein advances in medical care favor the sorts of chronic medical problems that older people have;
- political power; since these are mainly public expenditures, it could represent the rising political power of older people as societies age (and simultaneously become wealthier);
- data measurement anomalies; older and wealthier countries may provide some care for senior citizens in the market, whereas in poorer countries such goods are home produced,

as an example, it would be the shift from personal home care provided by family members toward institutional care provided in nursing home facilities.

Whatever the reasons for this pattern, the shift to higher expenditures at older ages magnifies the impact of population aging and is projected to lead to significant increases in health expenditures as a share of GDP.

As was the case for pensions, we present two scenarios for future public spending on health. In the Status Quo Scenario, age-specific public spending on health remains constant relative to GDP per working-age adult. In this scenario, only demographic change drives public health expenditures. In Brazil, this results in about 1.6 percentage points increase in spending through 2050: rising from 3.3% in 2005 to reach 4.9% in 2050. In the OECD Scenario, public expenditures on health care move toward the patterns observed in high-income economies – with large increases at older ages, as GDP per working-age adult increases. In this scenario, the fiscal impact of growing numbers of elderly is multiplied by this shift toward increasing cost of medical treatment for the elderly. Public expenditures increase by 4.4 percentage points of GDP by 2050 (reaching 7.7% of GDP). This increase is on par with that observed for pensions under the OECD Pension Scenario.

FIGURE 3
Public spending on health as percent of GDP
Brazil – 2005-2050



Source: Turra and Queiroz (2010) and Celade (2009).

Assessing the overall fiscal impact

Having assessed the impact of population aging in each sector, in concluding we present an assessment of the overall impact on government spending. In 2005, total public spending on education, pensions (including those for civil servants) and health care amounted to

17.7% of Brazil's GDP. Our baseline projection shows an increase of 8.9 percentage points of GDP over the interval, so that by 2050 public spending in these sectors would reach to 26.6 percent of GDP. This projection combines 3 sector forecasts. For public education, we assume that spending is maintained at 4% of GDP (the Status Quo Education Scenario). Educational spending per Brazilian youth gradually rises toward OECD levels over the forecast interval as the size of the youth population declines. For public pensions, we assume that a series of pension reforms will gradually reduce benefits to OECD levels by 2050 (the OECD Pension Scenario). For public health, we assume that the impact of increasing numbers of elderly is multiplied by an increase in the health costs for this age group (the OECD Health Care Scenario). Figure 4 shows public spending on these three programs as a percent of GDP from 2005 to 2050 in our baseline scenario. Beginning around 2015, public spending begins a sustained and rapid increase lasting several decades.

The fiscal impact of aging in Brazil will be considerable. The increases in spending over the entire 45-year period can be summarized by calculating the present value of these increases in spending relative to current GDP. Using a discount rate of 4%, we find these cost increases amount to 157% of current GDP. This liability is nearly triple the current debt obligation of the Brazilian central government, which stood at 53% of GDP in 2011 (WORLD BANK, 2013).

Figure 4 also shows an alternative to the baseline scenario in which Brazil adopts an ambitious education reform in order to reach OECD levels of investment per youth within a decade. We evaluate the additional costs associated with this reform by calculating the present value with respect to current GDP. The discounted present value is calculated by summing the 45 years of annual costs after they have been discounted by 4% per year. Table 2 presents the results for this calculation as well as those for other reforms in pensions and in health care. The cost of the educational reform over the 2005-2050 period amounts to 39% of current GDP, compared to 50% for health care, and 99% for pensions. Therefore, a key finding of our study is that even a very ambitious program of increasing educational spending to reach OECD levels of student investment within a decade would be far less costly than the projected increases in health care and pensions – about one-fourth of those costs. Whether such a program can be financed has much to do with the fiscal pressures exerted by these other two sectors.

In terms of public health care, one of the key findings from our projection is that health care expenditures could plausibly increase by more than 4 percentage points of GDP before 2050, about the same increase as pensions. These increases in health spending come relatively later in the projection period as compared to pensions – so the present value of cost increases in health care is about half that of pensions. There are two driving forces behind this increase in health costs: the increasing proportion of elderly in the population and a growing intensity of health care use among the elderly. According to these results, health care is likely to emerge as a major fiscal challenge in the coming decades in Brazil.

In terms of public pensions, we find that in the absence of reform the present value of projected increase in pension costs through 2050 amounts to more than 3.5 times the current

GDP. Clearly the old system was unsustainable. In our OECD Pension Scenario, we assume that a series of reforms will gradually reduce Brazil' pension benefits toward OECD levels as the economy grows. It should be noted that even in this optimistic reform scenario, the projected increase in pension expenditure dominates the fiscal outlook for Brazil – accounting for half of the total projected increase in public expenditures.

TABLE 2
Projected increases in public spending – 2005-2050

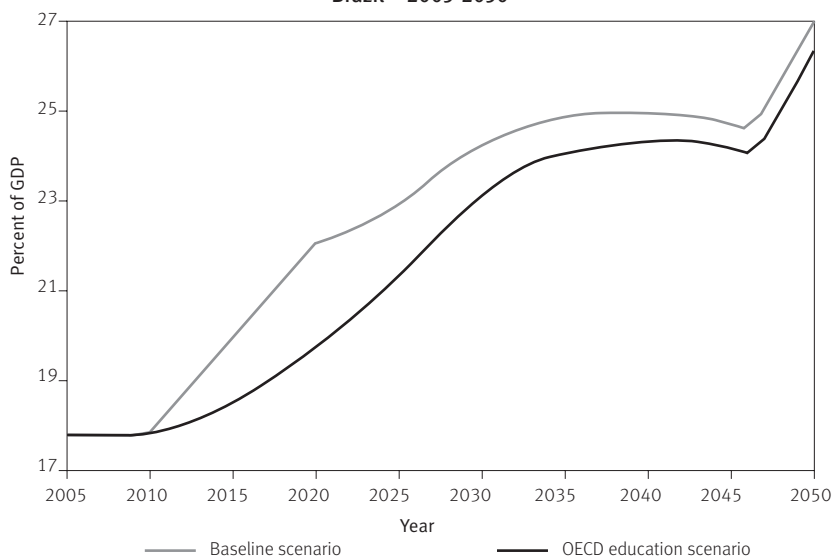
Sector	Scenario	Present value of future cost increase relative to current GDP (%)	Spending as percent of GDP		
			2005	2050	Difference
Education, pensions, and health care	Baseline Scenario. Maintain educational spending at 4% of GDP. Average pension benefits gradually decline toward OECD levels as Brazilian economy grows. Average health benefits by age gradually increase toward OECD levels as Brazilian economy grows.	157.0	17.7	26.6	8.9
	Status Quo Scenario. Maintain educational spending at 4% of GDP. Average pension and health benefits by age maintained at current levels relative to GDP per working-age adult.	375.0	17.7	46.1	28.4
	OECD Scenario. Rapid increase in student investment, reaching OECD levels by 2020. Average pension benefits gradually decline toward OECD levels as Brazilian economy grows. Average health benefits by age gradually increase toward OECD levels as Brazilian economy grows. Increases are greatest at the older ages.	196.0	17.7	27.2	9.5
Education	Status Quo Scenario. Maintain spending at 4% of GDP. As youth population declines, educational investment per youth will gradually rise toward OECD level.	0.0	4.0	4.0	0.0
	OECD Scenario. Rapid increase in student investment, reaching OECD levels by 2020.	39.0	4.0	4.6	0.6
Pensions	Status Quo Scenario. Average pension benefits by age maintained at current levels relative to GDP per working-age adult.	357.0	10.4	37.2	26.8
	OECD Scenario. Average pension benefits gradually decline toward OECD levels as Brazilian economy grows.	107.0	10.4	14.9	4.5
Health care	Status Quo Scenario. Average health benefits by age maintained at current levels relative to GDP per working-age adult.	18.0	3.3	4.9	1.6
	OECD Scenario. Average health benefits by age gradually increase toward OECD levels as Brazilian economy grows. Increases are greatest at the older ages.	50.0	3.3	7.7	4.4

Source: Turra and Queiroz (2010) and Celade (2009).

Note: A discount rate of 4% is used for the present value calculation.

Brazil is now entering a new demographic phase in which changing population age structure will lead to increasing cost pressures in health care and especially in pensions. Our projections show that beginning around 2015, public spending will begin a sustained and rapid increase lasting several decades. The needs for increased investment in students will compete against those of sustaining pension benefits and the increasing demands for health care especially among the elderly. By adopting long-range expenditure estimates along the lines of the illustrative projections presented in this paper, the government of Brazil can carefully weight these competing demands and adopt long-term strategies that buffer the fiscal impact of population aging while ensuring continued progress against inequality and poverty.

FIGURE 4
Public spending on education, pensions, and health as percent of GDP
Brazil – 2005-2050



Source: Turra and Queiroz (2010) and Celade (2009).

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Resumo

O impacto fiscal do envelhecimento populacional no Brasil: 2005-2050

Neste artigo estimamos a influência do envelhecimento populacional nas despesas em educação, previdência social e saúde no Brasil no período de 2005 a 2050. Os gastos fiscais foram estimados baseados em um modelo simples em que o gasto público agregado é determinado por mudanças na estrutura etária da população e no benefício médio recebido em diferentes idades. Estimamos o provável aumento no gasto público nas próximas décadas, contrastando diferentes tendências no gasto em educação, saúde e previdência social. O valor do crescimento no gasto fiscal é medido em relação ao Produto Interno Bruto (PIB) anual e o valor presente desse aumento em relação ao PIB atual. As projeções mostram que, a partir de 2015, depois de uma pausa, devido às reformas das pensões recentemente promulgadas, a despesa pública iniciará um aumento rápido e sustentado com duração de várias décadas. As necessidades crescentes de investimentos em educação irão competir com o crescente e sustentável aumento de demanda na saúde pública e na previdência social originado do considerável crescimento da proporção de idosos na população brasileira. Em particular, nossas projeções mostram que uma reforma educacional ambiciosa, com o objetivo de alcançar o nível de investimento por jovens em uma década de acordo com a OCDE, equivaleria a apenas cerca de um quarto dos aumentos de custos previstos em programas de saúde pública e de pensões.

Palavras-chave: Despesas públicas. Envelhecimento populacional. Projeção populacional. Saúde. Educação. Previdência social.

Resumen

El impacto fiscal sobre el envejecimiento de la población en Brasil: 2005-2050

En el presente artículo se estima el impacto fiscal sobre el envejecimiento de la población en Brasil entre 2005-2050. Enfocase las tres áreas fundamentales del gasto público: educación, previsión social y salud. Las proyecciones se basan en un modelo simple en el que los gastos públicos agregados son afectados por cambios en la estructura de edad de la población, así como por los cambios en los beneficios públicos promedio recibidos en función de la edad. Evaluase los probables aumentos en el gasto público en las próximas décadas comparando tendencias divergentes en los gastos públicos

en las áreas de educación, previsión social y salud. Evalúese la magnitud de estos cambios en lo que se refiere al aumento de los gastos relativos al PIB anual durante los próximos 40 años y estimase el valor presente de este creciente gasto en comparación con el PIB corriente. Verifíquese que la cambiante estructura de edad de la población ocasionará una presión de aumento en el área de la salud y sobre todo en la seguridad social. Las proyecciones demuestran que alrededor del año de 2015, después de la tregua ocasionada por las reformas recientes en el ámbito de la previsión social, el gasto público iniciará un sostenido y rápido crecimiento durante varias décadas. La necesidad de aumentar las inversiones en el área de la educación competirá con la necesidad de aumentar los beneficios de la previsión social y con crecientes demandas en el sector de la salud, especialmente entre las personas mayores. En particular, nuestras proyecciones indican que una ambiciosa reforma educativa dirigida a alcanzar el nivel de la OCDE de la inversión por la juventud dentro de una década sería de sólo alrededor de una cuarta parte de los aumentos de los costos previstos en los programas de salud pública y de pensiones.

Palabras clave: Gastos públicos. Envejecimiento de la población. Proyección de la población. Salud. Educación. Previsión social.

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